Upper-String Instrumentalists as Micro-Athletes:
A Framework for Integrating a Cognitive and Physical Strength and Endurance Regimen in (and out of) the Practice Room

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A dissertation

submitted in partial fulfillment of the

requirements for the degree of

Doctor of Musical Arts

The University of Washington

2022

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Program Authorized to Offer Degree:

Music

University of Washington

Abstract

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Researchers long have acknowledged similarities between sports athletes and musicians. Indeed, musicians are sometimes referred to as musical or instrumental athletes. They begin training at a young age, practice or perform daily, are highly competitive, require a high level of skill and physical capacity, play through pain, experience anxiety, and face risk of musculoskeletal disorders. The nature and quality of early musical training are crucial in developing skills to deliberately practice, self-regulate time, train bodies to play their instruments, and engage in healthy playing practices. In addition to inculcating proper music technique from the very beginning of instruction, teachers also must train students to develop mind and body strength to handle the demands of playing their instruments.

But while music teachers generally have great passion for, and insight into, their craft, they often have not been trained to give specific instruction on how exactly to practice in order to obtain the best results from a cognitive or physical point of view.

Music teachers don't always know how to address psychological issues that can hinder enjoyment and progress, and inhibit performance. Music performance anxiety is a condition that runs rampant amongst students and professionals alike, and has been a taboo subject for many decades. This difficult affliction can manifest itself in many different ways with varying degrees of severity. Fortunately, mounting research illustrates the promising effects that mindfulness can have on mediating the effects of music performance anxiety, and on building cognitive resilience overall.

The training music teachers receive often lacks focus on how to address physical concerns or to condition the body of the musician. Upper-string instrumentalists (those who play the violin or viola) are a special group of musicians particularly susceptible to developing performance-related musculoskeletal disorders (PRMDs). This is because of repetition of movement, hours of practice, awkward postures and the carrying of static loads. Playing these instruments emphasizes eccentric and concentric contractions that can lead to muscular imbalances. By implementing a complementary practice of postures to strengthen, re-align and relax the body, musicians can optimize their music practice and performance to build mental and physical strength.

This dissertation is written in five chapters. Together, they outline a framework for defining exactly what a micro-athlete is (in this context referring to upper-string instrumentalists), and training the micro-athlete musically and physically by integrating healthy practice habits and mind/body strengthening tools in (and out of) the practice room. Chapter 1:

Introducing the Micro-athlete, outlines characteristics of what being a micro-athlete entails. Chapter 2: Music Practice Habits, details how deliberate practice and self-regulation play an integral part in the quality of one's practice to optimize practice and prevent boredom. Chapter 3: Music Performance Anxiety, shows how holistic remedies such as mindfulness, meditation and deep breathing can relieve debilitating symptoms of this condition as well as build cognitive strength. Chapter 4: The Body of the Upper-String Instrumentalist, illustrates how the musculature involved, contractions engaged in, and musculoskeletal injuries incurred put these musicians on a "level playing field" with sports athletes. Chapter 5: Training the Micro-athlete, applies the research from previous chapters to demonstrate how to ergonomically hold and play the violin/viola, and how to strengthen body and mind of the upper-string instrumentalist by integrating micro-strengthening and relaxing activities and postures.

Dedication

to my parents for their unwavering love and support, and for always believing in me especially when I didn't believe in myself

Acknowledgements

There are so many people who have been a part of my journey that I simply don't have enough room here to express my gratitude. But I first and foremost would like to thank Melia Watras, my viola professor and mentor of the last eight years, as well as the chair of my doctoral committee, for her guidance, support, and patience. Melia, you have been such a huge artistic and pedagogical inspiration to me. Thank you for believing in my passion for music and wellness, and for making it possible for me to do the necessary interdisciplinary research for my dissertation.

I would also like to thank my other committee members, Sæunn Thorsteinsdóttir, David Rahbee, and Celia Lowe, for their guidance and support as well, especially since all this took place during a global pandemic! Sæunn, thank you for your glows and grows! Your incredible ability to bring people together through music is inspiring, as is your own artistic expression, and I just love watching you smile while you play. David, thank you for your artistry as a conductor, and also your innate ability to create a positive music-making experience through your humble approach to working with students. Celia, it was so wonderful to have you on my committee. We have spoken for a few years about my emerging research, so for you to be a part of it coming together in this culminating way is very special to me.

I want to thank Irene Putnam for creating meaningful illustrations for my dissertation. (Her many original drawings are denoted with *). It was a joy to collaborate with you and to watch you create original artwork based on my research.

I would also like to extend a special thank you to Steven Morrison, a former University of Washington professor of music education now at Northwestern University, for helping me organize my research and utilize the APA research format, and to the managing editor of

Eastland Press, John O'Connor, who gave me permission to use the illustrations from Blandine Calais-Germain's book *Anatomy of Movement*. (Those drawings are denoted with **).

Grammatical Note

When speaking in general terms I use “them” in the place of “him/her” and “themselves” in the place of “himself/herself.”

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Forward

In 2012, when I was 22 years old, I had a complete thyroidectomy and neck dissection for thyroid cancer that had spread to my lymph nodes. The surgery forced the major muscles in my upper body to atrophy and my left shoulder to sit higher than my right. I also lost all feeling in the upper left side of my body. To call this a musical setback was an understatement. I had just graduated with my Bachelor's degree in violin and viola performance and was starting to apply to graduate programs. My doctors knew nothing about how to help me musically and my musical mentors knew very little about how to help me physically. My own research on violinists/violists affected by thyroid cancer yielded very few results.

The lack of helpful resources regarding a very real affliction in my life was very depressing. Traditional physical therapy guided me only so far as how to move my muscles again. How to play music again with my muscles: Now that was the issue. After the trauma to my body and the medical/musical predicament that I found myself in, it dawned on me I was going to have to take the lead myself in designing a regimen to regain physical and musical health. Once I started a regular practice in yoga, my shoulders became more symmetrical. I also noticed that engaging in a yoga practice paired with practicing in short or timed intervals helped me increase body strength and physical stamina.

I started to think about the connection between musicians and sports athletes. As a result, I began a practice regimen that implemented a cross-training of sorts: practicing in short timed intervals, followed by short intervals of stretching and light strengthening. In my research to discover how musicians are a form of athlete, I began referring to musicians as micro-athletes and sports athletes as macro-athletes. These terms put musicians and sports athletes on a more level playing field to examine the qualities that help train one's body and mind.

As my physical body began to get stronger, I still struggled with a cognitive obstruction. Music performance anxiety started to become a greater issue when I began preparing again for performances. Without sensation in the upper left side of my body, I worried that I would drop my instrument. The fear forced me to clench, increasing tension throughout my neck into both shoulders and down my spine. Knees perpetually locked. These actions would not only affect my psychological well-being, but also drain my physical energy, rendering me to feel fatigued much faster. Through my research I have uncovered solutions that have aided me in times of stress, helping me discover the power that meditation and deep breathing have on performance anxiety and overall anxiety.

Chapter 1: Introducing the Micro-Athlete

What is a Micro-Athlete Versus a Macro-Athlete?

**Figure 1. Micro-athlete (left), macro-athlete (right)*

A “micro-athlete" is a musician. A “macro-athlete” is a sports athlete (See Figure 1). Sports athletes are macro-athletes because they train their bodies and their minds to work small and large muscle groups and are typically in full-body, constant motion. Musicians are micro-athletes because they train their bodies and their minds to work small and large muscle groups but are not typically in full-body, constant motion.

Micro-athletes and macro-athletes have the following in common:

—They benefit from engaging in deliberate practice.

—They require discipline and self-regulation.

—They practice or perform daily.

—They compete in challenging environments.

—They experience psychological challenges.

—They engage in the same muscle contractions.

—They share activation of many of the same muscle groups.

—They play through pain.

—They sustain musculoskeletal injuries.

—They face little "off season" because the training *really* never ends.

Micro-athletes and macro-athletes differ in the following ways:

—Unlike sports athletes, musicians practice in solitude (rehearsing with a group is something different).

— Unlike sports athletes, musicians often assume pain is a normal part of playing and find ways to mask the effects of an injury.

—Unlike sports athletes, musicians face a culture of silence regarding physical injury.

—Unlike sports athletes, many musicians have unaddressed injuries present by the time they enter college.

—Unlike sports athletes, musicians focus primarily on the quality of sound and intonation versus injury prevention.

—Unlike sports athletes, musicians often have little to no knowledge of the body that they use on a regular basis.

—Unlike professional sports athletes, professional musicians don't continue to receive instruction on a professional level.

Why Create a Cognitive and Physical Strength and Endurance Regimen for Violinists and Violists?

Upper-string instrumentalists are a group of musicians who particularly engage in such micro-athleticism. Playing the violin or viola is both a cognitive and physical activity. Cognitively, it requires engaging in proper practicing techniques and mindfulness to combat stresses that inhibit motivation and progress (Armbrecht, 2011; Bandura, 1977; Bonneville-Roussy and Bouffard, 2015; Barbar et al., 2014; Biasutti and Concina, 2014; Burin and Osório, 2016; Butzer et al., 2016; Csikszentmihalyi, 1990; Chang et al., 2003; Ericsson and Pool, 2016; Coles and Heimberg, 2000; Cox and Kenardy, 1993; Defares et al., 1986; Diaz, 2018; Fredrikson and Gunnarsson, 1992; Fullagar et al., 2013; Hoge et al., 2017; Iqbal et al., 2014; Kenny and Osborne, 2006; Kenny, 2011; Kesselring, 2012; Khalsa et al., 2009; Khalsa et al., 2013; Khng, 2017; Killough et al., 2015; Kobori et al., 2011; Krampen, 2010; LeBlanc et al., 1997; Lin et al., 2008; Nadler et al., 2004; Osborne and Franklin, 2002; Osório et al., 2017; Patston, 2014; Powell, 2004; Rahl et al., 2017; Rumsey et al., 2015; Sadler and Miller, 2010; Schneider and Chesky, 2011; Schubert, 2016; Sieger, 2017; Spielberger, 1979; Stern et al., 2012; Studer et al., 2010; Studer et al., 2012; Su et al., 2010; Thomas and Nettelbeck, 2014; Van Dam et al., 2014;

Wells et al., 2012; Yondem, 2007; Zhukov, 2019). Physically, it requires both the utilization of small motor movements and engagement of large muscle involvement. Because of this, upper-string instrumentalists require a significant degree of muscular strength, coordination and endurance to maintain the fixed and asymmetrical postures needed to perform (Coon, 2007; Dawson, 2008; Dick et al., 2013; Foxman and Burgel, 2006; Groth, 2016; Herzog, 2017; Janzen et al., 2014; Leska, 2010; Lima and Denadai, 2015; Liu and Hayden, 2002; Llobet and Odam, 2007; Maran, 1998; Moraes and Antunes, 2012; Ostwald et al., 1994; Rensing et al., 2018; Shan and Visentin, 2003; Stanhope, 2015; Watson, 2009; Zaza and Farewell, 1997). By implementing a micro-strengthening regimen that is both cognitive and physical, the upper-string instrumentalist can build healthy musical practice habits, while also learning to build overall body strength. Through this cross-training approach to learning music (discussed in Chapter 2), the micro-athlete can simultaneously train the brain to engage in purposeful practice and train the muscles that are both used and overworked.

Micro-Athletes Must Engage in Healthy Practice Habits

Chapter 2 illustrates the micro-athlete through the lens of examining productive practice habits that improve quality of practice and optimize performance. Over time, the performance standard in sports and music steadily has been rising. The 1908 Olympics gold medal for the marathon went to a macro-athlete who covered the 26 miles in 2 hours and 52 minutes. In 2008, a mere one hundred years later, that same medal went to a macro-athlete who won in 2 hours and 6 minutes—46 minutes faster (Ericsson and Pool, 2016). Human beings don't come out of the womb "better" in 100 years. The process of biological evolution takes place over many

millennia. This achievement happened because of the development of productive deliberate practice procedures.

Similarly, in the 1930s a micro-athlete pianist by the name of Alfred Cortot was one of the most renowned classical musicians of the 20th century—revered for his musicality and precision. But by today's standards, Cortot's performances would be considered sloppy—riddled with missed notes and careless technique (Ericsson and Pool, 2016). These are simply two congruent examples in the areas of micro- and macro-athletics that illustrate how more sophisticated methods of deliberate practice emerge as a response to combating challenges while simultaneously optimizing performance. The human body is incredibly adaptable to change. From the brain to the muscles there is an element of "plasticity" (Ericsson and Pool, 2016, p. 34) in the way the body can rewire itself when developing new habits. But the body also undergoes a process to maintain stability known as "homeostasis" that makes the body rather resistant to change (Ericsson and Pool, 2016, p. 37). Shaping the brain and muscles, and developing healthy practice habits involves the body's ability to challenge homeostasis. When the body is stressed to the point that homeostasis no longer can be maintained, the body responds with changes that are intended to reestablish this stability. And through the body's desire for maintaining balance, the seeds that drive meaningful change are planted. The brain and body respond to challenges by developing new abilities to combat those challenges. This process underscores the effectiveness of deliberate practice, self-regulation, motivation, and the importance of staying just outside of one's comfort zone (Csikszentmihalyi, 1990; Ericsson and Pool, 2016). For sports athletes and musicians, regular training leads to challenges that can only be overcome by the continuation of training—and training tactics should always evolve.

Micro-Athletes Must Learn to Build Cognitive Resilience

Chapter 3 illustrates the micro-athlete through the lens of examining performance anxieties and the various holistic approaches to combat these debilitating afflictions. Musicians and sports athletes alike face a variety of stressors. Some are motivating, beneficial and without a doubt fundamental to engaging in their craft, while others are completely detrimental to progress (Armbrecht, 2011; Cox and Kenardy, 1993; Diaz, 2018). When stressors become too powerful and athletes lack the tools to combat them, performance anxiety can set in. Learning to build cognitive resilience to combat this unfortunate affliction is important for engaging in productive practice and maintaining enjoyment throughout the process. There is a disproportionately small amount of research regarding anxiety among musicians compared with the amount research regarding anxiety among sports athletes. But the motives supporting sports psychology and psychology of performing arts are similar: to develop specific skills that require years of extensive practice, teaching and coaching (Armbrecht, 2011).

The culture of silence regarding physical injury that exists among musicians does not exist among sports athletes, but there is indeed a stigma attached to mental health issues in both fields. Unidentified or ignored mental health issues that began earlier in life become more evident when musicians and sports athletes are faced with the stressors associated with their crafts (Armbrecht, 2011; Nadler et al., 2004). Bauman (2016) explains that macro-athletic training still primarily focuses on improving the "'hardware' (physiology and biomechanics)" rather than the "'software' (mental health and performance psychology)" (p. 135), and that the challenge still remains to focus on both. Micro-athletic training still leaves much to be desired in both the hardware and software departments.

Micro-Athletes Must Understand Their Bodies

Chapter 4 illustrates micro-athletes through the lens of understanding the body they use on a daily basis. Many findings from the world of sports can be applied to that of music to optimize musicianship and overall health (Dick et al., 2013). When it comes to the physiology and biomechanics of athletic training, the science of macro-athletics is much further ahead than the science of micro-athletics (Maran, 1998). There is much more published information on how to train the body of a sports athlete than how to the train the body of a musician. In the field of music there is much to improve upon when viewing the musician as an athlete—on the part of both music instructor and music performer. As with sports, music-making is a physical activity that depends on muscle movements lining up various body segments into their appropriate anatomical positions, then out of their intended positions to achieve an objective. Unlike with sports, however, where the typical objectives of these muscle movements is to move the athlete from A to B, in music, the typical objectives of these muscle movements are necessary for musicians to produce sound and engage in very refined movements (Dawson, 2008; Foxman and Burgel, 2006). It is important that upper-string instrumentalists understand the body they use and abuse, the bodily contractions they engage in, and potential musculoskeletal injuries that can occur.

The musculoskeletal system is a very complex and capable entity that enables the upper-string instrumentalist to play fast repetitive movements using small- and large-muscle groups while allowing the body to carry a static load (Dawson, 2008). Musculoskeletal problems associated with the maintenance of awkward postures or with repetitive movements were first recognized in a wide-ranging study of occupational diseases by the seventeenth century physician Bernardino Ramazzini (Liu and Hayden, 2002; Watson, 2009). In the current era, there

has been a documented high prevalence of performance-related musculoskeletal disorders (PRMDs) since the 1980s (Chan et al., 2014).

One of the leading organizations in the world catering to the medical needs of performing artists is the Performing Arts Medicine Association (PAMA). PAMA was formed in 1988 by a group of physicians who individually had been involved with the medical care of musicians and dancers. Originally limited to physicians, PAMA quickly grew to take a more activist approach by including mental health care professionals, as well as performers and educators. Through interdisciplinary research to identify parallels between performing artists and sports athletes, scholars recognized that both groups need to practice their "ABCs:" A = alignment, B = breathing, C = coordination, D = diet, E = exercise, F = focus, and G = goals (Ackermann and Miller, 2018). A description and exploration of relevant muscles and functions will be extended in Chapter 4. Knowledge about the muscles that micro-athletes use and abuse on a daily basis is important for performers and teachers, so that future generations of musicians can make music while living in strong, healthy bodies.

