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Embodying the Music: A Survey of Choral Music Educators on Conducting Injury and Wellness Techniques

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Abstract

The purpose of this exploratory study was to identify the most common choral conducting-related injuries, and determine the ways conductors completing the survey have adapted their physical gesture to accommodate or avoid pain and discomfort. Utilizing a researcher-designed online survey, we asked choral music educators to identify and describe musculoskeletal and vocal injuries sustained throughout their careers, and the effects of these injuries on their conducting and teaching practices. Results from respondents (N = 75) indicated a high prevalence of upper-body repetitive stress injuries amongst participants caused by classroom ergonomics, misuse and overuse, poor technique, and tension. In response to their injury or injuries, participants reported altering alignment, change of technique, rest, and avoidance. Preventative responses included classroom modifications and therapy and/or treatment. We discussed the workplace culture of the typical American choir conductor, the state of wellness education in pre-service teacher training, and considerations for future research. Such findings could help inform conductors, teachers of conducting, and medical providers to understand more about injury prevention and management for conductors.

Keywords: Conductor, choir, occupational injury, prevention

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Researchers have established that choir ensemble directors (used interchangeably here as choral directors, vocal music teachers, or choral conductors) encounter a wide range of physical rigors including repetitive motion of conducting (Daley et al., 2020), standing for multiple hours on hard floors (Cham & Redfern, 2001), functional voice disorders (Byeon, 2019; Naqvi & Gupta, 2022), and other occupational risks such as moving equipment and student-inflicted injury (Schofield et al., 2017). Practitioner articles have instructed music educators in a variety of injury response and prevention including stretching and breathing (e.g., Wis, 2021), body mapping (e.g., Johnson, 2008), vocal health (e.g., Salvador, 2010), and self-care (e.g., Kuebel, 2019). There are extensive bodies of extant literature within performing arts medicine research regarding musician injury and prevention and specifically vocalist injury and prevention. Empirical research addressing injury and prevention for choral conductors, however, is less prevalent.

Instrumentalist Performance-Related Injuries

Many scholars have examined Performance Related Health Problems (PRHPs) for instrumental musicians (Cruder et al., 2021; Guptill, 2011; Heinan, 2008; Jacukowicz, 2015; Shoup, 2006; Yang et al., 2021; Zaza, 1997). PRHPs include physical problems like musculoskeletal disorders, peripheral nerve entrapment syndromes, motor dysfunction, hearing loss, and psychological playing-related health problems like musical performance anxiety and occupational stress (Zaza, 1997). Often, performing artists display several co-existing musculoskeletal problems as initial problems may evolve into more complicated problems involving multiple regions of the body (Shoup, 2006). Psychosocial aspects of musicians' work, such as long hours, high-demand jobs, low control and influence, lack of social support, and work content, may play a role in the development of musculoskeletal problems (Jacukowicz, 2015). Gentsch & Kuehn (2022) hypothesized that negative body memories, such as the stress mentioned above, get stored in memory and have the ability to contribute to the development of somatic manifestations. Although authors have discussed the biomechanics, common pathologies, and treatment and prevention strategies PRHPs for piano, strings, winds, brass, and percussion (Cruder et al., 2021; Guptill, 2011; Heinan, 2008; Jacukowicz, 2015; Shoup, 2006; Yang et al., 2021; Zaza, 1997), the conductor as a musician is often left out of the conversation.

Playing Related Musculoskeletal Disorders (PRMD) in instrumental musicians are most often overuse injuries that affect the upper extremities (Yang et al., 2021). Scholars dispute the prevalence rate of these injuries depending on their definition of playing-related injuries, response rates for their surveys, and methods of data collection (Guptill, 2011). For example, Yang et al. (2021) reported a prevalence rate of 50% to 88%, while Bosi (2017) reported a prevalence rate of up to 93%. Regardless of instrument, chronic injuries from overuse, misuse, repetitive and non-ergonomic movements may result in muscular imbalance, tightness, or pain. Changes in practice schedules, technique, and repertoire may further exacerbate the general risks that may affect instrumental musicians (Yang et al., 2021).

Injury and patterns of pain from PRMD within instrumental musicians affect not only professional musicians and educators, but also music students. Cruder et al. (2021) surveyed 340 university music students with current musculoskeletal disorders in order to identify patterns of pain location and determine associations between pain patterns and student characteristics. The researchers identified five patterns of pain location including wrist pain, widespread pain, right shoulder pain, both shoulders pain (left concentrated), and neck and back pain. Participants who identified as women, who perceived a higher exertion rate, who reported psychological distress, and who shared a lower level of self-efficacy reported the largest number of associated variables.

Guptill (2011) completed a phenomenological inquiry in which they examined the lived experience of instrumental musicians who had suffered from injuries related to playing. As musicians' identities are often linked to their instrument and ability to perform, Guptill related that playing-related injuries "can be emotionally devastating and can leave musicians destitute" (p. 84) since many musicians typically are independent contractors receiving minimal pay with poor access to healthcare. Guptill's interviews with ten professional musicians found that because music was integral to participant identity, disruption in music-making impacted their perception of time, body, space, and social well-being. When participants were engaged in music, the perception of time passed much more quickly compared to when they became fatigued or discomforted, which impacted their perception of time more negatively. Likewise, when they were engaged in performing music, their perception of bodily discomfort was less and seemed to be tied to the type of performance and the difficulty of the piece being played. For some individuals, the physical practice spaces where they felt emotional and physical pain became a trigger for them later. Additionally, participants described either an integrative supportive network of colleagues or the opposite, which was kept as a secret, causing isolation. In many cases, the lack of reporting was the result of fear that they would become unemployable.

Pianists, including those choral conductors who play piano for their ensembles, may encounter a variety of piano-specific injuries. Shoup (2006) explained that due to the repetitive nature of playing piano, piano players are "especially susceptible" to muscle strain of the hand or tendinitis (p. 858). Risk factors for PRMD in pianists include female sex, high stress, increasing age, previous shoulder and elbow injury, and small hand size (Yang et al., 2021). Yang et al. postulated that there have been increased risk for strain and overuse with smaller hand size because of excessive reaching and wrist movement. Additionally, poor playing posture, a lack of warm-up, and intense repertoire may have led to performance-related injury.

Vocalist Performance-Related Injuries

The research on vocal performance-related injuries has mainly focused on vocal injuries, including muscle tension dysphonia, vocal nodules, vocal hemorrhage and polyps, and chronic vocal deterioration (Jahn, 2009). Due to the proximity of the larynx to other major

organ systems, singers have been especially vulnerable to vocal injuries related to their respiratory, gastrointestinal, and endocrine systems. General health issues like gastric reflux, respiratory diseases, and medication side-effects have shown potential implications for vocal health.

Haben (2012) characterized a trained singer as a “vocal athlete” (p. 167). As vocal athletes are so tuned in to their instrument, they often are able to identify changes in their vocal quality quickly. The more experienced a singer is, Haben asserted, “the earlier and subtler the voice disturbance tends to be at presentation” of changes (p. 165).

Very few studies have examined the vocal dose of choral singers. Gorham-Rowan et al. (2017) examined the effect of a tapered rehearsal schedule on choral singer voices. The researchers observed increased practice time for choral ensembles prior to performances, and posited that while increased practice time may have improved performance abilities, it may have negatively affected vocal quality. They suggested a tapered rehearsal schedule prior to performances that may lighten the vocal load for singers. Their preliminary study with a small number of participants yielded results that suggested that a tapered rehearsal schedule may benefit some performers, potentially improving their vocal quality.

Conductor Performance-Related Injuries

Ensemble conductors, like other musicians previously discussed, are also susceptible to injury. Due to “the facilitative nature of the conducting instrument, the lack of practiced movement patterns, and the environmental and occupational stresses inherent in the role” (Daley et al., 2020), very few scholars have examined choral conductor injury. In a 1985 pilot study of 153 choral conductors, Simons found that choral conductors suffered from mental stress, general fatigue, and vocal strain. Twenty-seven percent of respondents also reported back and shoulder problems that affected their conducting.

Prevention and Treatment Strategies

To date, most osteopathic research for performing arts medicine has emphasized the diagnosis and treatment of the musculoskeletal system (Shoup, 2006). Shoup explained that “performing artists require near perfect function of the musculoskeletal system to meet the high demands of performance” (p. 854). Therefore, an osteopathic approach considers all causes of injury and provides a rational and multi-disciplined treatment plan to prevent or treat injury. This treatment plan may include approaches such as medication, physical therapy, surgery, lifestyle modifications, examination of practice habits, osteopathic manipulation, yoga, and deep muscle massage among other treatments (Shoup, 2006). Osteopathic treatment often combines several manipulative modalities in order to obtain the best results.

Although playing-related injuries pose a real threat to musicians, Bosi (2017) reported that musicians often ignore the symptoms, sometimes hindering their own recovery. Franklin (2016) noted a “surprising lack of an empirically verified method of teaching healthy movement of the body in music making, especially at a young age” (p. 2). As conductors

often do not learn conducting technique until they are adults (Daley et al., 2020), this is counter to the culture of many disciplines where technical skills and knowledge of risk/injury prevention are developed simultaneously. Furthermore, employees with positions in manual labor (warehouses, construction, line production, etc.) typically receive training every three years to maintain a safe workplace environment (Training Requirements in OSHA Standards, 2015). No such broadly implemented education or employer-based training in choral conducting is known to these authors or has been reported by previous researchers. There have been a few different prevention models that have been introduced over the last decade to help conductors avoid vocal and physical injuries.

Diaz (2021) posited body mapping as a method to prevent injury and address quality of movement for instrumentalists, singers, and conductors. A somatic method designed for musicians, Body Mapping encourages individuals to explore their perception of their bodies through anatomical information, self-observation, and self-inquiry (Diaz, 2021). An incorrect map of a body, Diaz explained, can produce rigid or uncoordinated movements that may lead to injuries.

The *Alexander Technique* is another method to approach injury prevention and learn about the physiology of the body (Franklin, 2016). A psychophysical method, the Alexander Technique led to the most efficient use of the body while conducting through “directed thinking activities and heightened kinesthetic awareness (p. 4). Physiology and knowledge of how to utilize their bodies to communicate is of the utmost importance as choral conductors rely heavily on non-verbal methods of communication.

Taylor’s (2016) practitioner guide to injury prevention and wellness for music educators, *Teaching Healthy Musicianship*, stressed the importance of ergonomics for musicians and music educators. Its five rules of ergonomics were to maintain good posture, avoid repeated twisting and reaching, avoid hunching, create a comfortable environment, and move continuously (Taylor, 2016). Music educators should consider their desk and computer ergonomics, the height of the conductor’s stand and podium, the size and weight of their baton, and ergonomics within the music library, car, and home. One full chapter of the book was dedicated to conductor back and shoulder pain, as Taylor said, “pain disorders of the shoulder and back are a common problem for conductors” (p. 135). Taylor addressed conductor injury, causes, and preventative and reactive stretches to address the pain.

MacDonald (2004) encouraged choral conductors to care for their voices through awareness of spinal alignment, core muscle groups, coordinated breaths, and ease and flow of phonation. Care for the voice is not limited to the singing voice; rather, care for speaking habits is equally important for a choral conductor. MacDonald cited additional vocal abuse factors such as daily stress, environmental conditions, allergies, psychological factors, and diet and exercise.

When prevention of vocal injury is no longer possible, the modality of treatment needs to be discussed. For individuals already experiencing a vocal injury, vocal rest is an “effective therapeutic option” if a full recovery with or without therapy is expected (Haben,

2012, p. 166). However, Haben advised that vocal rest is a short-term solution that often prevents singers from addressing the underlying problem. The author called for more clear guidelines regarding voice rest regimens for singers. The decision to seek therapy or resort to vocal rest can sometimes be controversial because of the difficulty to determine the efficacy of voice therapy with its wide array of symptoms and treatment methods. However, Carding et al. (1999) found strong evidence supporting direct treatment for patients with non-organic dysphonia, which was caused by overuse or misuse and a frequent diagnosis for vocal music teachers.