Micro-Athletes Must Engage in Regular Conditioning

Chapter 5 defines the micro-athlete as one who integrates mindfulness and micro-strength training exercises in (and out of) the practice room. A better understanding of the various psychological and physiological loads on violin and viola playing provides the basis for facilitating healthy practice habits, cognitive resilience and injury prevention strategies that promote mind/body health. This process of awareness begins with knowing about symmetry: where bodies rest at neutral, the various psychological and physiological ways that violin and viola playing disturb this symmetry, and what unfortunate afflictions are caused in the body

when symmetry is disturbed. From there it is imperative to understand how to build strength on and off of the instrument so the body can protect itself and maintain symmetry. Tension is a psychological and physiological issue. Mindfulness exercises as well as low-impact strengthening activities are discussed as beneficial techniques for reducing tension, combating performance anxieties, building strength, increasing flexibility, and sustaining symmetry. These types of exercises are especially beneficial for micro-athletes when using them the correct way.

Chapter 2: Music Practice Habits

The importance of a structured, organized approach to practicing music is a familiar topic to music educators. Self-regulated and deliberate practice behaviors provide a framework through which to focus on the ways musicians practice their instruments. A significant amount of research into self-regulation and deliberate practice demonstrates the positive effects these behaviors have on musical achievement. Researchers studying musical practice have found that learners begin as unsophisticated practicers and slowly acquire a broader repertoire of practice strategies over time. By preparing students for how to problem-solve on their own, music teachers can help students become independent musicians as a result of developing strong and effective habits of deliberate practice and self-regulation.

Deliberate Practice

Psychologist Anders Ericsson coined the term "deliberate practice" more than two decades ago. Through researching experts from a variety of fields, he dismantled the common belief that expert performers are born with innate talent. Instead, Ericsson discovered experts attain high levels of skill through how they practice. Deliberate practice involves activities that have been found most effective in improving performance. Ericsson and Pool (2016) characterize deliberate practice as having seven primary traits: (1) developing skills that other people have already figured out how to do and for which effective training techniques have already been established, (2) stepping outside of one's comfort zone and trying things that are just beyond current abilities, (3) setting well-defined goals that involve refining a specific aspect of an upcoming performance, (4) requiring a person's full attention and mindful actions, (5) receiving feedback and making modifications based on that feedback, (6) establishing effective

mental representations, and (7) building and modifying previously acquired skills to make them even more effective. In contrast to the action of playing, deliberate practice involves highly structured activities in which the explicit goal is to improve performance. Recall the terms "plasticity" and "homeostasis" from Chapter 1. Engaging in deliberate practice activities changes and evolves brain plasticity by challenging the body's desire to maintain balance. This process results in the body's ability to overcome weaknesses. Understanding the long-term benefits of deliberate practice is important, however, because the process is not *inherently* enjoyable, especially for beginning students. Deliberate practice is intended to be an effortful activity that can be sustained only for a limited time each day to avoid exhaustion and to maximize gains. While this process is not inherently enjoyable, it certainly can be. When the specific tasks to overcome weaknesses are engaging and the instructor monitoring the cues is motivating, deliberate practice can become deliberate play.

Bloom (1985b) characterizes the process that leads an individual from novice to expert performer in three phases. Phase One begins with an individual's introduction to the activity and ends with the individuals commitment to pursuing it further. Phase Two begins with an individual's commitment to extending the period of preparation and ends with the individual's commitment to pursue the activity on a full-time basis. Phase Three begins with full-time commitment to improving performance and ends when the individual decides either to pursue the activity professionally or terminates serious engagement in the activity (Bloom, 1985b; Ericsson et al. 1993).

There is a long-contested view that merely engaging in a sufficient amount of practice, regardless of the structure of that practice, leads to maximal performance. However, without extended efforts, there can be plateaus in skill acquisition (Bryan and Harter, 1897, 1899; Ericsson et al.,1993; Ericsson and Pool, 2016). Upper-string instrumentalists—those musicians that play the violin or viola—are particularly susceptible to "automaticity," (Ericsson and Pool, 2016, p. 13) or what most people understand as "automatic pilot." When such a musician has reached this level of comfort, the learning can stall and the actions can become mindless. People often misunderstand this, assuming that playing through music is a form of practice and that if they keep doing it, they are sure to improve. But research has shown that once a person reaches a level of acceptable performance, the additional years of practice don't lead to improvement at all. Violinists and violists are susceptible to automaticity because it is entirely possible for notes to end up in the fingers and be absent in the brain. Vocalists and wind/brass players, for example, have a finite amount of time to practice in a day due to the impact these instruments have on the inner workings of the human body—exacerbating the lungs, muscles of the thorax, etc. These musicians do not have time to be mindless if they are to get the most value out of their practice allotment. Upper-string instrumentalists are capable of practicing for more hours in a day, which can lead to more opportunity for mindless practice. It is clear that the antidote to mindless practice is "purposeful practice," or as Ericsson and Pool (2016) whimsically describe it, "putting a bunch of baby steps together to reach a longer-term goal" (p. 15).

Deliberate practice involves activities that both slice the music in digestible chunks for the purpose of learning and utilize tools (such as metronomes, tuners and timers) to help reinforce knowledge. Often referred to as "chunking" (Gruson, 2001; Ericsson and Pool, 2016) this method helps focus attention on a single task rather than aimlessly play through music. In

chess, skilled players use chunking to recognize and remember patterns. Chess masters believe that the ability to recognize and remember patterns has everything to do with creating meaningful mental representations (Ericsson and Pool, 2016). Chunking is useful for learning music more efficiently, but especially so because the chunks are held in long-term memory (Ericsson and Pool, 2016).

Rainero (2012) explains that learning music has more to do with finding the correct tool in a toolbox rather than following a specific recipe in a cookbook. This is another form of chunking. When an issue arises, it is critically important to find the tool most useful for exploration, discovery and creativity. Useful ways to chunk the music include: breaking up a piece of music into a series of flashcards to help learn the music both in and out of context, practicing with a tuner or metronome to work out various kinks, flipping a coin to determine whether one will engage in tuner or metronome work and assign the result to a flashcard, setting a timer to avoid mindless practicing, playing a section of music on the open strings that the notes are found on to cultivate sound and to work on bow control without distraction of the notes, and practicing in front of a mirror to make sure the bow is parallel to the bridge. There are many other creative ways to learn music carefully.

One of the most interesting methodologies for implementing deliberate practice into the practice room is found in a document called “101 Ways to Differentiate a Scale.” Created by Feldenkrais method expert and violin/viola teacher Lisa Burrell, her exercises are designed to integrate playing the instrument with purposeful movement. The Feldenkrais method is a movement-based practice used to help sports athletes and musicians re-teach habits and functions to improve the spectrum of practice and performance. Israeli engineer and physicist Moshé Feldenkrais (1904-1984) theorized that by exploring the elements of a habit—the thoughts,

feelings, and sensations associated with it—one could explore the infinite parts of a function. Through varied and subtle exploration of the habit, one could begin to understand the burdensome complexity of the habit and learn to engage in actions more effectively (Burrell, 2017). Burrell explains that the principles of these exercises are to "explore and understand smaller or more particular parts of a whole and recombine them to further clarify some larger function which we might be exploring, such as speed of movement or acceleration" (p. 1). Burrell's "101 Ways to Differentiate a Scale" include such creative tactics like: #3) "Sing the tonic before each tetrachord." #13) "Play the octaves out of order." #30) "Play the scale standing on one foot." #38) "Open and close your jaw while you play the scale." #53) "Play with your feet wide apart." #58) "Rock between your heels and your toes while playing the scale." #95) "Move from standing to squatting while playing the scale." Etc. Burrell emphasizes that when students practice scales with even one little variation each day, they will keep evolving and will not get bored. In Burrell's document, "101 Ways to Practice Anything: Variations for Individual Practice, Classroom Teaching, and Ensemble Rehearsals," she explains that variation helps prepare musicians for an increasing range of performing circumstances, enhances creativity and elevates learning potential by generating new sensory experiences in one's functional relationship to playing (Burrell, 2019). Burrell's "101 Ways to Practice Anything" includes creative tactics like: #5) "Make a list of textures (fuzzy, rough, silky, sticky, airy, warm, etc.) and experiment with how to create those sounds." #9) "Play with different shoes: higher, flatter, barefoot, one shoe on and one foot barefoot." #14) "Play while contracting and releasing your abdominal muscles, buttocks, or muscles of your pelvic floor and notice the effect on your breathing, sound, and freedom of movement." #26) "Play a difficult passage in reverse." #34) "Play with varied articulation." #47) "Play the phrasing you would like to achieve using only one

pitch." #54) "Stand on a balance board or roller." #85) "Practice in 10 minute intervals, changing what you practice after a timer goes off, even if you are not finished." Etc.

Getting creative in the practice room is one of the best ways to curate deliberate practice tactics. Engaging in creative practice strategies also helps students avoid boredom, which in turn increases motivation to keep going. When students stay engaged in a difficult process, they can begin to take accountability for their own progress.

Self-Regulation

Psychologist Albert Bandura established the concept of "self-regulation" more than three decades ago. Through researching human behavior, he concluded that self-regulation operates through three key elements: self-monitoring of one's behavior, judgment of one's behavior, and affective self-reaction (Bandura, 1977). Self-regulation also can be defined as an active metacognitive, motivational, cognitive, and behavioral participation in one's own learning (Bonneville-Roussy et al., 2015), coupled with how an individual controls the cognitions that lead to action (StGeorge et al., 2012). Metacognitive strategies are related to planning, goal-setting, self-assessment and selecting environments that are conducive to success (Bonneville-Roussy et al., 2015; Bouffard-Bouchard, Parents, & Larivée, 1993; Zimmerman, 1990). Self-regulated learners must engage in cyclical activities that occur in three major phases: forethought (methods that precede efforts to learn), performance control (methods that occur during learning), and self-reflection (methods that occur after learning efforts) (Bartolome, 2009; McPherson & Zimmerman, 2002).

Self-regulation is described as cyclical because the feedback from prior practice and performance helps improve future practice and performance. Both the successes and struggles

from previous musical endeavors are used to make adjustments during current efforts. The factors that make up the triadic process of self-regulation—person, behavior and environment—are proactively as well as reactively adapted for the attainment of personal goals, and are constantly changing during the course of learning. What distinguishes effective from ineffective forms of self-regulation is the quality and quantity of one's self-regulatory processes and deliberate practice behaviors (Zimmerman, 2000).

Deliberate practice and self-regulation relate directly to *self-efficacy*, *motivation*, and *flow*. These three elements are integral for developing healthy practice habits and provide the framework for optimal music making—one that fosters growth and is also engaging.

Self-Efficacy and Motivation

Bandura (1977) defines self-efficacy as one's perceived capabilities for learning or performing actions. Through his research to understand the mechanisms of self-regulation, Bandura established that self-efficacy plays a central role in the exercise of personal agency by its significant impact on thought, motivation and action. Researchers have shown that self-efficacy influences a learner's choices of activities, motivation, effort expended, persistence, achievement and self-regulation (Schunk and DiBenedetto, 2016). Self-efficacy can help music students develop skills to deliberately practice and self-regulate their time. The issue is maintaining effective and enjoyable learning during private practice, as it is an integral part of playing an instrument. Simply telling students to practice is not sufficient to foster the motivational resources that they will need if they are to make significant progress (Pitts, Davidson and McPherson, 2000).

According to Bandura (1977) cognitive processes play a prominent role in the acquisition and retention of new behavior patterns. This idea is essential for beginning instrumentalists, as it

will dictate whether they develop positive or negative behavior patterns relating to practicing their instruments, and even how they build self-efficacy. Motivation is another important factor because it can enhance the persistence of a desired behavior. Researchers who examine motivation seek to understand how people come to value an activity, and the processes they engage in that help them view the activity as important to them and to their own personal goals (McPherson, 2000/2001). Bandura explains that self-motivation involves implementing goal-setting and self-evaluating. The aforementioned triadic process of self-regulation from earlier in Chapter 2—person, behavior, and environment—can be translated to the triadic process of self-efficacy and motivation—person, behavior, and outcome (Bandura, 1977).

Psychological procedures serve as a means of creating and strengthening expectations of personal efficacy. Bandura (1977) explains that an efficacy expectation is "the conviction that one can successfully execute the behavior required to produce the outcomes" (p. 193). Because the strength of people's convictions in their own effectiveness is likely to affect whether they will even try to cope with the situation at hand, giving music students the tools to practice effectively and in a fulfilling manner at home can build self-efficacy and help motivate them to keep progressing (Bandura, 1977; McCormick and McPherson, 2003).

Bonneville-Roussy and Bouffard (2015) propose a framework in which deliberate practice and self-regulation are integral to attain optimal performance. The motivational profile of the musician is linked to both the quantity and quality of practice, and is also directly related to musical achievement. This framework posits that formal, structured, mindful practice mediates the link between quantity of practice and achievement.

Flow

The concept of "flow" was imagined by psychologist Mihàly Csikszentmihalyi more than forty years ago. A subjective state of mind in which individuals have complete focused motivation and are highly absorbed in their activity, this mental state of operation is one in which a person performing an activity experiences enjoyment of a process rather than a product (Csikszentmihalyi and Csikszentmihalyi, 1988). The principles of flow are very congruent to those of deliberate practice and self-regulation. Fullager et al. (2013) explain that flow is generated from a cycle that begins when individuals develop the skills required to perform an activity. From there, they also begin to master the challenges inherent to that craft. As new skills are acquired, new obstacles arise and the cycle repeats again.

While the flow experience might appear to be effortless, it actually requires physical exertion, and highly disciplined mental activity that does not happen without the application of a skilled performer (Csikszentmihalyi, 1990). In juxtaposition to "automaticity," mentioned earlier in Chapter 2, flow is the complete opposite. They may seem similar, but the former relates to being "zoned out" while the latter is being "in the zone." Flow is a mindful action that can successfully take place only after one has diligently engaged in deliberate practice and self-regulation.

Because deliberate practice is not inherently enjoyable for beginning students (or for students in general, for that matter), engaging in playful activities that are both deliberate and self-regulatory in nature—like the ideas depicted earlier in Chapter 2 by Lisa Burrell—can enable music students to develop flexible behavior that is adaptive in the long run, and can contribute to meaningful flow states (Csikszentmihalyi, 1975/2000). Csikszentmihalyi (1990) explains that happiness must be cultivated, the same way that gaining the skills to a craft must be

cultivated. The process is critical to deriving pleasure from the work one does and is what Csikszentmihalyi refers to as the "optimal experience." He explains that an optimal experience occurs when "psychic energy—or attention—is invested in realistic goals, and when skills match the opportunities for action" (p. 6). It is important that when challenges exist, and struggles to overcome those obstacles occur, the periods of struggle be as enjoyable as possible. Csikszentmihalyi explains there are five steps to transforming a physical act into an enjoyable activity: (1) set an overall goal alongside smaller goals, (2) find ways of measuring progress toward the goals, (3) continue to concentrate on the task at hand and to keep making adjustments, (4) develop the skills necessary to interact with available opportunities, and (5) keep raising the level of attention to the activity to avoid boredom.

Attaining an optimal experience is possible during private practice as well as a performance. There are different challenges in cultivating flow in each music situation. The issue with attaining flow during private practice is finding enjoyment in solitude. This level of autonomy requires a person to find rewards in the events of each passing moment as well as staying mindful in each action. Young students are sometimes resentful of practicing if it is something that has been forced upon them. When music falls into the chore category, it is very difficult for students to cultivate enjoyment from the process.

Achieving a flow state can be challenging during public performance because of music performance anxiety (discussed more in Chapter 3). Flow states during private and public situations are important because they make the present moment more enjoyable, and because they help build self-efficacy (Csikszentmihalyi, 1990). As Csikszentmihlayi states: "The purpose of flow is to keep on flowing, not looking for a peak or utopia" (p. 54).

Periodization and Cross-Training as Deliberate Practice and Self-Regulation

"Cross-training," introduced in Chapter 1, is a term that has been gaining considerable attention in recent years. Typically used as an athletic term, cross-training is a progressive approach to exercising. It can (1) add the missing link to the effectiveness of a physical workout, (2) increase power, add flexibility, build stability and increase motivation, and (3) lead to endless training possibilities (Krause, 2009). This term will be discussed more in Chapter 5, when the principles of micro-athleticism are put into action.

Throughout the process of researching practice habits, mindfulness and strength-building for upper-string instrumentalists, I became curious about how cross-training could be implemented in a musical practice setting. Referring back to the concepts of "chunking" and "flow" from earlier in Chapter 2, it seems plausible that practicing music with a cross-training element that strengthens practice habits, cognitive resilience, and the physical body could create an enjoyable practice experience and in fact fortify learning. Turning practice time into an engaging, and motivating, experience filled with activities of varying lengths both on and off the instrument can add the missing link to the effectiveness of a practice session.