In response to the specific healthcare needs of performing artists like choral conductors, the Performing Arts Medicine Association (PAMA) was founded in 1989 (Performing Arts Medicine Association, n.d.). Through this association, medical professionals, artist educators, and music administrators collaborate to work toward the goal of improving health care for performing artists. PAMA members treat performing artists, serve as medical consultants, showcase research, and serve as a resource for performers who need healthcare and support. The organization's website, artsmed.org, houses a variety of resources including webinars, online courses, articles, and information about their annual international symposium (PAMA, 2024).

Although several researchers have examined the liability of musician or teacher injury and practitioner articles have provided injury-response advice to music teachers, no studies have investigated patterns of injury and prevention by choral conductors. Therefore, in this study, our team of two music teacher educators, one osteopathic physician, and one osteopathic medical student sought to identify the most common choral conducting-related injuries and determine the ways conductors completing the survey have adapted their physical gesture to accommodate or avoid pain and discomfort. Research questions included (a) What injuries did choral conductors experience throughout their careers?; (b) How did conductors adapt their gesture to account for injury?; and (c) What preventative responses did conductors utilize as a result of their injury?

Method

Participant Recruitment

An Institutional Review Board approved the following research method and online survey. We created a researcher-designed online questionnaire (Appendix A) in an effort to reach a broad group of choral directors. We acquired our participants through online choral music educator forums, social media posts, and a research call via a national choral association's listserv. Calculation of actual response rates was not possible due to the unavailability of the numbers of participants in each virtual venue. We collected 94 survey responses and included 75 in this investigation. We excluded incomplete surveys. The undergraduate student demographic of respondents was also prevented from continuing the survey and was excluded from the results. Current and retired choral directors were permitted to continue.

Participants

Participants ($N = 75$) were volunteer practicing and retired choral music educators. Respondents were 50 women (67%), 24 men (32%) and one nonbinary individual (1%) with a mean teaching experience of 19.58 years (range = 1-40 years of teaching experience). For the majority of participants, the highest degree earned was a master's ($n = 44$, 59%), followed by bachelor's ($n = 17$, 23%), doctoral ($n = 13$, 17%), and no degree ($n = 1$, 1%). Participants resided in 24 of 50 U.S. states, with the majority of participants residing in Arkansas, Missouri, and Texas ($n = 42$, 56%). Approximately 89% of the participants identified as White with the next largest group being Black or African American at 6%.

Questionnaire

Utilizing the limited extant literature on choral conductor injury, as well as the expertise of both the choral music educators and the osteopathic physicians on the research team, we designed a survey to help us learn more about choral conductor injury. We used the online survey tool Qualtrics to create the questionnaire for the investigation (Appendix A). We piloted the questionnaire by sending versions and updates to music education and wellness researchers ($n = 3$) for suggestions and edits. The questionnaire included two sections. Section 1 contained a consent statement, demographic information, types of choirs taught/conducted, and rehearsal practices/structure. Section 2: included: an injury attitudes Likert scale; injury experiences, including questions from the Nordic Musculoskeletal Questionnaire (NMQ); (c) injury affects; (d) responses to injury; and (e) space to share additional information. Specifically, Section 2 included the following:

- (a) injury attitudes Likert scale (e.g., Injury is part of being a vocal teacher; My injury is an integral part of my teaching experience; My pain/discomfort level from occupation-related injury affects my sense of well-being)
- (b) injury experiences (e.g., Describe your most prominent choral-occupation-related injury)
- (c) injury affects (e.g., What symptoms did you experience as a result of your injury?),
- (d) responses to injury (e.g., How did your injury and symptoms affect your conducting? What adaptations did you make in response to your injury?)
- (e) space to share additional information.

Responses to the online survey were in the form of Likert scales, check all that apply, diagram clicking, drag the cursors, and open-ended responses. The NMQ is a validated evaluative tool to determine areas of the body where injury has occurred. It was developed by

Kuorinka et al. (1987) for epidemiological use and not clinical diagnosis.

Data Analysis and Trustworthiness

We uploaded open-ended questionnaire data into the qualitative analysis software De-doose and independently coded the data for emergent themes. We then cross-checked codes by comparing our independently derived results. Once coding was complete and coding differences were addressed and managed, we classified codes into themes, identified patterns, and drew conclusions in response to our research questions. To ensure the trustworthiness of the data, we utilized data triangulation, peer debriefing, and intercoder cross-checking (Creswell, 2014).

Quantitative analysis was completed by isolating data and correlated data points into an Excel spreadsheet and calculated using the software's formulae. An example of correlated data would be the types of injury according to the length of rehearsal periods.

Results

An important aspect of the study's results can be examined through quantitative and qualitative lenses. The prevalence of different injury types in addition to the numbers of working years provided insightful information. For conductors who had been teaching more than the mean number of years ($n = 19.6$ years), the total number of injuries per participant was significantly higher (most respondents below the mean did not report any injuries). In particular, the frequency of shoulder and voice-related injuries was very high among more veteran conductors. Reading participants' description of their injuries offers insight about the behaviors and risks involved in teaching in a choral music setting. Respondents frequently listed psychological and professional difficulties which grew out of their physical injuries.

What injuries did choral conductors experience throughout their career?