"Periodization" is a training tool that endurance athletes use to reduce the risk of overuse injuries. It involves a gradual increase in training followed by recovery (Manchester, 2008). Because musicians are a variety of endurance athletes, this group can also benefit from the built-in time that periodization allows for the mind and body to increase performance capacity while reducing injury. It also seems plausible that the inclusion of periodization when practicing can help musicians maximize their time, self-regulate their time, deliberately develop tasks, and increase motivation.

One method that includes a cross-training/periodization element is The Pomodoro Technique. This technique was established more than three decades ago by Francesco Cirillo (and named after the Italian word for tomato, the shape of a common kitchen timer). The technique is one method that continues to be a progressive process designed to increase self-regulatory behaviors. Through a timer approach to learning—a period of work followed by a period of rest—this technique aims to enhance focus by eliminating distractions for set periods of time, increase awareness of ones decisions, encourage motivation, establish goals, shorten the quantity of practice while increasing the quality of practice, and even reduce anxiety linked to spending time on a task (Cirillo, 2006).

Examining Self-Regulation and Deliberate Practice in Musicians

In the areas of novice/advanced students, structured/unstructured practice, blocked/alternated/timed-interval practice, and self-efficacy/motivation in practicing, many studies have illustrated how deliberate practice and self-regulation contribute to the quality of practice and more productive music learning.

Novice/Advanced Students

In a seminal series, Ericsson et al. (1993) were the first researchers to examine how deliberate practice affects beginning and advanced musicians. Study 1 showed that elite violinists rated effortful practice as the single most relevant activity for improving performance. Similarly, Study 2 found that expert pianists overcame weaknesses better than amateur pianists. Comparably, Gruson (2001) discovered that significant changes in practicing behavior took place as musicians acquired competence. More advanced students were better able to engage in

"chunking." Drake and Palmer (2000) illustrated that beginning piano students (1) make many more errors than expert pianists, (2) make different types of errors than expert pianists, (3) exhibit a lack of temporal control, and (4) have poor ability to plan practice sessions. Similarly, Hallam (2001) showed that with improving levels of expertise came better strategy development (engaging in deliberate practice and self-regulation).

Hyllegard and Bories (2008) found that effort and inherent enjoyment are affected by both the difficulty of the task and the experience of the learner; as cumulative practice increased, effort decreased and enjoyment increased. These findings contradict Krampe and Ericsson (1996), who established that effort must in fact increase as practice increases. In their view, this is because the degree of maintenance for older expert musicians was predicted by the amount of effortful, deliberate practice they engaged in during adulthood. Nielsen (2001) established that advanced music students set specific goals, engage in strategic planning, and use self-instruction to monitor themselves and to optimize their learning.

Structured/Unstructured Practice

Nielsen (1999) determined that students who used learning strategies to select and organize information and then integrated this product with existing knowledge tended to be more cognitively engaged. Similarly, Ross (1985) found that the use of mental practice with physical practice can actually enhance deliberate practice. Leon-Guerrero (2008) showed that adolescent musicians engaged in repetition as the most self-regulatory behavior. Barry (1990) suggested that using a structured approach (designed by both teacher and student) to practice enabled students to correct more performance errors than utilizing a free practice method. Kim (2008) established that the implementation of practice diaries helped students plan out their practice sessions by

setting proximal goals and applying appropriate practice strategies. Complementary to these studies, López-Íñiquez and Pozo (2016) found that when teachers perform self-regulating activities and get their students to view errors as opportunities for learning, students become critical thinkers.

McPherson and McCormick (1999) determined that the quantity of practice in the month leading up to a student's performance examination was related to both the amount of technical work (scales, etudes, repertoire, etc.) and informal/creative activities (playing by ear, improvising, etc.). Similarly, Miksza (2006) established that students who engaged in informal/creative activities in addition to more structured, technical work tended to be more cognitively engaged while they practice. Contrary to McPherson and McCormick (1999) and Miksza (2006), Lordo (2015) found that music students who engaged in deliberate play activities involving music games gained skills at a rate similar to those observed with traditional practice without such boosters.

Cantwell and Millard (1994) found that "deep" (structured) learners displayed greater depth of content and greater flexibility in practice behaviors than "surface" (unstructured) learners, who had challenges in resolving difficulties. StGeorge et al. (2012) identified unstructured learners as "expedient" learners and structured learners as "constructive" learners. Bartolome (2009) ascertained that young instrumentalists who utilized self-regulated practice behaviors—chunking, using a tuner/metronome, etc.—attained higher levels of performance achievement than their peers. Similarly, McPherson (2000/2001) discovered that children's commitment to learning their instrument and the amount of deliberate practice they undertook was useful in predicting achievement. Sloboda et al. (1996) found that high-achievers tended to be more consistent in their pattern of practice from week to week, and tended to engage in more

technical, effortful practice. Interestingly, Lacaille et al. (2005) found that the relationship of achievement goals to performance among elite sports athletes and musicians were consistent in that mastery of goals were more likely to be associated with optimal performance.

Blocked/Alternated/Timed Intervals in Practicing

Logan and Balota (2008) and Carter and Grahn (2016) examined the effects of blocked versus alternated, or spaced out, practicing. They found that alternated and spaced out practicing showed better retention in musicians. Similarly, Stambaugh (2011) found that retention of music was better in students who practiced a piece of music out of sequence twenty-four hours after a performance test. Santana (1978) found that the application of a specific method for practice can result in significant reduction of time spent in preparation of etudes, and can also make it possible for students to plan technical preparations to achieve criterion goals in a specific time frame.

Self-Efficacy/Motivation in Practicing

Miksza and Tan (2015), Miksza, Tan and Dye (2016), and Tan and Miksza (2019) discovered that students who exhibited grit—courage and resolve—in their learning process were more reflective about their practicing, experienced better flow during practicing and rehearsal, and tended to possess more self-efficacy. Miksza, Tan and Dye (2016) uncovered that mastery goal orientations were positively related to grit. McPherson and McCormick (2000) found that the ability to perform proficiently relies not only on technical and expressive skills, but also on the employment of a range of motivational resources. Similarly, McCormick and

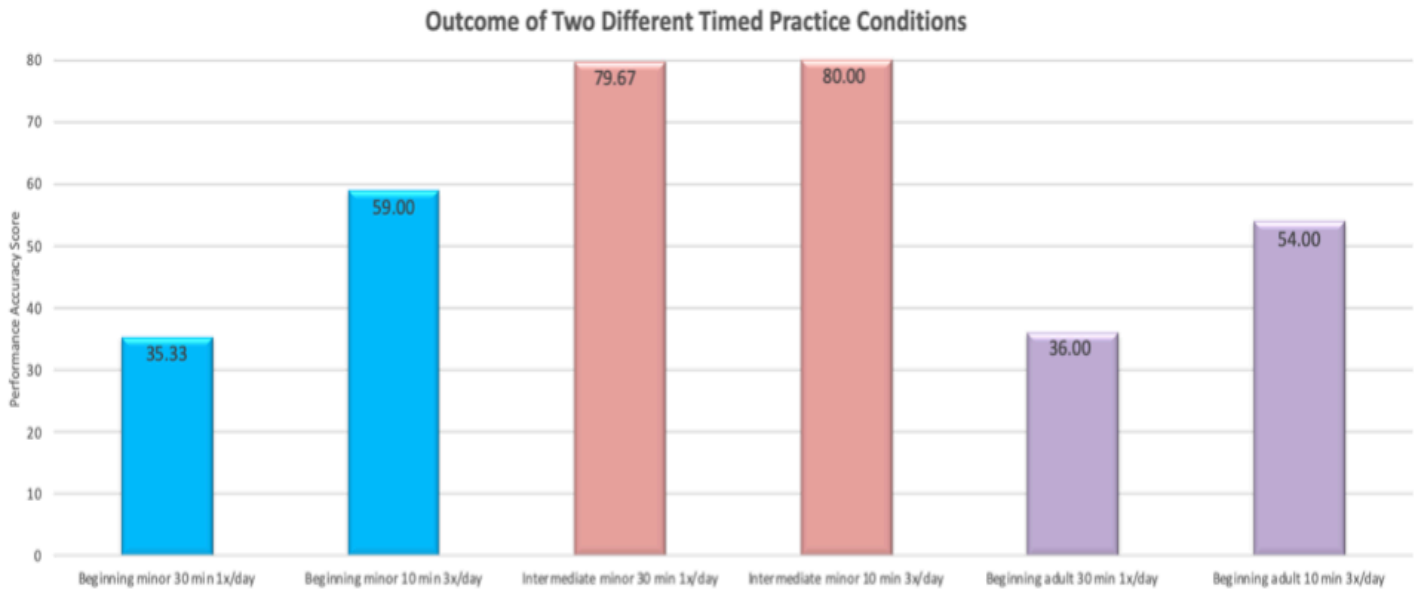
McPherson (2003) postulated that self-efficacy and motivation were the best predictors of ability to engage in deliberate practice and self-regulation.

Schmidt (2005) established that performance and effort were strongly correlated with self-concept and intrinsic motivation. Pike (2017) posited that dialogue between teacher and student helped facilitate the practice of self-reflection, self-regulation and improve intrinsic motivation during practice. Powers et al. (2009) showed the effect of self-criticism on goal progress was mediated by self-motivation and self-efficacy. Renwick and McPherson (2002) illustrated that when practicing self-selected repertoire, students were more likely to engage in strategies that are conducive to engaging in deliberate practice and self-regulation. Oare (2007) found that highly motivated students are more likely to focus on quality of practice instead of practicing for a set amount of time. Pitts and Davidson (2000) showed that students expressed a wide variety of attitudes toward practicing that change over time, and that frustration and enjoyment fluctuate.

Novice/Advanced Students, Structured/Unstructured Practice, Blocked/Alternated Practice Sessions, and Self-Efficacy/Motivation in Practicing

In 2019 I conducted a small study for a quantitative analysis course. The study examined the role of two different timed music practice conditions and their effects on performance outcomes of pitch and rhythm in a group of violin/viola students after two weeks spent learning a new piece of music. I was interested in how students would implement deliberate practice and self-regulation on their own having no prior knowledge about what that entailed. Six private violin and viola students were divided into two groups. Each group was comprised of one beginning student under the age of 18, one intermediate student under the age of 18, and one

beginning student *significantly* over the age of 18. Each student in Group A was instructed to practice the piece 1 time a day for 30 minutes, while each student in Group B was instructed to practice the piece 3 times a day for 10 minutes each. Student performance tests at the end of the two weeks were anonymously evaluated by me (Observer 1) and an independent peer reviewer (Observer 2). The results indicated a higher performance mean score for students in Group B than for students in Group A (see Figure 2). Interviews with students in each group indicated that students in Group B realized that each 10-minute segment went by fast and that they had to get as much work done as possible during that that time frame. Students in Group A found the one 30-minute segment to be long and tedious. It was evident that the students in Group B learned to deliberately practice and self-regulate their time better than the students in Group A.



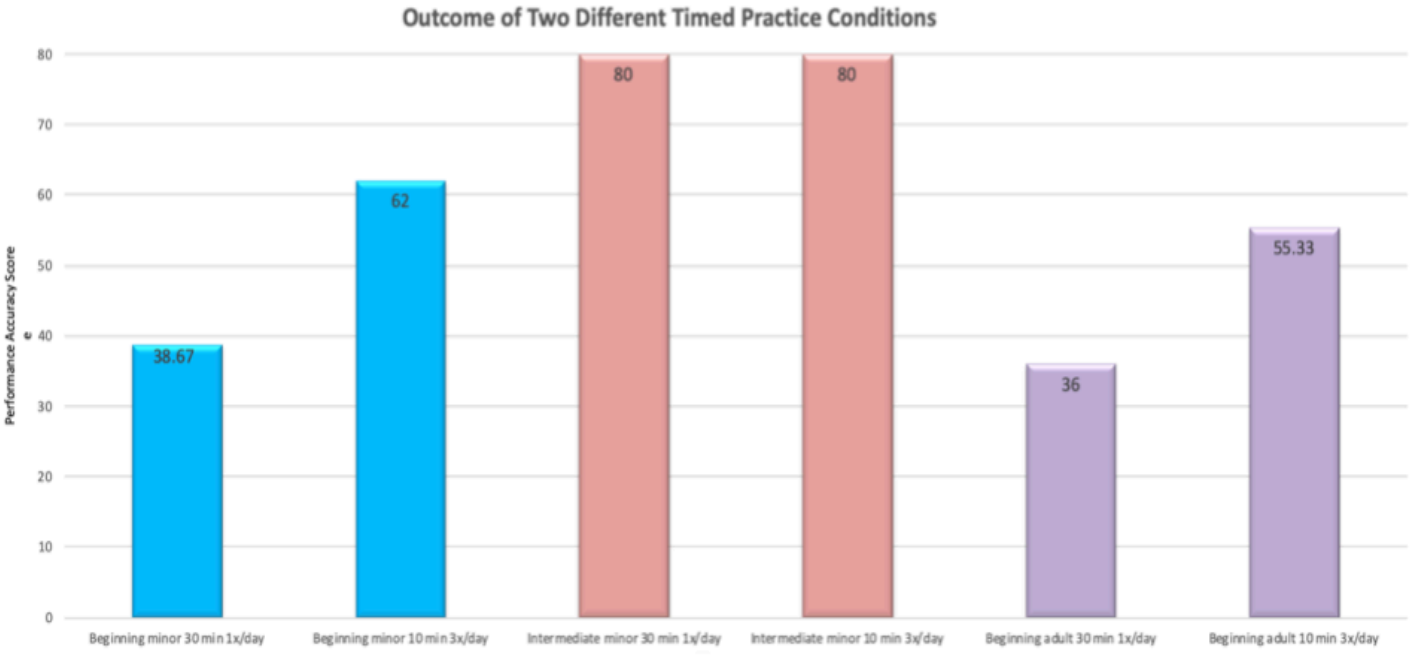


Figure 2. Results from study

Chapter 3: Music Performance Anxiety

Music performance anxiety (MPA) is a condition that has gained considerable attention over the past several decades. With mounting research about this subject, scholars across disciplines have explored its psychological and physiological developmental factors, investigated the many forms in which MPA manifests itself in performing artists, and identified various ways to better understand the issues at hand and establish coping strategies that help relieve symptoms. Because MPA presents itself both mentally and physically, the way it affects individuals can present itself with varying degrees of severity.

Defining MPA

Performance anxieties are a group of disorders that affect individuals in a number of domains, including sports activities and musical performance. For more than a century scholars have defined performance anxiety in varying ways. Developed by a pair of psychologists, the Yerkes-Dodson law, or inverted-U theory, proposes there is an evidence-based relationship between pressure and performance. Yerkes and Dodson (1908) postulate that performance ability increases with physiological and mental stimulus, but only up to a certain point. When levels of arousal become too high, performance can suffer. Salmon (1992) defines MPA as "a state of arousal and anxiety that occurs before or while a person is performing an undertaking of value, non-anonymously in front of a live audience" (p. 3). Kesselring (2012) describes MPA as "a state of arousal and anxiety occurring before or while a person is performing non-anonymously in front of a live audience producing a valuable or evaluated task touching on his/her self-esteem" (p. 1). The DSM-V (American Psychiatric Association, 2013) characterizes MPA as "a

marked fear or anxiety about one or more social situations in which the individuals is exposed to possible scrutiny by others" (p. 202).

MPA as Social Anxiety Disorder

Social anxiety disorder (SAD), is defined as "the strong and persistent fear of social or performance situations in which an individual is afraid of doing something or behaving in a humiliating or embarrassing way when faced with possible scrutiny by others" (Barbar et al., 2014, p. 381). Music performance anxiety has been accepted as a subtype of social anxiety disorder that can manifest itself in a wide range of severity ranging from normal stress and anxiety fundamental to being a musician, to severely debilitating symptoms of trepidation and panic (Barber et al., 2014; Biasutti and Cocina, 2014). Although MPA has been part of the human experience since time immemorial, it was not until the 1970s that research began into medical and psychological treatment, and intervention-related issues.

Characteristics of MPA

Havas (1974) was one of the first authors to illustrate the effects of stage fright. A prodigy violinist herself, Kato Havas was inspired to research this subject after a lifetime of suffering in solitude from this condition. Her book indeed was pioneering in the 1970s, especially for daring to explore the (then) relatively taboo world of mental health. But there are also many aspects of scholarship that illustrate how far MPA research has come since then. One example: Stage fright is now classified as only the first of three sub-types of music performance anxiety (Kenny, 2011). Researchers also have come to understand that there are many mental

health factors that contribute to a person experiencing music performance anxiety, and to what severity.

Symptoms of MPA

Kenny (2011) and Kesselring (2012) explain that MPA manifests itself in three main categories: (1) cognitive impairments, such as memory slips, confusion and constant negative thoughts, (2) physical impairments, such as trembling, heart palpitations, hyperventilation, numbness in hands, gastrointestinal upset, and (3) combination of cognitive and physical impairments that affect the physical body, such as tension, depression, anxiety-induced panic. This third category is possibly the most challenging because it coincides with the state of mental health—a subject that remains taboo in many respects and can be responsible for obstacles on and off of the instrument. The degree of trait anxiety (discussed later in this chapter) is closely associated with this third category.