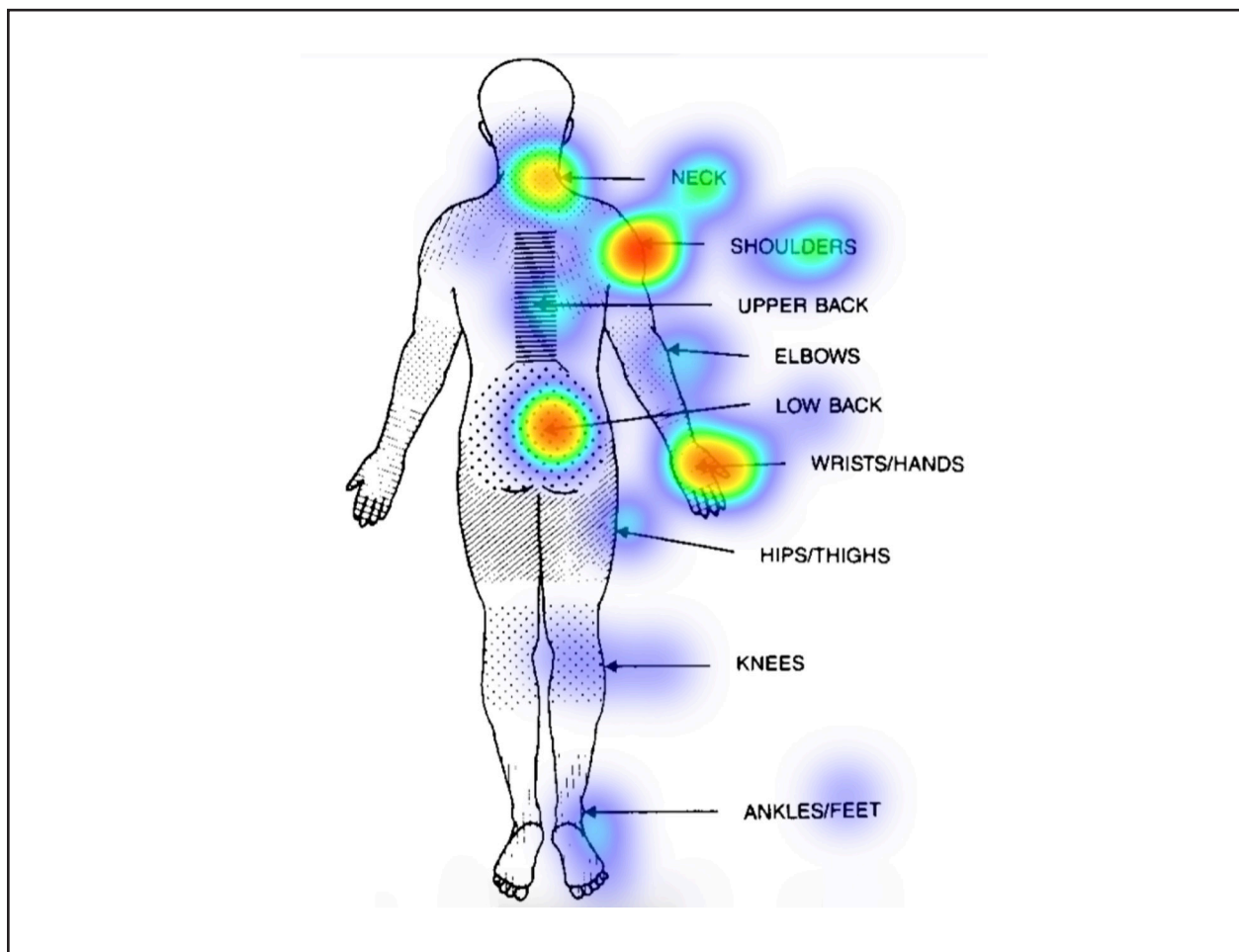
The mean of time taught for all participants was 19.6 years. Respondents with more experience teaching than the mean accounted for 87% of conductors with reported injuries, while respondents with less than the mean experience accounted for 13%. There was no strong trend between the type of injury sustained by a choir director and the setting where they worked (elementary, middle school, university, etc.). The mean duration of a typical rehearsal for all respondents was 69.0 minutes. However, the mean duration for participants with different types of injuries varied. See Table 1 on the next page for rehearsal durations based on injury type.

One method through which respondents indicated the location of their injury in this study was by using the Nordic Musculoskeletal Questionnaire (NMQ), a validated methodology in epidemiological studies. Figure 1 on the next page shows the aggregate responses

Table 1.
Rehearsal Durations Based on Injury Type

Injury Type	Average Rehearsal Length (minutes)	Standard Deviation (minutes)
Shoulder	80.23	27.11
Wrist/Hand	65.1	29.75
Neck	64.67	36.41
Low back	56	29.4
Lower extremity (hip, thighs, knees, ankles, feet)	72.5	30.4
All participants	66.29	23.08

Figure 1.
Participant Responses to Nordic Musculoskeletal Questionnaire (NMQ)



regarding the point of injury. A higher concentration of responses is indicated by warmer colors (red, orange, yellow) and a lower concentration of responses is indicated by cooler colors (green, blue, violet). It seems that some respondents clicked on the name of the body part (e.g. neck, shoulders, etc.) rather than the location on the body.

Over half of the participants who had a work-related injury said that it affected their conducting ($n = 24$) and we followed up with more in-depth questions for this group. The frequency of injuries as reported by those participants can be seen in Table 2.

Table 2.

Number of Primary Injuries by Area of the Body

Area of Body	# of Reported Injuries	% of Total
Shoulders	14	19%
Neck	10	13%
Hands/Wrists	8	11%
Lower Back	6	8%
Upper Back	5	7%
Hips/Thighs	3	4%
Elbow	3	4%
Voice	2	3%
Other	2	3%
Ankles/Feet	1	1%
Knees	1	1%
No Injury	20	27%
Total	75	

Repetitive stress injury (RSI) accounted for 66% ($n = 14$) of these injuries, 29% ($n = 6$) indicated an acute injury, and 1% ($n = 1$) of individuals reported neither repetitive stress nor acute injury. The average onset of injury symptoms occurred 17.3 years into their teaching career. 100% of respondents in this sub-group reported that they had two or more

work-related injuries that affected their conducting. When we prompted these participants to report all locations of injury, the results were “other” ($n = 15$), shoulder ($n = 10$), wrist/hand ($n = 9$), lower back ($n = 8$), neck ($n = 5$), ankles/feet ($n = 3$), upper back ($n = 2$), and knees ($n = 2$).