Biological Responses to MPA

There is clear evidence that performance situations induce the same fear and bodily reactions as does serious danger in the real world (Kesselring, 2012). Surprising, biological reactions that one is faced with in a life-or-death situation—fighting, fleeing, or avoiding—are also experienced by people with debilitating MPA. “Homeostasis,” the important element from Chapters 1 and 2, that helps human beings maintain balance, is also an important function when discussing anxiety reactions. Charles Spielberger, a leading authority in psychology, explains that when a stressor stimulates the hypothalamus—the nerve center of the brain—a complex chain of neural and biochemical processes begins, and homeostasis is challenged (Spielberger,

1979). The autonomic nervous system—which helps the body cope with stress—is also activated by the hypothalamus, which in turn activates the pituitary gland. This process releases a biochemical agent called adrenocorticotrophic hormone (ACTH) into the blood stream. Activated by ACTH, the adrenal gland secretes adrenalin and other biochemical agents that further stimulate the body (Spielberger, 1979).

Unfortunately, while these biological responses make sense in a strictly biological realm, they are indeed counterproductive in the social context of playing music for an audience. Kesselring (2012) explains that the perceived "danger leading to the anxiety reaction is mainly a fear of being judged and possibly devalued in one's self-esteem" (p. 3). He furthermore says, "Performance is a conflicting mixture of attraction and avoidance: a challenge on the one hand of being heard and seen and on the other hand a fear of being exposed with possible failure. Such fear is more marked when a pre-defined role has to be performed (as is the case in musical performance)" (p. 4).

Trait/State Anxiety

MPA occurs because of an imbalance among skill level, expectations, and coping capabilities. Kesselring (2012) explains that this condition becomes worse "in situations which may endanger self-esteem, the affection and sympathy of others, or the continuation of a career" (p. 4).

Two psychological factors help explain how MPA manifests itself in individuals: state and trait anxiety. Spielberger (1979) describes state anxiety as a transitory emotional state in which emotional reactions consisting of tension, apprehension and worry cause heightened activity of the autonomic nervous system. Trait anxiety, on the other hand, is described as a

personality characteristic and a relatively stable predisposition or propensity to experience chronic anxiety and anticipated worry (Spielberger, 1979). Trait anxiety influences a musician's vulnerability to experiencing MPA, while state anxiety accounts for the degree to which it manifests itself. Kenny (2011) illustrates three sub-types of music performance anxiety. Sub-type 1, mentioned earlier in this chapter, is called focal music performance anxiety, or what most people recognize as classic "stage-fright." Sub-type 2 is the combination of sub-type 1 plus social anxiety disorder. Sub-type 3 is sub-types 1 and 2 plus depression and/or panic disorder. From this description, it follows that a musician who experiences both MPA and major depression disorder would suffer more debilitating symptoms than someone who doesn't identify as being clinically depressed.

Personality Traits

In addition to general anxiety and depression, other personality traits that are negatively affected by MPA are perfectionism, neuroticism, and introversion.

Recent literature suggests that musicians with perfectionist standards are particularly susceptible to more anxiety (Yondem, 2007; Diaz, 2018; Sadler and Miller, 2010; Schneider and Chesky, 2011). Perfectionism is a trait marked by the desire to perform at an exceptionally high level while simultaneously being excessively critical of one's own efforts (Diaz, 2018). Yondem (2007) explains that perfectionism can either be adaptive— "having high personal standards, persisting in striving for performance excellence but not being excessively self-punitive or chronically dissatisfied with their performance or themselves" (p. 1417)—or maladaptive— "excessive concerns about making mistakes, self-criticism, self-doubt" (p. 1417).

Sadler and Miller (2010) explain that personality traits are either positively affected (PA) or negatively affected (NA) by MPA, and that MPA is affected by both negative emotionality (NEM) and positive emotionality (PEM). PEM is associated with self-efficacy, wellbeing, achievable expectations and extroversion, while NEM is related to stress, anxiety, depression, mood disturbance, and introversion/alienation. Characteristics that make NEM worse are feelings of anger, distress, and feelings of guilt/shame in everyday life.

How Cultivating Flow Can Mediate MPA Symptoms

"Flow," discussed in Chapter 2, is a positive state-of-mind that enhances wellbeing. It was illustrated as an ideal outcome of deliberate practice and self-regulatory behaviors, helping to build self-efficacy and motivation. Luckily, the wellbeing that occurs as a result of a flow experience can have beneficial psychological effects on performance anxiety. Flow can be illustrated as a holistic remedy to combating MPA because it reinforces mindfulness as a part of learning music and also promotes healthy practice behaviors. Flow provides a way to avoid the "chaos in consciousness" (Csikszentmihalyi, 1990, p. 120). While performance anxiety is most associated with the act of performing because performing has the most potential to cause chaos in consciousness, it often stems from how one practices. Cultivating flow while practicing means that a student is mindful and deliberate while they practice. These factors lead to positive emotionality and can help change behaviors associated with increased anxiety.

Mindfulness

Mindfulness can be described as a "moment-to-moment, non-judgmental awareness, cultivated by paying attention in a specific way, that is, in the present moment, and as non-

reactively, as non-judgmentally, and as openheartedly as possible" (Kabat-Zinn, 2015, p. 1). In fact, when intentionally cultivated, this can be referred to as *deliberate* mindfulness and is the foundation of flow experiences. Similarly to the aforementioned deliberate practice, mindfulness can also be refined through practice and knowledge. This is why it is at the core of self-reflection. Kabat-Zinn (2015) explains that mindfulness enables people to utilize "the mind as a mirror [and be able to] reflect, contain, encounter, and know with great fidelity things as they actually are" (p. 1482). The Pomodoro Technique, introduced in Chapter 2, is a method that promotes deliberate mindfulness due to the aspect of practicing in timed segments of work followed by rest.

Yogic Postures

Yoga is an ancient mind-body practice that typically consists of deep breathing, unconventional body postures and mindfulness meditation (Butzer et al., 2016). This practice teaches people to control the body and its experiences, and is associated with positive psychology that focuses on growth and potential. There are many connections between yoga, flow, and music performance because all three involve finding an optimum balance between challenge and ability. Csikszentmihalyi (1990) explains that both yoga and flow "try to achieve a joyous, self-forgetful involvement through concentration, which in turn is made possible by a discipline of the body" (p. 105). There are also parallels between engaging in a yoga and music practice centered around cultivating positive practice habits. A successful yoga and music practice require physical and mental preparation to develop habits that enable the practitioner to overcome challenges, and to stay motivated and focused without becoming distracted or bored (Csikszentmihalyi, 1990).

Recall from Chapter 2 Rainero's "toolbox" and Burrell's "101 Ways to Differentiate a Scale" and "101 Ways to Practice Anything" as ways to practice music with the intention of preventing boredom and aiding in progress. Through this rationale, it seems plausible that integrating yogic postures into the practice room and before performances could help musicians improve their physical and mental capacity to overcome challenges. In Chapter 5 when I detail how to train the micro-athlete, I will use the term "yogic postures" instead of "yoga." The point here is to introduce and discuss aspects of these postures and the benefits they have on upper-string instrumentalist from a scientific point of view, as opposed to yoga as it relates to Sanskrit culture.

Examining MPA and Coping Strategies

Many studies have examined the prevalence of characteristics related to music performance anxiety in students and professionals, and strategies to relieve symptoms and build cognitive resilience.

Behavioral/Trait/State Characteristics

Barbar et al. (2014) found that 24% of 230 musicians studied had indicators of MPA. Some 19% had indicators of social anxiety, while 20% had indicators of depression. Gender and professional status did not predict MPA, but they did predict social anxiety and depression. Furthermore, Osório et al. (2017) looked at 214 musicians. They found 39% had indicators of MPA. Some 57% of those had concerns about repertoire difficulty, 52% feared the presence of an audience and 51% had issues with negative aspects of perfectionism. Cirakoglu and Senturk (2003) conducted three studies that found the factors that contributed to MPA were: fear of stage,

avoidance and severity of symptoms. Similarly to Barbar et al. (2014), females were found to have higher MPA than males.

Yondem (2007) saw significant positive correlations between anxiety and dysfunctional attitudes like perfectionism and neuroticism. Similarly, Thomas and Nettelbeck (2014) found that trait anxiety and neuroticism were also significant factors that correlated positively with MPA, while extraversion was significantly negatively correlated with MPA. Results also indicated that, similarly to Cirakoglu and Senturk (2003), and Barber et al. (2014), females reported significantly higher MPA than males.

Fredrikson and Gunnarsson (1992), Cox and Kenardy (1993), Leblanc et al. (1997), Osborne and Franklin (2002), and Studer et al. (2012) also examined performance setting as a factor in performance anxiety. Fredrikson and Gunnarsson (1992) found that heart rate was higher in high- than in low-anxious musicians during both private and public performance. Cox and Kenardy (1993) found that music students showed a higher level of performance anxiety during solo public performance than for group public performances. Leblanc et al. (1997) found that self-reported anxiety rose with each succeeding performance condition (practicing alone in a practice room, in a practice room with one researcher present, and in a rehearsal room with all researchers present). Osborne and Franklin (2002) discovered significantly higher anxiety in formal situations than in informal situations. Studer et al. (2012) similarly found that from private to public performance, self-reported anxiety increased. Unlike Cox and Kenardy (1993), who found that experience was not a factor of MPA, Killough et al. (2015) concluded that musicians with more musical experience were less insecure, showed better regulation of their stress hormone (cortisol), and demonstrated better working memory. Biasutti and Concina

(2014) found similarly that advanced students had higher levels of MPA than professional musicians.

Defares et al. (1986) determined that abnormal breathing patterns and hyperventilation are associated with several clinical psychological disorders, including anxiety neurosis, chronic depression and phobic responses. Similarly, Studer et al. (2010) found a positive significant correlation between hyperventilation complaints and negative feelings of MPA before performance, and positive significant correlation between hyperventilation complaints and the experience of stage fright. Sadler and Miller (2010) concluded that negative emotionality predicted more than 50% of individual differences in music performance anxiety. Results also indicated that performance anxiety decreased over successive performances under varying circumstances.

Similar to Kim (2008) from Chapter 2, who established that a diary format of self-monitoring was conducive to deliberate practice and self-regulation, Sadler and Miller (2010) posited that a diary format of self-monitoring could also have therapeutic benefits. Kobori et al. (2011) also illustrated that perfectionism traits may provoke the aforementioned positive emotionality or negative emotionality. While positive emotionality may provoke a mild level of anxiety that can increase the quality of performance, negative emotionality can lead to preoccupation about mistakes and failure and might possibly decrease the quality of a performance. Schneider and Chesky (2011) revealed that music majors perceived significantly lower levels of social support when compared to non-music majors. Findings also indicated that students with greater perceived social support reported less frequent anxiety. Regarding the aspect of support, Sieger (2017) concluded that teachers who focus attention on both the mental

and physical aspects of playing can help students embrace anxiety as an obstacle to overcome, rather than a danger.

Holistic Coping Strategies

Diaz (2018) found that higher trait-mindfulness—inherent openness—predicted lower levels of performance anxiety, whereas higher levels of perfectionism predicted higher MPA scores. Biasutti and Concina (2014) established that MPA is influenced by experience, hours of practice per week, social support and avoidance strategies. Dysfunctional coping strategies included lack of social support, minimal practice hours and engaging in avoidance strategies. Functional coping strategies included good social support, confronting issues rather than avoiding them, and adaptability. These functional coping strategies were shown to have a positive correlation with decreases in MPA. Burin and Osório (2016) found that the most utilized coping strategies for MPA were cognitive behavioral therapy (CBT), virtual reality exposure, biofeedback, yoga, and meditation. Similarly, Coles and Heimberg (2000) found that cognitive-behavioral therapy helped improve MPA in students suffering from symptoms in varying degrees of severity. Both Su et al. (2010) and Wells et al. (2012) found that musicians who engaged in slow breathing 5 minutes before, and during a performance reported a reduction in performance anxiety. Students who engaged in these techniques also made fewer mistakes.

The following nine studies examine the positive effects that meditation, yoga and flow have on relieving MPA. Chang et al. (2003) found MPA decreased in musicians who practiced mediation whereas musicians who did not practice meditation showed no decrease. Butzer et al. (2016) found that adding a yoga/meditation practice increased dispositional flow in music students. Fullagar et al. (2013) concluded that flow and performance anxiety were antithetical

experiences: When flow was higher, performance anxiety was lower. Lin et al. (2008) found that the meditation experimentation group demonstrated an increase in performance quality with decreases in performance anxiety compared to the non-meditation control group. Iqbal et al. (2014) showed that dynamic meditation reduced anxiety in comparison to the control group that did not practice dynamic meditation. Khalsa et al. (2009) found that the implementation of a yoga and mediation practice showed a trend towards less music performance anxiety and significantly less general anxiety, tension, depression and anger in music students. Khalsa et al. (2013) found that yoga participants showed statistically significant reductions in MPA from a baseline to the end of the program compared with the control group. Stern et al. (2012) found that yoga reduced music performance anxiety in a group of conservatory musicians. Rahl et al. (2017) examined the affect that meditation had on mind-wandering outside of music. They found that meditation training was important for reducing mind wandering in general.

The following two studies are not specifically about music but may have implications on reducing state anxiety in musicians. Both Khng (2017) and Krampen (2010) revealed that deep breathing and relaxation exercises reduced state anxiety in a group of students with test-taking anxiety. This next study examines the effects of performance anxiety in musicians and athletes side-by-side. Armbrecht (2011) looked into the physical and cognitive components of performance anxiety in musicians and athletes. Athletes and musicians reported equal levels of performance anxiety.

The co-morbid effects of mental and physical tension can cause many issues for micro-athletes. Rumsey et al. (2015) found that musicians who have high-perceived anxiety also displayed physical muscle impairments such as increased masseter (jaw) activation and higher fatigue rates in the upper trapezius (upper back) and sternocleidomastoid (front neck) when

compared with the the non-anxious participants. Micro-athletes are endurance athletes who do not engage in movement and action the same way as typical macro-athletes do. Macro-athletes tend to take part in highly aerobic, physical movement that deliberately increases heart rate, and has a natural tendency to relieve anxiety. But for musicians, delicacy and accuracy of movement is expected. Musicians who experience sub-categories two or three of music performance anxiety (mentioned earlier in Chapter 3) will experience an increase in heart rate but have limited aerobic ability to help relieve this stress. When this happens, the symptoms become physical and the body becomes tense. This is why practicing mindfulness and building cognitive strength can help musicians accumulate the tools necessary to combat performance anxiety.

Chapter 4: The Body of the Upper-String Instrumentalist

**Figure 3. Musculoskeleture of the micro-athlete*

An aerobic and anaerobic activity, playing a musical instrument is a demanding pursuit that involves a complex series of physical actions and repetitive movements (Dawson, 2008; Llobet and Adam, 2007) that should demonstrate a well-balanced combination of cognitive, expressive and physiological excellence. Researchers and health professionals who work with musicians have posited that the physical condition of many music students and professionals may be inadequate to cope with the demands of playing their instruments (Ackermann et al., 2002). Musicians may lack physical strength and knowledge of how the body works, or appropriate training techniques.

Between the asymmetric positioning, fixed postures, and repetitive motion, the violin and viola are two instruments that are especially ergonomically challenging for the body. These instrumentalists play with rapid, complicated and repetitive motions with small muscles like those of the hand. At the same time they engage in rapid, complicated, and repetitive motions with large muscles like that of their arm, shoulder and elbow (Dawson, 2008). The micro-athlete also engages large and small muscles that stabilize the instrument and the musician themselves, especially the trunk and legs.

Muscles of the Body that Upper-String Instrumentals Use and Abuse

Playing the violin or viola is a physical activity. A basic knowledge of the skeletal musculature of the body is crucial to best understand the underlying biological principles of musical performance. Skeletal muscles are attached to bones and are formed by thousands of long, elastic, muscle fibers that are responsible for producing movement of the joints between the bones and maintaining body posture. (Groth, 2016; Llobet and Adams, 2007). Ackermann et al. (2002) explain that when playing an upper string instrument, “smaller distal [further] muscle groups are generally required to ‘fine-tune’ the sound, while the larger proximal [closer] muscle groups, such as those around the shoulder, drive the basic sound production” (p. 33). Long muscles, like those of the arms, or even fingers, are typically kinetic, meaning they are able to produce highly visible external motion. Short, deep muscles, like those of upper and lower back as well as hips, tend to be more responsible for precise, small-space adjustments rather than large movements (Calais-Germain, 2007). I will be examining the musculature of the micro-athlete’s body by looking at the following areas: trunk (torso from pelvis to neck), shoulders (with arm attachments), elbows (with arm attachments), wrists/hands, and hips/knees. Upper-string

instrumentalists and violin/viola teachers often do not know the areas that are so frequently used and abused. This comprehensive section of the dissertation offers detailed insight into these areas. **The diagrams in this section come from Blandine Calais-Germain's book *Anatomy of Movement* and were created by the author.

Trunk

The trunk aids in healthy, ergonomic upper-string playing by serving a double function. On the one hand, the trunk is mobile due to the flexibility of the spine. On the other hand, the trunk also must be able to align and stabilize the entire body when it is motionless, and when carrying a load (Calais-Germain, 2007). Violinists and violists are expected to play with proper posture, are not motionless and carry a load. For these reasons, the muscles of the trunk are constantly engaged and often times overworked.

I will begin with the muscles at the top of the spine (seven cervical vertebrae—C1-7), through the middle of the spine (twelve thoracic vertebrae—T1-12), to the lower part of the spine (five lumbar vertebrae—L1-5) and ending with the muscles at the bottom of the spine (five sacral vertebrae—S1-S5) surrounding the pelvis/hips:

Deep spinal muscles (see Figure 4): *Longus colli* (C1-7)*, transversospinalis* (T1-12) and *psoas* (L1-5)—run the entire length of the spine. They are responsible for keeping the trunk erect. In addition to protecting the spine, these muscles provide the foundation for good standing and sitting posture—foundationally important for upper-string instrumentalists (Calais-Germain, 2007; Watson, 2009).

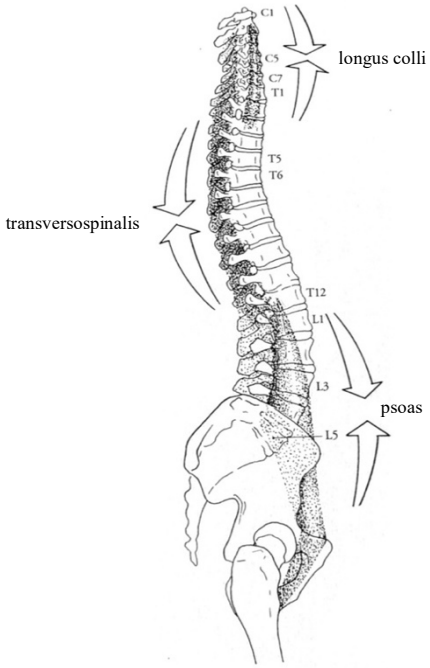


***Figure 4. Deep spinal muscles*

Deep neck muscles (see Figures 5 and 6): *Rectus capitis posterior minor* (C1)*, rectus capitis posterior major* (C2)*, obliquus capitis superior* (C1)*,* and *obliquus capitis inferior* (C1-C2)—have limited lever action because of their small size, but allow for great precision of movement. In conjunction with the anterior (frontal) neck muscles, these deep muscles regulate the correct orientation of the head on the neck (Calais-Germain, 2007). The asymmetric position that violinists and violists must hold often cause a deviation of the vertebral column from the normal erect position (Watson, 2009; Coon 2007).

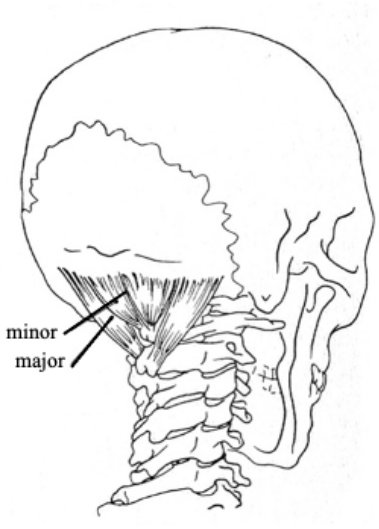


***Figure 5. Rectus capitis posterior minor and major*

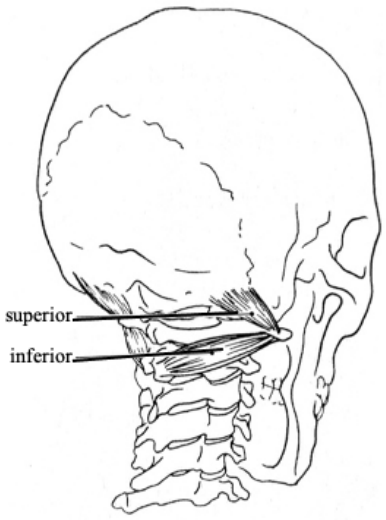


***Figure 6. Obliquus capitis superior and inferior*

Intermediate (middle) back and neck muscles: *Erector spinae* muscles (see Figure 7) *iliocostalis cervicis, iliocostalis thoracis, iliocostalis lumborum* (C4-L3) and *longissimus capitis, longissimus cervicis, and longissimus thoracis* (C2-L5) are responsible for extension of the spine, and also for side-bending and rotation. *Spinalis capitis* and *semispinalis capitis* (C7-C1 and C4-T4) (see Figure 8) contribute to side bending of the head/neck. *Spinalis thoracis* (T1-T10 and T11-L2) (see Figure 9) extend the spine into the thoracic region. *Splenius capitis* (C7-T4) and *splenius cervicis* (T5-C3) (see Figure 9) aid in head/neck side-bending. *Levator scapulae* (C1-C4) (see Figure 10) reinforces other muscles in the neck area. S*errates posterior* and *superior* (C7-T3) (see Figure 11) elevates the ribs while *serrates posterior inferior* (T12-L2) (see Figure 12) depresses the ribs. *Rhomboids* (C7/T1-T4) (see Figure 13)*, latissimus dorsi* (T7-T12) (see Figure 14) and *trapezius* (C2-T12) (see Figure 15) act primarily to stabilize the shoulder joint. However, when the shoulder is fixed, they also help stabilize the spine (Calais-Germain,

2007). While upper-string instrumentalists are not constantly engaging in side-bending, these muscles are still important for stability in the spine and good posture throughout the body.

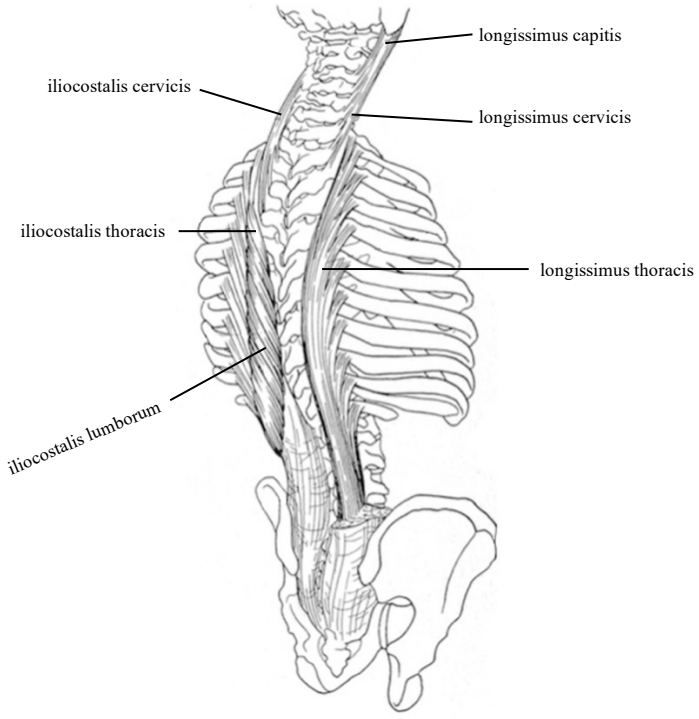


***Figure 7. Erector spinae muscles*

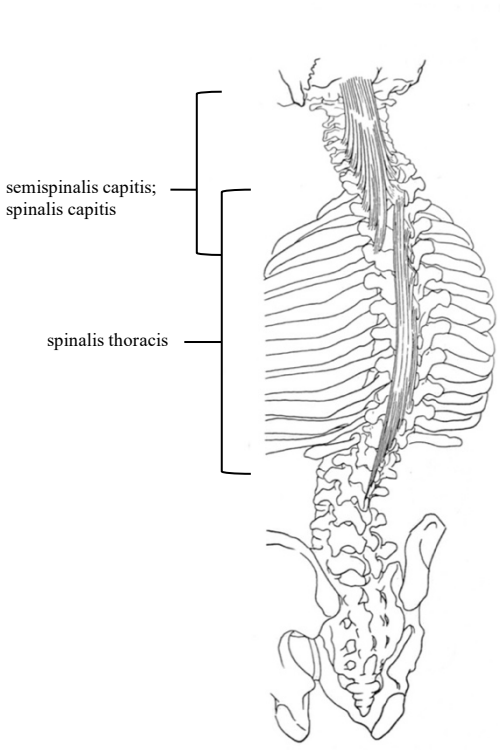


***Figure 8. Spinalis capitis and semispinalis capitis*

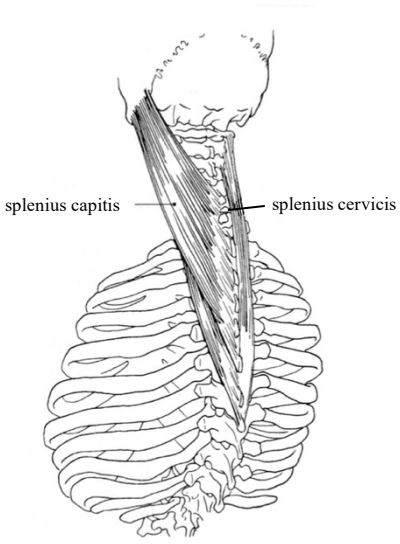


***Figure 9. Splenius capitis and cervicis*

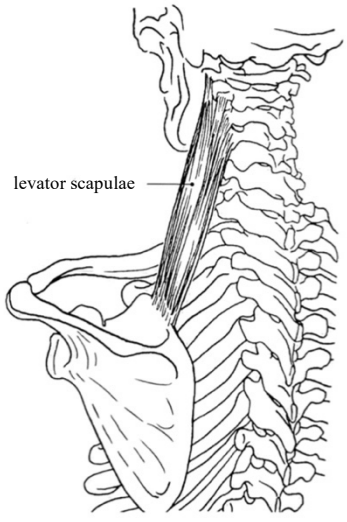


***Figure 10. Levator scapulae*

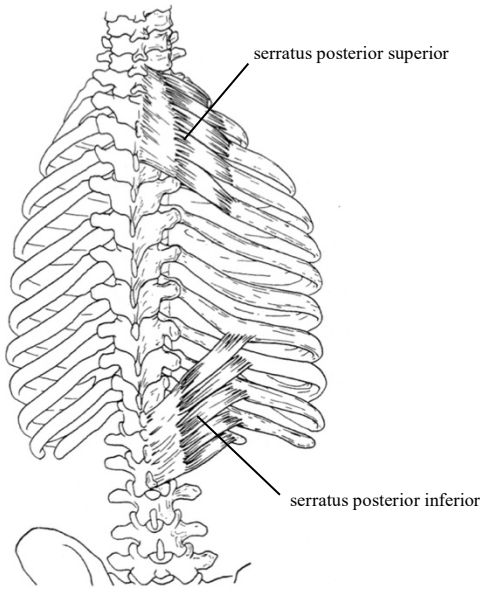


***Figure 11. Serrates posterior and superior*

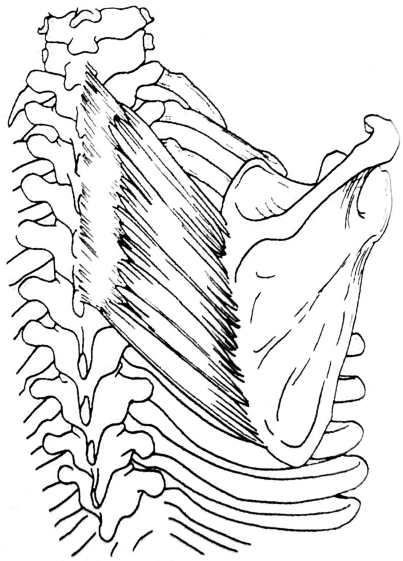


***Figure 12. Rhomboids*

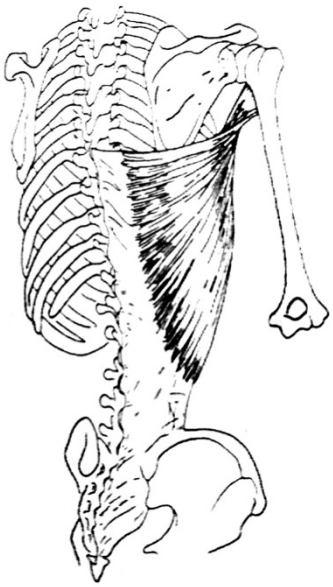


***Figure 13. Latissimus dorsi*

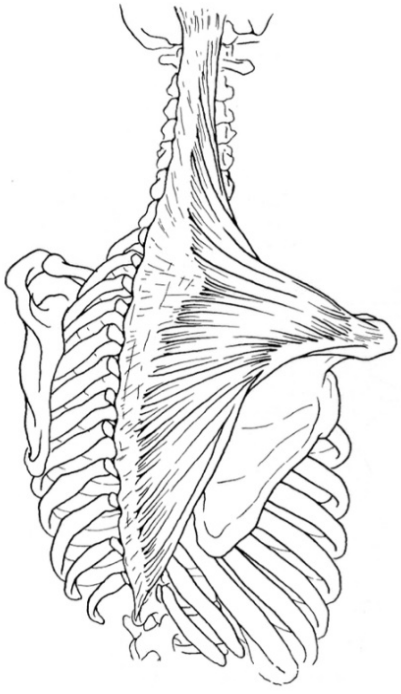


***Figure 14. Trapezius*

Anterior (front) and lateral (side) neck muscle: *Longus colli* (C2-T3) (see Figure 15) flexes the head and straightens the cervical spine. *Rectus capitis lateralis, rectus capitis anterior* and *longis capitis* (C3-C6) (see Figure 16) help straighten the upper cervical spine and flex the head. *Scalenus anterior* (C3-C6)*, scalenus medius* (C2-C7)*,* and *scalenus posterior* (C4-C6) (see Figure 17) play important roles in stabilizing the cervical spine, and s*ternocleidomastoid* (see Figure 18), the largest anterior neck muscle (Calais-Germain, 2007).

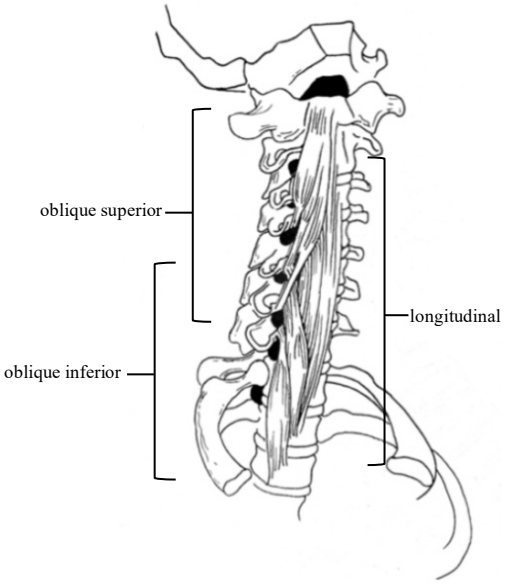


***Figure 15. Longus colli*

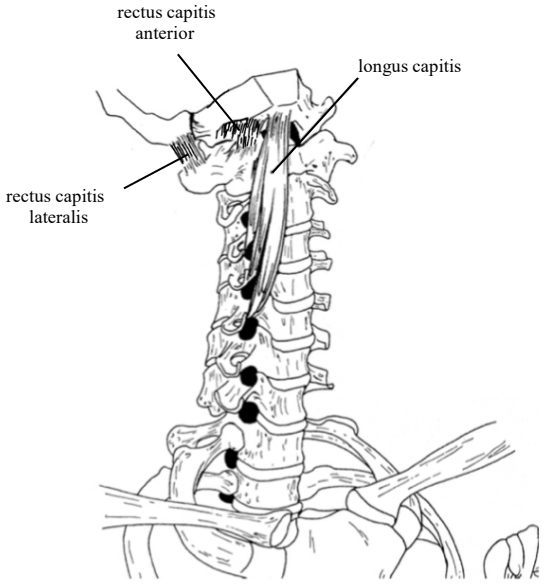


***Figure 16. Rectus capitis lateralis, rectus capitis anterior, and longus capitis*

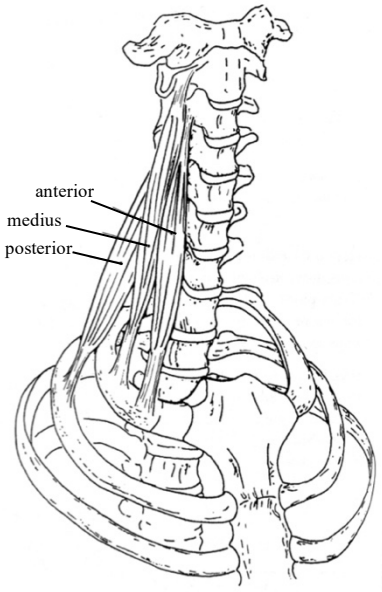


***Figure 17. Scalenus anterior, medius, and posterior*

***Figure 18. Sternocleidomastoid*

Muscles of the thorax: *Internal intercoastals* and *external intercoastals* (see Figure 19) occupy the space between adjacent ribs. *Levatores costarum* (see Figure 20) assists in rotation of the spine and elevation of the ribs. *Transverses thoracis* (see Figure 21) contracts and lowers the ribs. The *diaphragm* (see Figure 22) extends like a dome between the thoracic and abdominal cavities (Calais-Germain, 2007). While upper-string instrumentalists do not use their mouths to play their instruments, it it is still important to understand the muscles that support breathing. Note: Diaphragmatic breathing has many benefits, and it is at the center of the practice of meditation (discussed in Chapter 3).