Types of Reported Injuries

The majority of injuries that participants reported were upper body injuries, including the arm, wrist, hands, back, elbow, and shoulder. Shoulder injuries were the most commonly reported injury in this survey, with many participants reporting sore, painful, or frozen shoulders; torn rotator cuffs, hitches in their shoulder movement, calcific tendonitis, bursitis, and shoulder impingement syndrome. Arm injuries that affected quite a few participants’ conducting included “pain in my right arm if I extend it for long periods,” neuropathy in both arms, and near loss of a right arm due to a bone infection. Participants ($n = 2$) reported elbow tendonitis or tennis elbow. Wrist and hand impediments to conducting included arthritis ($n = 3$), carpal tunnel ($n = 2$), cubital tunnel ($n = 1$), sprained wrist or fingers ($n = 2$), stiff fingers and wrists ($n = 1$), and cuts on fingers from snapping ($n = 1$). Some participants reported degenerated or injured lumbar discs as well as muscle spasms and pulled or strained back muscles.

Participants also reported lower-body injuries, vocal injuries, and a traumatic brain injury that affected their abilities to conduct. Lower-body injuries included a sprained ankle ($n = 1$), arthritis in the knee ($n = 1$), neuropathy in the legs ($n = 1$), a broken foot ($n = 1$), and pain in the feet ($n = 1$). Vocal complaints included “severe laryngitis,” “vocal fatigue,” “voice strain,” “loss of singing/speaking voice,” “vocal cord damage,” “muscular tension dysphonia,” “vocal injury,” “hoarseness,” “breathiness and vocal strain.”

Injury Causes: Acute

Causes of acute injuries that impaired participants’ choral conducting included car accidents, falls, moving or faulty classroom equipment, and student-inflicted injuries. Four participants experienced car accidents that affected their abilities in the choral classroom. One participant said, “I didn’t have too many issues with conducting until I was in a car accident and had to have a rotator cuff surgery done. Now my shoulder tires out faster.” Another participant reported, “I had a car accident and suffered from muscle spasms in my back. It has affected my career as a teacher and as a conductor.” A third participant explained that due to a car accident and subsequent surgery, they can no longer play the piano.

Several participants reported falls that led to injuries that affected their conducting. One participant fell from a portable stage that was not secure, injuring their leg. Another participant fell when they were standing and conducting on a chair, injuring their wrist. During a musical theater rehearsal, one participant fell and tore their rotator cuff, affecting their conducting for ten weeks.

Classroom equipment was the cause of several reported injuries. Several participants re-

ported acute injuries including hand and back injuries due to moving pianos, choral risers, chairs, and/or heavy furniture. Another participant was “cut to the bone moving glass shelf in the music library.”

One participant reported a student-inflicted injury. A student “running full speed” ran into this teacher and “slamm[ed] into [their] head.” This caused a traumatic brain injury.

Injury Causes: Repetitive Stress Injury

Repetitive stress injuries (RSI) accounted for the majority of participant injuries. Participants indicated classroom and piano ergonomics, misuse and overuse, poor technique, and tension as the main causes of these repetitive stress injuries.

Classroom ergonomics played into participant RSIs in a variety of ways. Piano-related RSIs included “hip, wrist, and thumb pain” from teaching while standing behind a piano, a “sprained finger from repeated playing notes for pop music,” “arthritis in my hand joints from years of playing piano,” knee and foot pain “from standing and playing the piano,” bursitis from “sitting too long on a piano bench,” “tightness and stiffness in my fingers and wrists,” and carpal tunnel from playing piano for choral groups. Other RSIs incited by classroom ergonomics include “lengthy holding of scores” and a foot injury due to “standing for so many years on a concrete floor to direct.”

An overwhelming majority of participants used the words “misuse” or “overuse” to describe the causes of their repetitive stress injuries. Some participants reported overuse in regards to their conducting (e.g., “my injuries come from overuse in the shoulder area” or “overuse of arms during the [COVID-19] shutdown while conducting. My gestures were bigger and more forceful to make up for the lack of facial expression due to [my] mask.”). Other participants reported overuse in regards to their vocal use (e.g., “misuse of voice,” “hoarseness on rare occasions from overuse,” or “Breathiness and vocal strain from overuse”).

Length of conducting experiences played into this overuse for several participants who reported injuries caused by “lengthy holding of scores and conducting positions,” “years of rehearsing constantly with almost no downtime,” “rehearsals too long when multiple rehearsals in succession,” and “conducting a concert after extensive rehearsal.” Several participants blamed poor technique for their overuse or improper use. In free responses, participants mentioned poor conducting technique, piano technique, standing or sitting technique, and overall tension as contributors to their repetitive stress injuries.

Previous Injuries

Injuries acquired prior to employment as choral conductors affected the ways several participants approached their teaching or conducting gesture. They reported acquiring the injuries anywhere from childhood to during their undergraduate and graduate work. Previous injuries were acquired from accidents and by participating in sports like basketball, running, water skiing, and mountain biking. One participant’s disc injury from college persists,

forcing them to “hunch or get weight off of one foot to help ease the pain if I have been standing for a long time.” They explained, “I have seen this in my videos of conducting which keeps me off my center of balance and does not allow me to be tall and centered.”

For some participants, their injury was not a temporary impediment, but rather a long-term disability to which they have had to adjust. One participant reported losing their arm. As a result, they conducted using their left arm only and “because of this, my left arm gets tired easily having to conduct and do everything else (daily life routines).” Another participant was diagnosed with rheumatoid arthritis, which made “work-related conducting more difficult as well as healing.” Another participant reported having a cochlear implant for the last 6 months, for which they were “thankful...so that I can continue my career.”

How did conductors adapt their gesture to account for injury?

In order to account for their injury or injuries, participants reported gesture modifications including altering alignment, change of technique, rest, and avoidance. The need for such strategies suggests that a full recovery was not achieved. Of participants who indicated they had encountered an injury related to their profession ($n = 41$), 46.3% of respondents reported their ongoing injury, pain, or significant modifications to basic teaching behaviors such as conducting, standing, or singing. Several conductors reported a need to change arm positions frequently or to utilize their non-dominant conducting arm more frequently. One participant mentioned the need to “shift weight from one foot to the other to ease pain,” and two participants reported a need to sit and conduct from the piano exclusively.