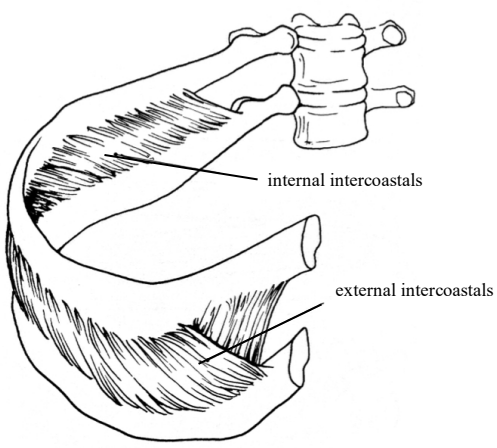


***Figure 19. Internal and external intercoastals*

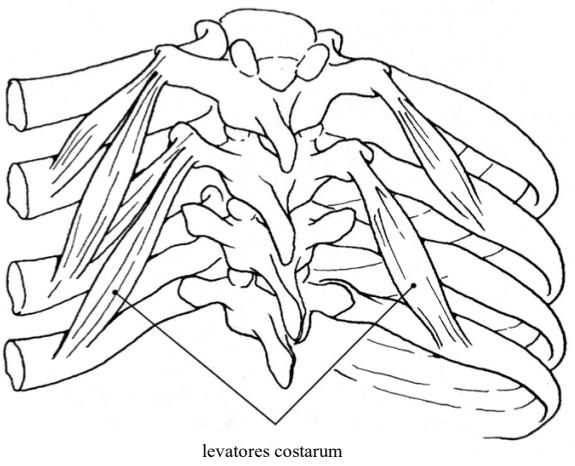


***Figure 20. Levatores costarum*

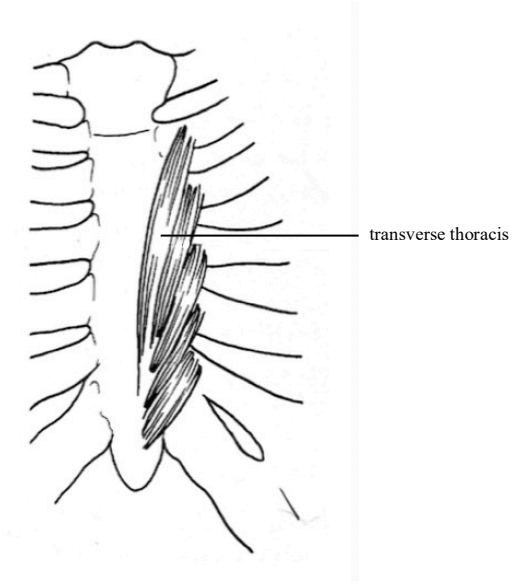


***Figure 21. Transverse thoracis*

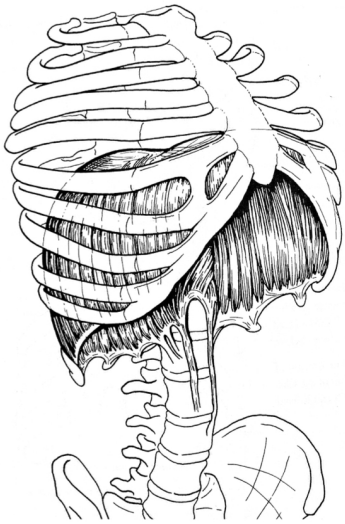


***Figure 22. Diaphragm*

Posterior (back) muscles of the neck and trunk: *Intertransverse muscles* (C3-S4) (see Figure 23) aid in side-bending. *Interspinalis muscles* (C3-S4) (see Figure 23) aid in extension of the spine. *Transversospinalis muscles—rotatores, multifidus, and semispinalis* (C3-S4) (see Figure 24) run along the spine and attach from the head to the sacrum. *Posas major* (L1-L3) (see Figure 25) participates in straightening the spine, while *quadrates lumborum* (T12-L3) (see Figure 26) aids in side-bending of the lumbar spine and ribcage (Calais-Germain, 2007).

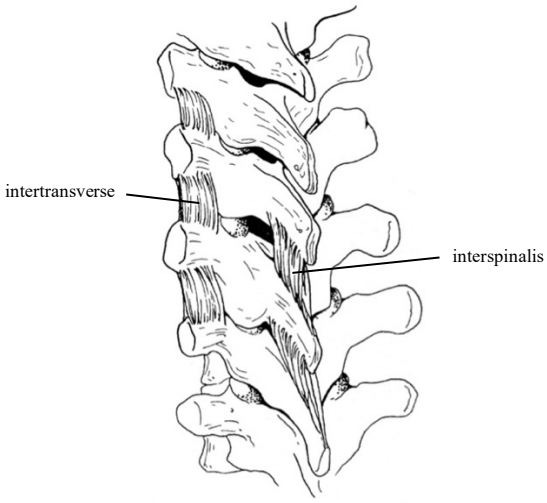


***Figure 23. Intertransverse and interspinalis muscles*

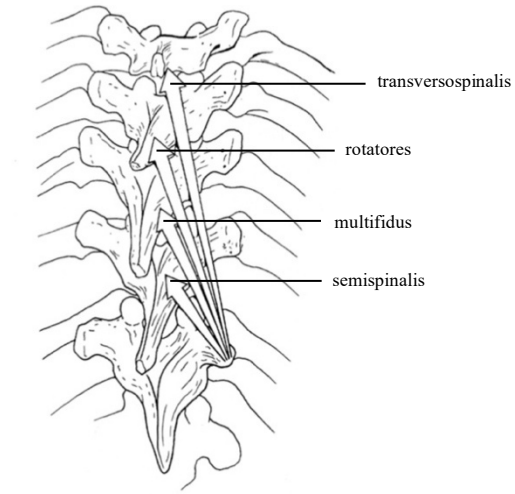


***Figure 24. Transversospinalis muscles*

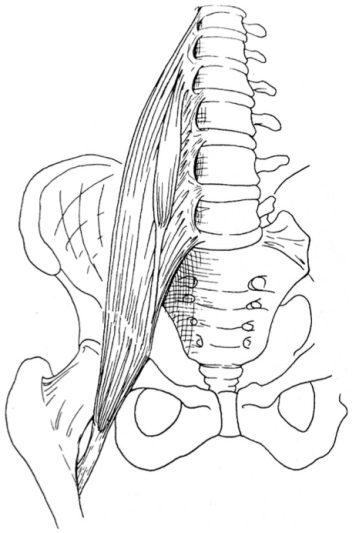


**Figure 25. Psoas major*

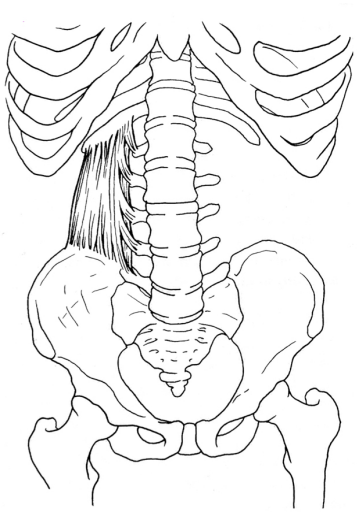


***Figure 26. Quadrus lumborum*

Abdominal muscles: *Transverse abdominis* (T7-L1) (see Figure 27) is the deepest abdominal muscle that supports the spine from belly to back. *Internal oblique* (T9-L1) (see Figure 28) aids in side bending or rotation of the spine and ribcage. *External oblique* (T5-L1) (see Figure 29) aids in cross-body rotation. *Rectus abdominis* (T5-L1) (see Figure 30) is the outermost layer of abdominal muscles and aids in good posture (Calais-Germain, 2007).

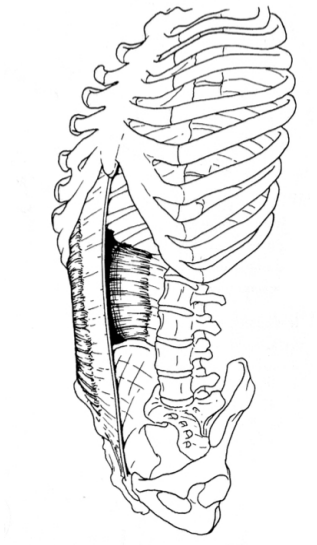


***Figure 27. Transverse abdominals*

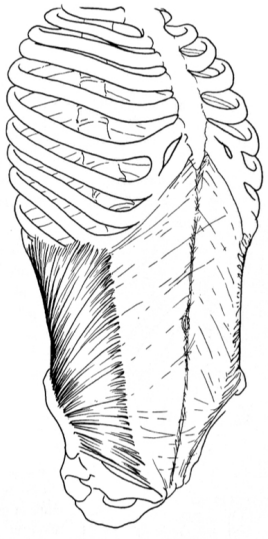


***Figure 28. Internal oblique*

***Figure 29. External oblique*

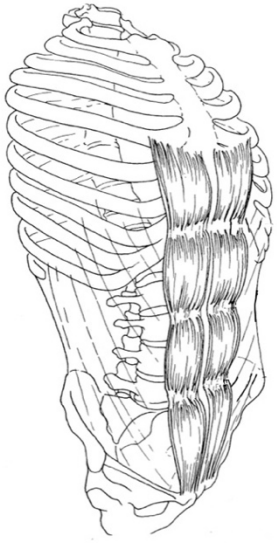


***Figure 30. Rectus abdominis*

Pelvic muscles (see Figure 31): *Levator ani* (S3) and *coccygeus* (S4) support the weight of the pelvic organs and rotate the sacrum backward (Calais-Germain, 2007) . It may seem odd to discuss the muscles of the pelvis, but upper-string instrumentalists can hold a lot of tension in the hips/pelvis region, and this can translate to more tension in the lower/upper back.

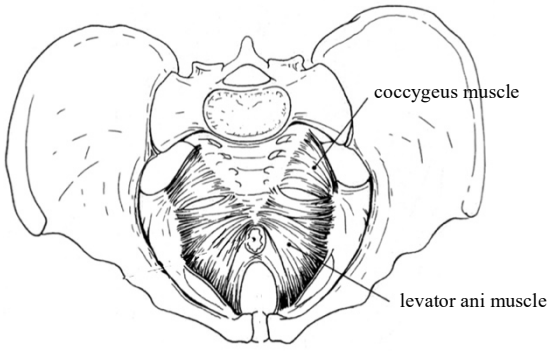


***Figure 31. Pelvic muscles*

Shoulder

The shoulder is responsible for providing a strong, stable foundation for various actions involving lifting a weight—such as holding up the violin/viola, or pushing against a resistance, such as depressing the bow against the instrument (Calais-Germain, 2007). Along the thorax, the shoulders engage in elevation (raising), depression (lowering), abduction (away from the body), adduction (toward the body), medial rotation (rotation toward the midline of the body) and lateral rotation (rotation away from the midline of the body). The combined actions of the scapula (shoulder blade) and arm allow the arm to move in a 360-degree motion, which is particularly important for the right arm, which controls the bow.

I will be describing the scapula-thoracic shoulder, which mobilizes the scapula and clavicle (collar bone) with respect to the thorax, as well as the scapula-humeral shoulder, which mobilizes the arm with respect to the scapula:

Scapulothoracic muscles: *Serratrus anterior* (C5-C7) (see Figure 32) keep the scapula fixed in place when force is being exerted. , S*ubclavius* (see Figure 33) depresses the clavicle. *Pectoralis minor* (C7-T1) (see Figure 33) pulls the scapula downward and forward. *Sternocleidomastoid* (see Figure 34) acts primarily on the top of the spine (recall from anterior and lateral neck muscles). *Levator scapulae* (C1-C4) (see Figure 35) acts on the cervical spine and elevates the scapula and rotates it downward. *Rhomboids* (C7-T4) (see Figure 35) acts on the thoracic spine and adduct the scapula while rotating it downward. *Trapezius* (C2-C4) (see Figure 36) acts in depressing and elevating the scapula while stabilizing it (recall from intermediate neck and back muscles) (Calais-Germain, 2007).

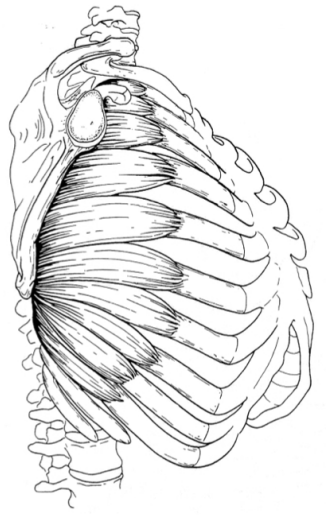


***Figure 32. Serratrus anterior*

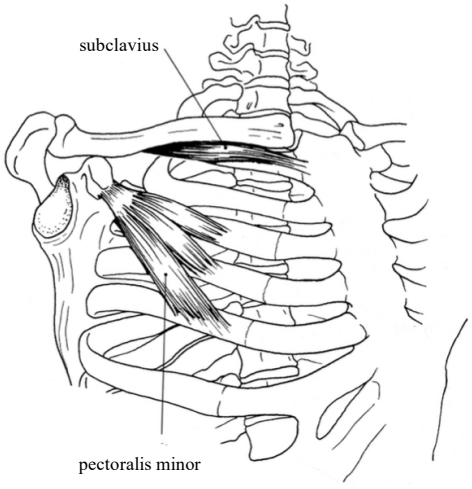


***Figure 33. Subclavius and pectoralis minor*

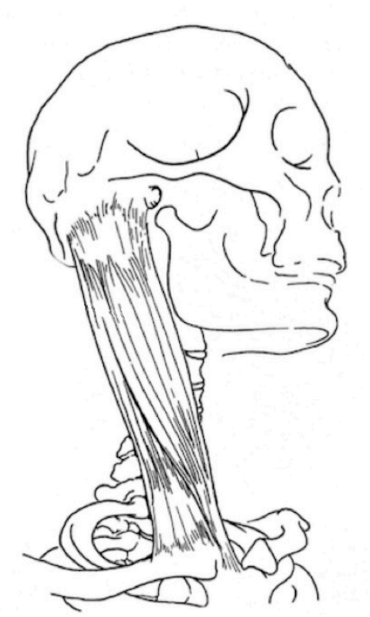


***Figure 34. Sternocleidomastoid*

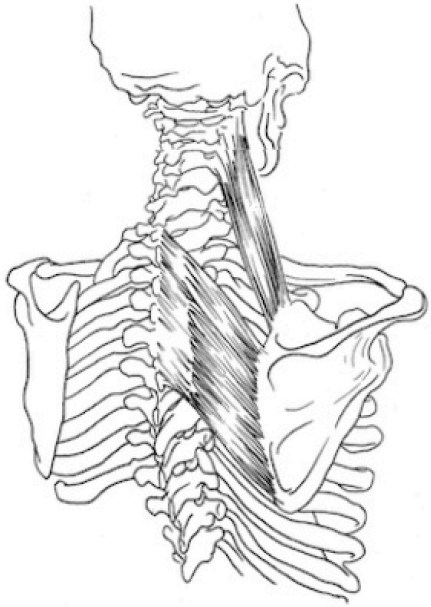


***Figure 35. Levator scapulae and rhomboids*

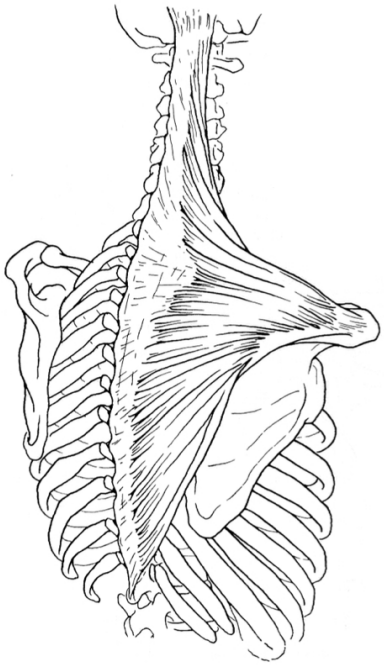


***Figure 36. Trapezius*

Deep scapulohumeral, or rotator cuff, muscles of the shoulder joint: *Subscapularis* (see Figure 37) is the principal muscle of medial rotation of the arm and prevents the top of the arm bone from gliding backward. *Supraspinatus* (see Figure 38) assists in moving the arm away from the body and prevents the arm bone from being dislocated or displaced upward. *Infraspinatus* (see Figure 39) aids in lateral rotation and participates in moving the arm away from the body. *Teres minor* (see Figure 40) helps in lateral rotation and prevents the arm bone from being dislocated backward (Calais-Germain, 2007).

***Figure 37. Subscalularis*

***Figure 38. Supraspinatus*

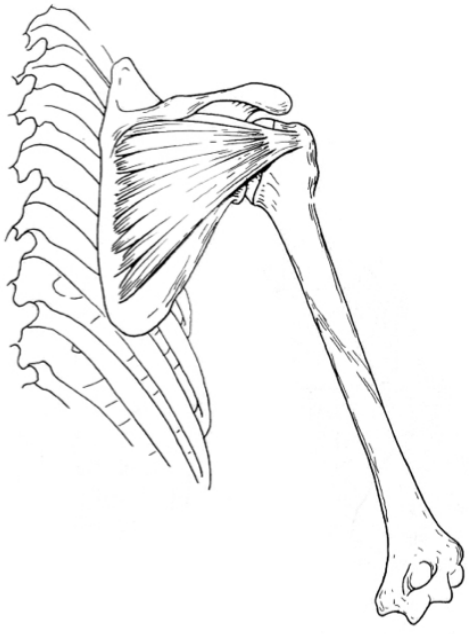


***Figure 39. Infraspinatus*

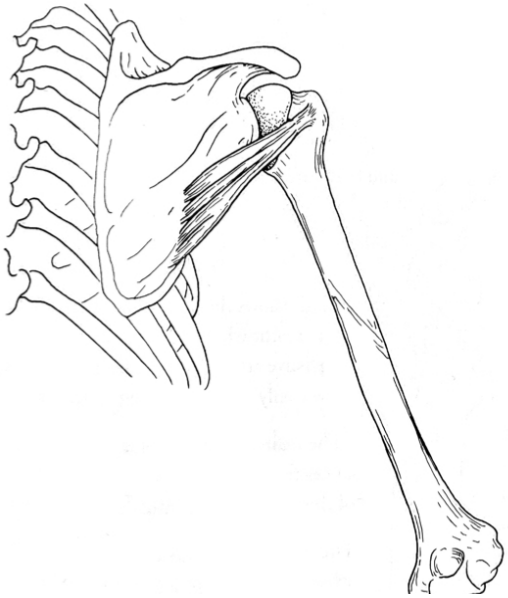


***Figure 40. Teres minor*

Scapulohumeral muscles of the shoulder: *Coracobrachialis* (see Figure 41) flexes and moves the arm toward the body. *Biceps brachii* (see Figure 42) is the large front muscle of the upper arm (in connection with the elbow), participates in flexion at the shoulder. *Triceps brachii* (see Figure 43) is the large back muscle of the upper arm (in connection with the elbow) that participates in adduction of the arm at the shoulder. *Pectoralis major* (see Figure 44) is the largest muscle of the chest, helps in adducting and abducting the arm. *Latissimus dorsi* (T7-T12) (see Figure 45) aids in extension, adduction and medial rotation of the arm. *Teres major* (see Figure 46) assists in extension, adduction, and medial rotation in the arm in conjunction with the *latissimus dorsi*. The three *deltoid* (see Figure 47)—anterior, middle, and posterior—give the shoulder its characteristic shape as well as aid in flexion and rotation of the arm (Calais-Germain, 2007).

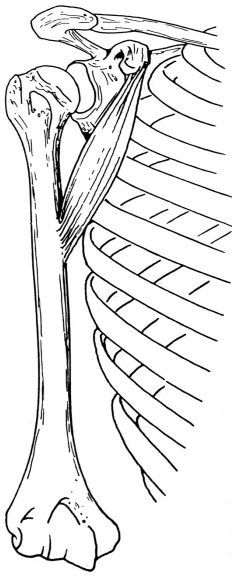


***Figure 41. Coracobrachialis*

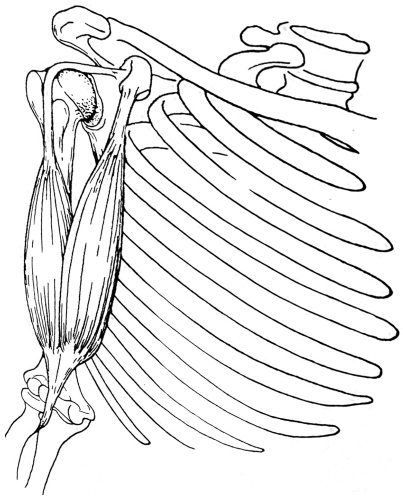


***Figure 42. Biceps brachii*

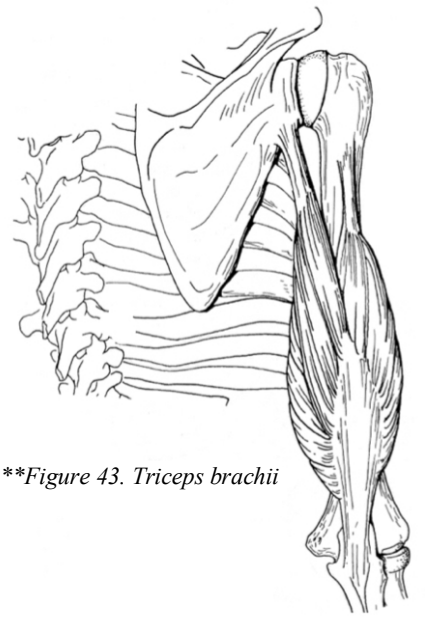


**Figure 43. Triceps brachii*

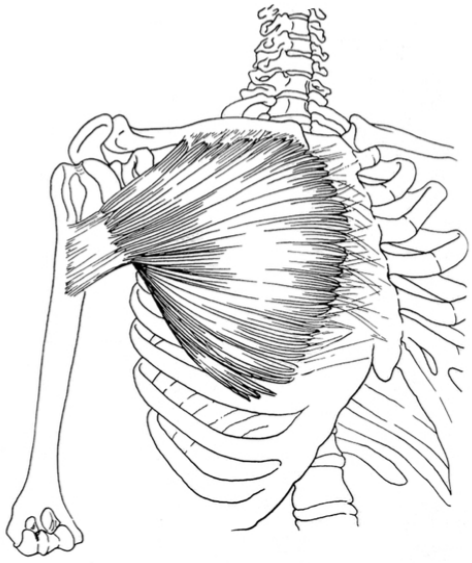


**Figure 44. Pectoralis major*

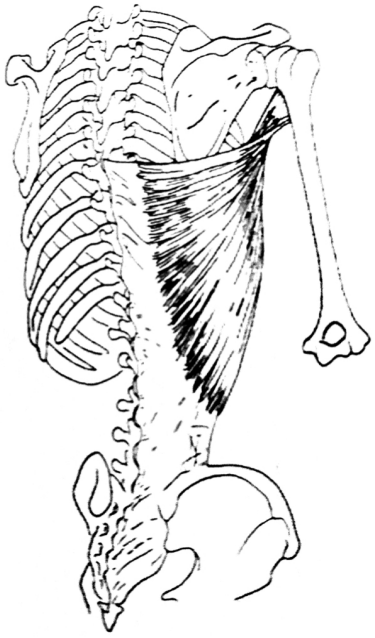


**Figure 45. Latissimus dorsi*

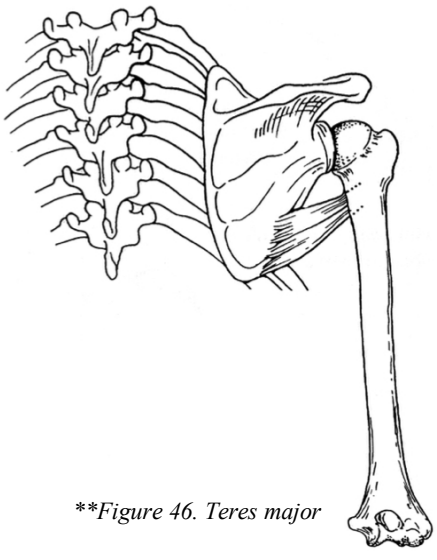


**Figure 46. Teres major*

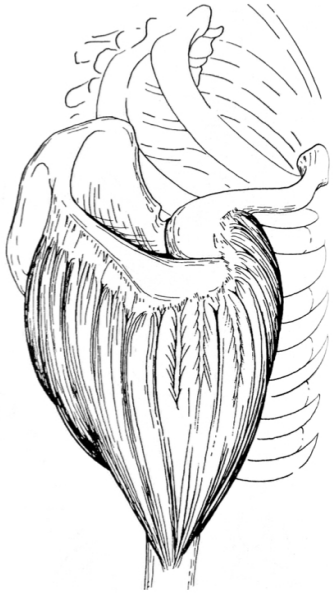


***Figure 47. Deltoid*

Elbow

The elbow is a joint that serves a double function. It allows the upper arm to bend and extend—the action that takes place when a violinist/violist glides the bow in an "up bow" or a "down bow" with their right arm. It also participates in rotating the forearm in pronation—the accurate positioning of the upper-string instrumentalist's right arm that controls the bow, and supination—the accurate positioning of the upper-string instrumentalists' left arm that controls the instrument (Calais-Germain, 2007). I will be examining the principal muscles for bending and extending the arm. *Brachialis* (see Figure 48) is the major flexor of the elbow. *Brachioradialis* (see Figure 49) flexes the elbow in pronation or supination and brings the forearm toward the upper arm. *Biceps brachii* (see Figure 50) is the primary elbow flexor responsible for supinating the forearm (Calais-Germain, 2007).

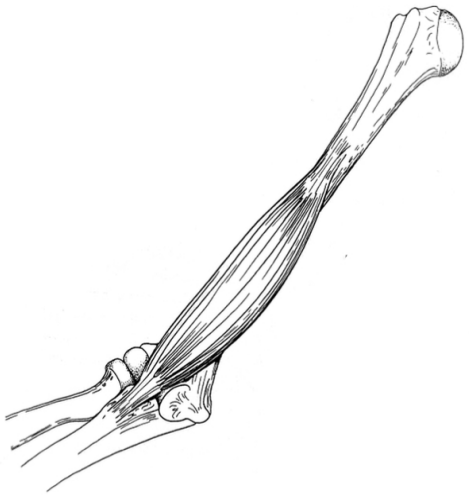


***Figure 48. Brachialis*

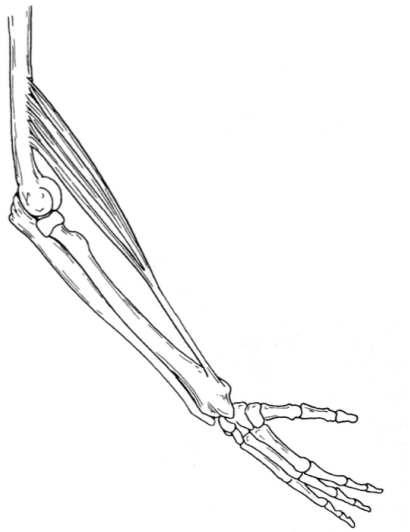


***Figure 49. Brachioradialis*

***Figure 50. Biceps brachii*

Muscles for extension of the elbow include *triceps brachii* (see Figure 51), the major elbow extensor, and *anconeus* (see Figure 52), which aids in extending the elbow (Calais-Germain, 2007).

***Figure 51. Triceps brachii*

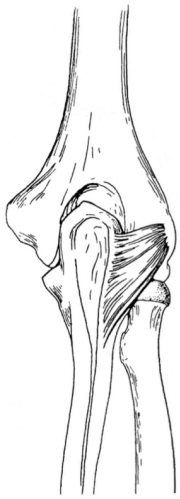


***Figure 52. Anconeus*

Wrist/Hand

The hand is an extremely versatile tool due to the mobility of the fingers. The left hand and fingers are responsible for producing notes on the violin/viola while the right hand is in control of the bow. Both hands are accountable for producing sound—the delicacy of the left and the weight/speed of the right. The wrist and hand share many muscles because of the hand's proximity to the forearm (Calais-Germain, 2007).

I will be examining the muscles that directly move the wrist and the muscles that move the fingers and indirectly the wrist:

Flexors of the wrist: *Flexor carpi ulnaris* (see Figure 53) aids in flexing and adducting (moving toward) the wrist. *Palmaris longus* (see Figure 54) assists in flexing the wrist and assists in elbow flexion. *Flexor carpi radialis* (see Figure 54) help in flexing and abducting (moving away) the wrist and assists in elbow flexion and pronation (Calais-Germain, 2007).

***Figure 53.*
Flexor carpi ulnaris

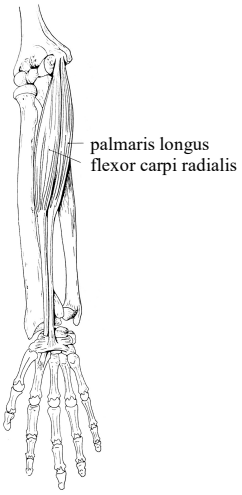


***Figure 54.*
Palmaris longus and flexor carpi radialis

Extensors of the wrist: *Extensor carpi radialis longus* (see Figure 55) extends the wrist, abducts the hand, and engages in elbow flexion. *Extensor carpi radialis brevis* (see Figure 56) extends the wrist and participates in elbow flexion. *Extensor carpi ulnaris* (see Figure 57)—extends and adducts the wrist and aids in elbow extension (Calais-Germain, 2007).

***Figure 55. carpi radialis longus*

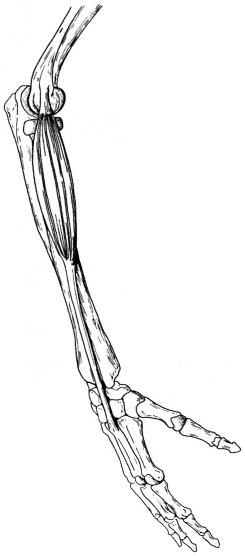


***Figure 56. Extensor carpi radialis brevis*

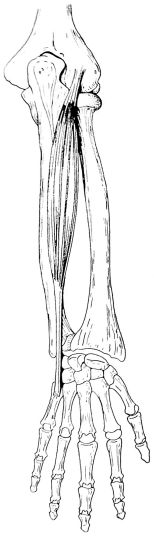


***Figure 57. Extensor carpi ulnaris*

Extrinsic flexors of the fingers: *Flexor digitorum profundus* (see Figure 58) bends the top of the finger toward the bottom of the finger. *Flexor digitorum superficialis* (see Figure 59) flexes the middle of the finger toward the forearm (Calais-Germain, 2007).

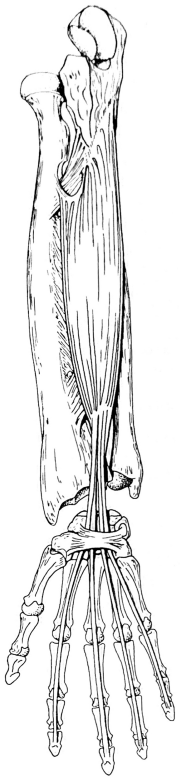


***Figure 58. Flexor digitorum profundus*

***Figure 59. Flexor digitorum superficialis*

Extrinsic extensors of the fingers: *Extensor digitorum* (see Figure 60) bends knuckles toward the back of the hand. *Extensor indicis* (see Figure 61) reinforces the action of the extensor digitorum, particularly on the index finger. *Extensor digiti minimi* (see Figure 62) reinforces the action of the extensor digitorum, particularly on the little finger (Calais-Germain, 2007).

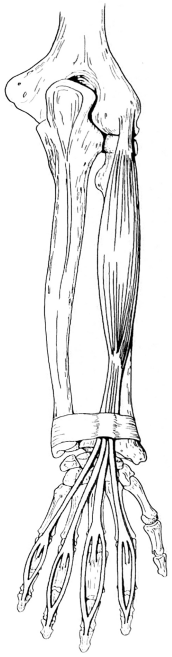


***Figure 60.*
Extensor digitorum

***Figure 61.*
Extensor indicis

***Figure 62. Digiti minimi*

Intrinsic muscles that move the fingers: *Interossei* and *palmer interossei* (see Figure 63) are small muscles that occupy the space between the metacarpals (finger bones that continue

from the digits into the hand) and allow the fingers to adduct and abduct to and from each other. *Lumbricals* (see Figure 64) are small musclesoriginating from the tendons that flex the metacarpophalangeal joints and extend the interphalangeal joints (Calais-Germain, 2007).

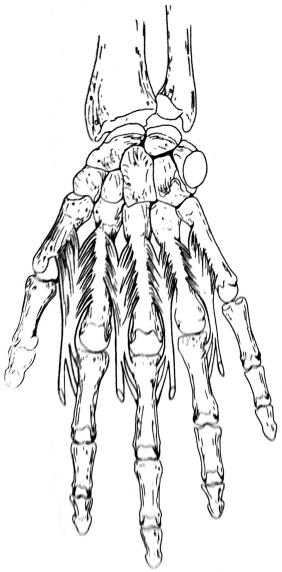


***Figure 63. Interossei and palmer interossei*

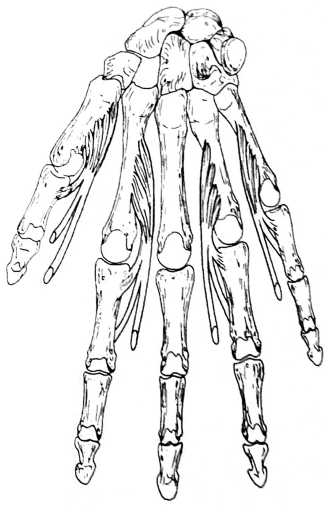


***Figure 64. Lumbricals*

Intrinsic muscles of the 5th finger: *Opponens digiti minimi* (see Figure 65) helps move the little finger toward the thumb and creates the curvature of the palm. *Flexor digiti minimi* (see Figure 66) flexes the little finger. *Abductor digiti minimi* (see Figure 67) abducts the little finger and simultaneously flexes the ring finger (Calais-Germain, 2007).