Many participants reported changing their conducting size or position. Many participants focused on using a smaller gesture to accommodate their injury (e.g., “Adjusted conducting pattern to much smaller movements,” “smaller gestures,” “minimizing my overall gesture”). One participant worked to “broaden conducting positions” in response to their injury and another employed the baton in order to minimize gesture.

Several participants used rest as an important way to address their injuries. This rest may occur during conducting (e.g., “sometimes rest one arm while continuing to conduct with the other” and “stool used for sitting if needed”). The rest may also occur between conducting periods (e.g., “vocal rest” and “being mindful of when I need to rest!”)

The overwhelming amount of written feedback regarding gesture modification indicated a total avoidance of the use of the injured mechanism. Some participants reported being completely unable to conduct (e.g., “often unable to conduct,” “I had to keep it in a sling so I didn’t use it, until I recovered,” “I don’t conduct with my arms,” “I simply could not use the arm”). Other participants reported major alterations in their vocal use (e.g., “vocal rest for two years,” “never sing for pleasure,” “can’t demonstrate”). Other avoidance behaviors reported by participants included relying on others to move furniture and no longer playing the piano.

What preventative responses did conductors utilize as a result of their injury?

As a result of their injuries, participants reported utilizing preventative responses against further injury, including classroom modifications and therapy and/or treatment. Some participants reported planning to continue the injury-causing behaviors as they felt as if there were no alternative options.

Classroom modifications included altering the environment, including seat choice, sound and light mitigation, and employing tools or devices like a microphone, crutches, a cochlear implant, and increased use of the piano and baton. Some participants reported limiting how many hours per day they engaged in risky classroom activities and implementing “rest periods” into their classroom routines. Students played a role in some participants’ prevention responses, leading vocally to give their teacher’s voice a break and helping to move furniture to prevent further injuries.

Of the respondents who said they engaged in treatment for their injury ($n = 21$), 66% received three or more types of treatment, with the two most common types being physical therapy/occupational therapy (67%) and stretching (62%). Therapies employed by participants in response to their injuries included massage, guided strength training, and voice therapy. One participant mentioned how they “learned how to talk with speech therapy and how to protect my voice,” while another has had “several years of voice therapy” and must utilize a classroom microphone and rest their voice completely when not at school. A few participants reported responding to their injury with surgery or medication.

Three participants reported plans to not respond to their injury due to time or job constraints. One participant shared, “It is heartbreaking. I can never sing for pleasure. I have to continue to damage my voice because of my job. I am too old and too close to retirement to change fields. I feel like I am in a horrible *Catch 22*.” Another participant reported that without surgery, they would just have to accept their “limited range of motion and discomfort.” A final participant who suffered a rotator cuff injury acquired by conducting reported that their injury did not affect their rehearsal, so they did not need to respond to their injury in any way. They said, “That is confusing to me, but it is my experience.”

Additional Considerations/Concerns

Throughout the free-response portions of the survey, participants raised a variety of concerns regarding their choral-conducting related injuries, including injury as a part of the job, injury as a part of aging, stress and anxiety as a part of injury, and job security concerns as a result of injury. One participant shared their surprise at teacher acceptance of vocal injury as part of the job: “I have been in meetings recently where multiple teachers have spoken about vocal injury as a guarantee of teaching. Teachers agreed that when we begin teaching, we agree to sacrifice our own singing voices. I was surprised by this.” This statement is supported by Byeon (2019). Several participants mentioned age or aging as a factor when considering injury (e.g., “Many of the other injuries are just with age”).

Of participants who indicated they had encountered an injury related to their profession ($n = 41$), 9.7% indicated a resulting pattern of anxiety and depression. One mention was in response to a physical injury (“intense stress and anxiety that caused me to go on disability”), and another in response to emotional abuse from administrators (“the unseen nature of psychological injuries caused by abuse of administrators who do not understand music or methods of teaching in a choral setting has caused my depression to spiral out of control”).

Job security was a concern for several participants following their injuries. One high school choral director who could no longer play the piano following a car crash explained, “Since I was not at the end of the time required to retire with full benefits, I was grateful when an elementary principal accepted me as a music teacher.” Another choral director was instructed by administration to teach less in order to save their voice following a vocal injury: “They were asking me to not do my job fully. They denied workman’s comp...” Of respondents who experienced an injury resulting from their work ($n = 41$), 22% said they had reported it to an administrator and only 12% had received support from their employer in the form of workers’ compensation, flex-time for care, etc. Of this group, 34% had taught grades 6-8 and 34% had taught grades 9-12 at some point in their career. Other grade levels were less represented.

Participants reported their feelings on a range of issues related to their work and injury. Multiple choice options (and the response value) were: *Strongly Agree* (2), *Somewhat Agree* (1), *Neither Agree nor Disagree* (0), *Somewhat Disagree* (-1), and *Strongly Disagree* (-2). The questions respective mean response values were as follows: “My personal identity is tied to my work as a teacher” $M = 1.10$; “Non-work-related injuries have affected my life as a teacher” $M = 0.68$; “Injury is just part of being a vocal music teacher” $M = -0.71$; “I was aware of risk for occupation-related injury when I became a teacher” $M = -0.51$; and “I am equipped with wellness strategies to prevent injury in my job” $M = 0.21$. These responses revealed important issues about teacher identity and the culture of work-related injury.

Discussion

Results in a Research Context

The connection of workplace culture for professional musicians and PRHPs has been well-established by existing research (Jacukowicz, 2015). Many of those factors, such as long hours, repetitive practice, and psychological stress, could account for the fact that a majority of participants’ reported injuries were repetitive stress injuries (RSIs). This study found that 66% of the primary injuries subjects chose to discuss were RSIs and were not acute. This preponderance was consistent with the 50-88% frequency of RSIs found by Yang et al. (2021). Had we asked subjects to report the cause of all conducting-related injuries, and not limited them to discussing a primary injury in the current study, the data may well have been closer to the 93% found by Bosi (2017).

The results of utilizing the NMQ image in this study to determine areas of injury were similar to results from the Zaza and Farewell study (1997) regarding playing-related musculoskeletal disorders (PRMD) of instrumental musicians in which a modified NMQ was used. Researchers within that study asked a question regarding points of injury similar to Question 14a of the current study in which a human diagram was labeled by body region. Common points of high-frequency injury between the two studies were the neck, shoulders, lower back, and wrist/hands. One discrepancy in Zaza and Farewell's data compared to the current study was a higher prevalence of upper back pain. The similar injury findings between the two studies suggest significant merit for advocacy in Performing Arts Medicine. Furthermore, this parallel could give focus to wellness educators as well as researchers and healthcare providers who specialize in the treatment of musicians. These topics will be discussed in greater detail in subsequent sections.

Several respondents in our study reported feeling distressed over limitations in their conducting abilities. One vocal music teacher reported, "Broke a foot in my classroom, intense stress and anxiety that caused me to go on disability." These frustrations of teachers were likely intensified by the frequency with which professional musicians have been found to connect their work to their personal identity (Guptill, 2011). When asked about pre-service teachers' expectations and active teachers' observations regarding work-related injury, the respondents indicated a significant disparity regarding what was anticipated and what occurred. Encouragingly, respondents largely rejected the supposition that injury is inherent in vocal music teaching. Having limitation of activity is not merely a problem of pain and workplace challenges, it may well prompt conductors to redefine their self-perception, relationship to others, and feelings of worth. The potential psychosocial ramifications are considerable and are not fully explored in this study but are deserving of further research.

Within our study, we asked injured conductors what types of medical care they sought for healing. Their answers included surgeons, primary care physicians prescribing medication, chiropractors, acupuncturists, physical and/or occupational therapists, osteopathic physicians, and counseling. Although some of our respondents received at least some benefit from these modalities, not all received full restoration of health and motion.

Osteopathic physicians may also provide a beneficial outlet to provide this restoration. The osteopathic approach takes into account all possible causes of injury, the mechanism by which it occurs, and through their thorough knowledge of the musculoskeletal system, can provide a multi-disciplined approach to treatment (Shoup, 2006). In addition to their ability to prescribe medication, order imaging and physical or occupational therapy, Osteopathic physicians have also been uniquely trained to diagnose regions of dysfunction throughout the body and provide manipulative treatment in the office setting. This often results in fewer medications prescribed and, over time, resolution of patient's pain and dysfunction. Additionally, because osteopathic physicians recognize that mental and emotional well-being plays into physical well-being, they provide treatment that also recognizes and incorporates the self-identifying aspect that many choral conductors communicated in this

study (Ward et al., 2003). Although there is literature to support the use of Osteopathic manipulation for instrumentalists, research surrounding the uniqueness of choral directors is lacking, and future research should focus on further understanding the types of injuries that occur with this group and the efficacy of osteopathic manipulation for this group of individuals.

State of the Choral Workplace

The most common employers for American choral directors have been school systems, places of worship, and non-profit arts organizations. The authors of this study examined the collective challenges of working in these three settings as they related to employer health and wellness. Choral conductors in this study indicated a fairly strong connection between their work and identity. This finding correlates to previous research about instrumental musicians (Guptill, 2011). When workers felt strongly connected to their vocation, the effects often included career longevity, effectiveness, and positive self-esteem.

First, we will examine the largest group of employees: those who work in school systems. Researchers have found that individuals who remain in the education profession for five years were likely to remain until retirement (Ingersoll et al., 2021). Participants in this study strongly indicated that their identity being was tied to their work as teachers. Coupled with the emotional valences of being an arts educator, it is easy to understand how individuals became willing to endure inconveniences, under-compensation, and even injury (Scheib, 2006) for a career about which they are passionate. With the ever-increasing portfolio of responsibilities for today's teachers in America (NASM, 2023), preservice education has become vast and weighted with requirements such that wellness for the teacher themselves has lagged behind. This area of wellness education has been both under-researched by academics and under-prioritized by administrators, as illustrated by two accounts reported in the present study of school principals who gave less than their utmost concern for the well-being of their employee. This study endeavored to examine the prevalence of work-related injury for choral directors, attitudes about themselves and their injury, and efforts to mitigate those injuries.

Choral directors working in places of worship are very often in a part-time capacity and are, therefore, not subject to the benefits of health insurance. Some religious organizations, as a result of their affiliation or budget restrictions, do not have the financial resources to compensate or replace employees who are on temporary leave. Further, the clergy who often manage the day-to-day operations of a congregation frequently do not have training in human resources skills to identify workplace injuries or reporting to employer insurance, if any exists. When merged with the personal commitment to the mission of the organization, these factors create the conditions for an atmosphere where conducting-related work injuries may be under-reported or addressed.

Conductors working in non-profit arts organizations such as community choirs, youth choirs, or community music schools may encounter similar challenges to places of worship

when it comes to securing worker's compensation. Depending on the long-term fiscal and policy approach of its board and staff, minimal procedures may be in place.

Education and Advocacy

Wellness education in pre-service teacher training programs have had far-reaching benefits for physical and mental health, self-efficacy, and self-esteem (Stapp et al., 2019). Once in the classroom, the gains from previously experienced wellness curricula extend beyond the teacher to the students. Unfortunately, a meaningful wellness education in preservice music teacher programs is still the overwhelming exception within university curricula. The National Association of Schools of Music, the accrediting body for music programs in U.S. higher education, has only recently included recommendations that wellness be addressed in the curriculum but has not stipulated how formally, in what coursework, or what topics should be addressed. Since most current university faculty do not have such training in wellness study, adequately educating pre-service music teachers is a cyclic problem.

When asked if they felt equipped with wellness strategies to prevent injury, participants suggested significant room for wellness training in pre-service and continuing education formats. When paired with other responses regarding the awareness of risk, this survey results suggested both the desire and need for additional research and instruction regarding injury prevention and management. Daley et al. (2020, p. 23) called for (a) “empirical research investigating the incidence and type of injuries sustained by conductors at all levels,” (b) “prioritizing pedagogical materials and course designs that address injury prevention and body awareness early and often,” and (c) “advocating for injury prevention as foundational to the body of skills needed for successful conducting among service organizations and accrediting bodies.” The likelihood of a choral director now in the middle or late part of their career having had wellness education in their degree program is very low. Therefore, it is incumbent upon professional organizations and providers of continuing education to provide information and training in the current field.

Advocacy for better working conditions and support is a multi-pronged solution. The same institutions needed to provide education and training for current choir conductors must also work to equip employers, administrators, and even insurance companies with the knowledge and response capacity to better serve their constituents. As the low rate of injury reporting found in this study suggested, many school leaders and policymakers may have been unaware or under-informed about the risk profile to choral directors and the long-term impacts on their health. Therefore, it is incumbent upon conductors to speak up about their concerns and accurately report both acute and repetitive stress injuries.

Limitations

Limitations of this study include a limited sample size and relative lack of diversity. We are confident that the majority of participants encountered the study invitation through forums for choir directors on social media. Though study participants came from 24 U.S.

states and territories, 56% of participants came from Arkansas, Missouri, or Texas. This concentration of responses is likely due to two factors. First, our ability to gain access to private social media groups, which are often regionally-based, was more challenging than anticipated. Second, we have more professional relationships in these states and greater access to online forums. Those relationships likely contributed to a higher response rate.

Participants in this study indicated a high degree of professional mobility with 87% having conducted two or more levels of choir (Pre-K, K-5, 6-8, etc.). The survey failed to ask participants what age range they were teaching when the discussed injuries occurred. Therefore, an indirect correlation among general experience and types of injuries is all that can be determined.

Further Research

Our findings highlighted the need for both a greater depth of knowledge on the subject and for new questions to be asked in future studies. A larger and more diverse sample of subjects would serve a wider swath of choral directors in the U.S., particularly across racial and geographic demographics. The lack of diversity in this study's respondents generally reflects a lack of diversity in the profession itself. Unfortunately, no choral music professional organization effectively tracks the demographic makeup of its membership, so it is difficult to say to what degree this study's participants reflect the field of choral directors. Below are recommended questions for future research, and the limitations of those topics in the current study.

Future researchers might consider the role of the work setting (elementary, middle level, high school, adult/community, etc.) and the injury. We only asked in what settings had participants worked over the course of their career. Understanding the frequency and nature of injuries that are correlated to their educational setting may help to narrow recommendations for injury prevention.

We also did not explore the types of specific wellness education that conductors received in their pre-service training and/or continuing education. Respondents indicated here only the degree to which they felt prepared to manage their injury. A more detailed understanding of wellness content knowledge preservice would aid in finding common gaps of education.

Additionally, future researchers might consider how choral directors alter their movement and function related to the practice of conducting, playing piano, voice use, and other movements in response to their injury. Some conductors volunteered that information in this study, but we did not ask directly or ask for further details.

Finally, future research regarding conductor injury and prevention should explicitly include voice-related injury to allow participants to identify their specific injuries with more clarity. The current study did not enumerate the voice as an option to be included in its reporting, therefore it is most likely under-represented in the data.

Conclusion

The vast majority of respondents in this study reported at least one injury which affected their work as a choral director. Often, their injuries were sustained from job-related behaviors or events. The types of injuries were wide-ranging, affecting the musculoskeletal and nervous systems throughout the body, voice-related injuries, as well as negative impacts on participants' mental health. If these trends are indicative of the broad population of vocal music teachers, then there is a need to address them. Based on the data found in this study, we believe that the ongoing risks to choral conductors' physical and mental well-being is significant enough to warrant (a) increased wellness education in pre-service and continuing education, (b) increased awareness of risks for preservice conductors, (c) deeper research to better understand causal trends of injury in larger and more diverse populations, and (d) increased education for medical providers about the idiomatic risks and treatment options for choral directors.

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Appendix A

Survey

Demographics

In which state do you currently reside?

What is the highest level of school you have completed or the highest degree you have received?

Are you Spanish, Hispanic, or Latino or none of these?

Choose one or more races that you consider yourself to be:

What is your gender identity?

Which of the following best describes your sexual orientation?

Are you now married, widowed, divorced, separated or never married?

Occupation

For how many total years have you been teaching?

How would you classify yourself? (Graduate student, early career professional [0-9 years], mid career professional [10-19 years], late career professional [20+ years], retired professional)

Which grade levels have you taught?

Do you currently teach in a private or public setting?

How many hours per week do you work with each of the following: (choral ensemble, instrumental ensemble, elementary general music, secondary general music, higher education courses)

On average, how long are your rehearsals? (in minutes)

Do your rehearsals usually include a break when you are not using your body to conduct or teach?

Please indicate your level of agreement for the following statements.

- My personal identity is tied to my work as a teacher.
- Non-work-related injuries have affected my life as a teacher.
- Injury is just part of being a vocal music teacher.
- I was aware of risk for occupation-related injury when I became a teacher.
- I am equipped with wellness strategies to prevent injury in my job.
- I have encountered injury as a result of my work as a teacher.
- If yes, indicate your level of agreement for the following statements:
 - My pain/discomfort level from occupation-related injury affects my sense of well-being.
 - My injury is an integral part of my teaching experience.
- Which is your dominant conducting hand?

Injury

I have experienced one or more choral-occupation-related injuries that affect how I conduct my ensembles.

If yes:

- Click on the image where any choral-occupation-related injury has occurred (up to 5 clicks)
- Please describe your most prominent choral-occupation-related injury (choose one):
- Please describe how your chosen choral-occupation-related injury occurred:
- In what year of teaching did the injury occur?

- Was your injury an acute injury or repetitive stress injury?
- Which part of your body was affected by your injury? (Choose all that apply)
- Please indicate which side is affected by your injury
- What symptoms did you experience as a result of your injury? (Choose all that apply)
- How would you describe your current injury status?
- How did your injury and symptoms affect your conducting? What adaptations did you make in response to your injury?
- What steps do/did you take to treat your injury? (Choose all that apply)
- Did you report the injury to your administrators?
- Did you receive support from your job? (i.e., workers' comp, flex time for on-going care, etc.)
- Have you experienced any other choral-occupation-related injuries?
- If yes: Please briefly describe any other choral-occupation-related injuries:
- Is there anything about your injuries or choral-related injuries you would like to share with us?

End of Survey