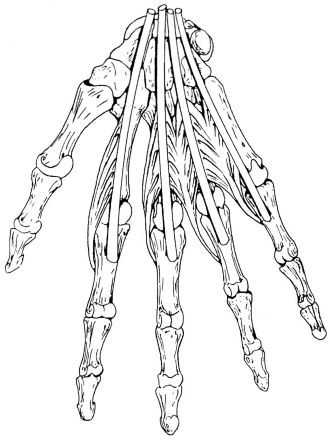


**Figure 65. Opponens digiti minimi*

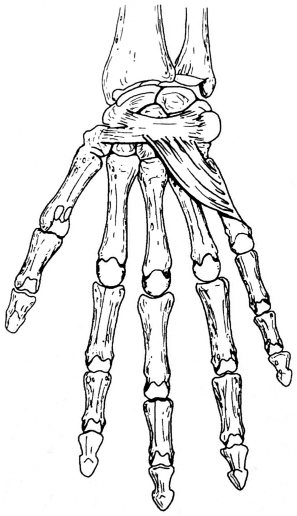


**Figure 66. Flexor digiti minimi*

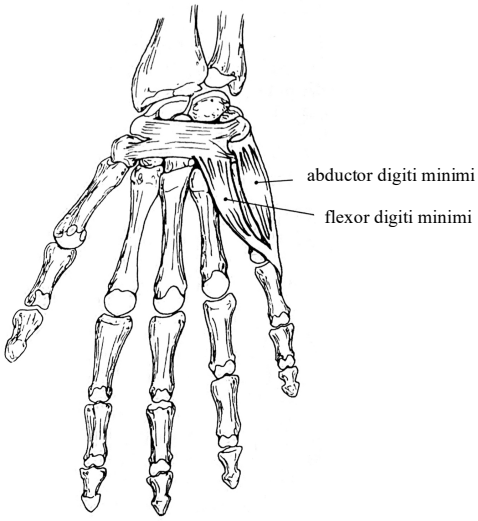


**Figure 67. Abductor digiti minimi*

Extrinsic muscles of the thumb: *Flexor pollicis longus* (see Figure 68) aids in flexion of the three thumb joints and assists in flexion of the wrist. *Abductor pollicis longus* (see Figure 69) is responsible for anteromedial movement of the thumb and also assists in flexion of the wrist. *Extensor pollicis brevis* (see Figure 70) is the extension of two thumb joints and assists moving the thumb away from other fingers. *Extensor pollicis longus* (see Figure 70) performs same action as the *extensor pollicis brevis*, but also extends the third joint of the thumb (Calais-Germain, 2007).

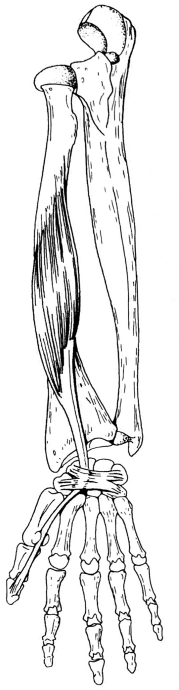


***Figure 68.*
Flexor pollicis longus

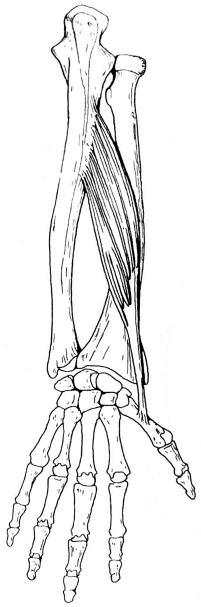


***Figure 69.*
Abductor pollicis longus

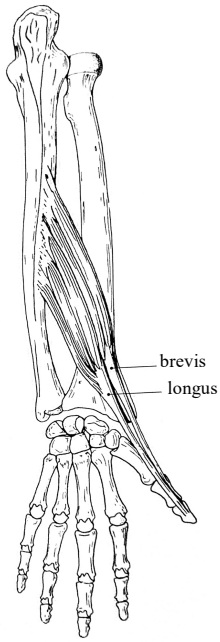


***Figure 70.*
Extensor pollicis brevis and longus

Intrinsic muscles of the thumb: *Adductor pollicis* (see Figure 71) moves the second metacarpal toward the first and also flexes the metacarpophalangeal joint. *Flexor pollicis brevis*

(see Figure 72) moves the metacarpals anteromedially and in medial rotation, and flexes the proximal phalanx of the thumb. *Opponens pollicis* (see Figure 73) is responsible for anteromedial movement of the first metacarpal causing rotation toward the midline. *Abductor pollicis brevis* (see Figure 74) brings the metacarpal anteriorly and flexes the metacarpophalangeal joint (Calais-Germain, 2007).

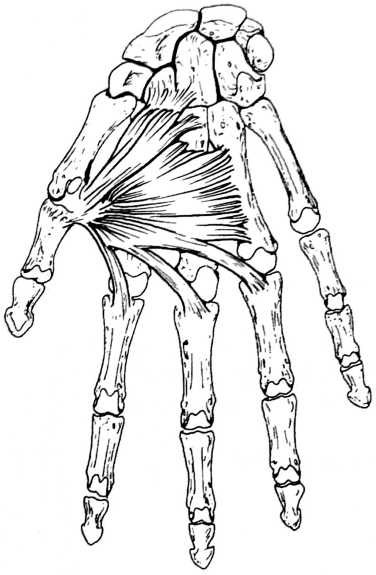


***Figure 71. Adductor pollicis*

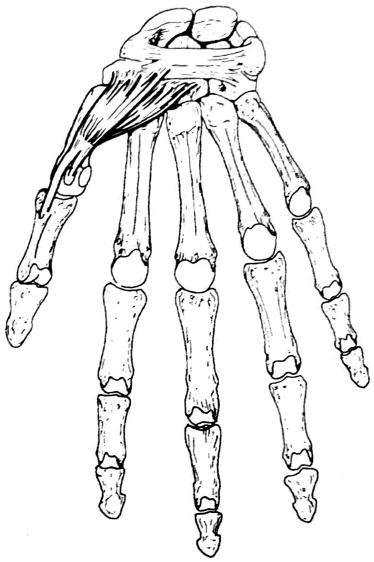


***Figure 72. Flexor pollicis brevis*

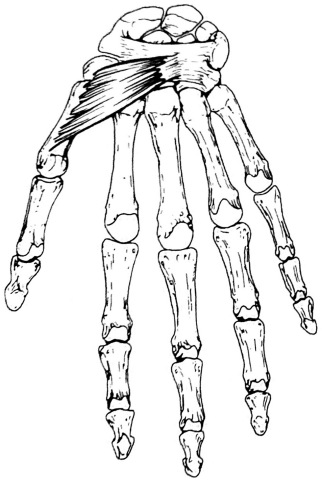


***Figure 73. Opponens pollicis*

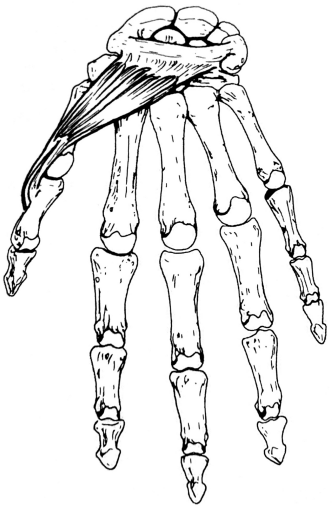


***Figure 74. Abductor pollicis brevis*

Hip/Knee

The hip is a stable and powerful joint, surrounded by thick muscles to support the body. Because of this, range of motion at the hip is restricted and typically affects nearby structures such as the lower back and knee. The knee receives stress from above (a person's body weight) and below (the impact of standing) (Calais-Germain, 2007). Regardless of whether the upper-string instrumentalist is playing in a standing or seated position, the musician relies on strong hips and healthy knees to reduce undue muscle tension in proximal (near) and distal (distant) regions.

I will be discussing the hip and knee together as these two joints have many muscles in common and are connected by the largest and strongest bone in the body, the femur (thigh bone):

Hip muscles (see Figure 75): *Piriformis* (L5-S2) and *quadratus femoris* (L5-S2 contribute to extension and contraction of the pelvis. *Gemellus superior and inferior, obturator internus* (L5-S2) *and externes* (L1-S2) support the hip. *Iliacus* (L2-L4) acts in flexion or

extension of the hip. *Gluteus minimus* (L4-S1) laterally flexes or contracts the pelvis. *Gluteus medius* (L4-L5) stabilizes the pelvis against gravity (Calais-Germain, 2007).

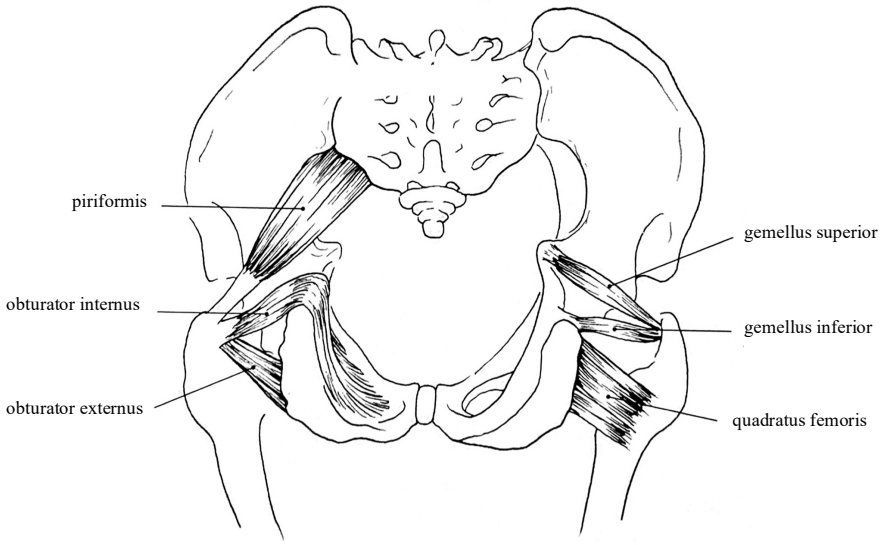


***Figure 75. Hip muscles*

Muscles of the knee: *Biceps femoris* (see Figure 76) flexes and laterally rotates the knee. The *popliteus* (see Figure 76) flexes and medially rotates the knee. The *gastrocnemius* (see Figure 77) aids in flexing the knee.

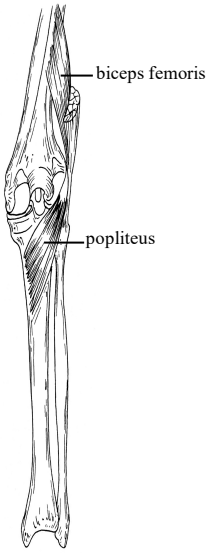


***Figure 76.*
Biceps femoris

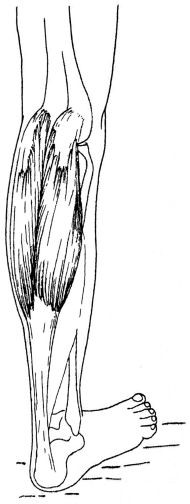


***Figure 77.*
Gastrocnemius

Contractions that Upper-String Instrumentalists Engage in

The muscles responsible for producing movement and maintaining body posture are formed by muscle fibers that contract when they receive electrical stimuli from the nerves connected to muscles. Throughout the body, pairs of muscles work across joints so that when a muscle pulls a bone in one direction, the opposing muscle is passively stretched to enable it to move (Llobet and Odam, 2007).

There are three primary muscular contractions that both micro-athletes and macro-athletes engage in: (1) eccentric contractions, (2) concentric contractions, and (3) isometric contractions (Herzog, 2017; Lima and Denadai, 2015). An eccentric contraction takes place when the muscle lengthens while a concentric contraction occurs when the muscle shortens. An isometric contraction takes place when a body position is fixed by a muscular contraction, resulting in muscles that neither lengthen nor shorten (Calais-Germaine, 2007).

Sports athletes engage in eccentric and concentric contractions whenever they flex/extend their arms/legs (i.e. as in soccer, basketball, football, swimming, etc.) and engage in isometric contractions whenever they have resistance on the muscles and maintain a fixed position (i.e. found in swimming, gymnastics, baseball, karate, tai chi, etc.) Upper-string instrumentalists simultaneously engage in eccentric and concentric contractions with their (right) bow arm and violin/viola (left) arm. While taking a "down bow" (gliding the bow from the frog to the tip) the bicep (the front muscle of the upper arm) is extended, widening the angle at the elbow, producing an eccentric contraction. This same action contracts the tricep (the back muscle of the upper arm). While taking an "up bow" (pushing the bow from the tip to the frog) the bicep is contracted, narrowing the angle at the elbow, producing a concentric contraction. This same action extends the tricep, producing an eccentric contraction.

While small in magnitude, the repetitive activity that occurs in the left hand is comprised of continuous eccentric and concentric contractions. This is exactly why playing with less physical force coming from the fingers will preserve overall energy, and why building the muscles that support those movements is a good idea. Violinists and violists engage in isometric contractions with their left arm when they sustain a rather fixed position (compared to the kinetic nature of the right arm) and help carry a load (the instrument). These musicians also engage in isometric contractions when they rely on the larger, stabilizer muscles, which surround the muscles of the trunk and those of the shoulder joint, to maintain the most ergonomic posture possible (Groth, 2016).

A muscle or group of muscles that conducts a single movement is known as an agonist, while its opposing muscle or group is called an antagonist (Dawson, 2008). When both agonist and antagonists contract simultaneously, very little joint movement (isometric contraction) occurs. Through skeletal structure, acted upon by a system of agonist and antagonist muscles, the body "fights against forces of gravity" (Leska, 2010, p. 14), in order to maintain good posture.

When compared to isometric and concentric contractions, eccentric contractions cause significantly greater magnitudes of damage (Lima and Denadai, 2015; Herzog, 2017). Because fewer motor units are used during eccentric and contractions versus concentric or isometric contractions, greater mechanical stress is applied to the active muscle fibers, resulting in the sensation of pain and even the possibility of damage to the muscle (Boyle et al., 2004; Ator, 2012). As Lima and Denadai (2015) explain, "Eccentric exercise-induced muscle damage (EIMD) is a multifactorial phenomenon that occurs when skeletal muscle is exposed to elevated mechanical stress conferred by unaccustomed eccentric exercise. This exposure to stress leads to

cellular disruption, loss of function, soreness and leakage of intracellular proteins to the blood stream." p. 1.

Micro- and macro-athletes need to warm up before engaging in eccentric, concentric and isometric contractions. Cold tissues are slow and more prone to injury. Once heated, blood flow is increased and tension is reduced (Groth, 2016). Muscle fatigue and injured tissue also contribute to increased muscular tension. This is because muscles use two types of fuel: (1) fuel that is stored in the muscle itself for immediate use by the athlete, and (2) fuel that is not ready to be used and must be refined in the muscle itself before utilization. (Llobet and Adam, 2007; Groth, 2016). As a result, intense playing before being sufficiently warmed up will exhaust all of the immediately available reserves. This undoubtedly will diminish one's performance and make it more likely for injuries to occur (Llobet and Adam, 2007).

Sustaining Musculoskeletal Injuries

The combination of highly repetitive movements, long hours of practice, poor physical conditioning, carrying a static load, and awkward postures is suggested to cause the high number of overuse injuries suffered by musicians (Ackermann et al., 2002; Liu and Hayden, 2002; Moraes and Antunes, 2012; Rensing et al., 2018). Musicians are not only susceptible to developing musculoskeletal disorders, but they suffer frequently, over long durations, and can be occupationally disruptive. Muscles that contract frequently or forcibly for long periods of time do not have a chance to rest and replenish the chemicals needed for further contraction. Poor strength and stability in proximal areas can cause overuse injuries at both proximal and distal sites. This can occur as a result of faulty ergonomics and inadequate postural support leading to increased stress throughout the entire body (Ackermann et al., 2002). There are two primary

static loads that the upper-string instrumentalist is responsible for carrying while playing. The first is the instrument itself, which needs to rest comfortably and in a rather still fashion so the rest of the body can engage in the necessary contractions. The second is the instrumentalist's head. When aligned properly above the spinal column, this 10-to-15-pound weight appears weightless. However, when deviated from its neutral position stacked atop the spinal column—even by just a little bit, such as the technically correct but anatomically incorrect positioning of the violin/viola—the once-weightless head becomes another static load hanging off of the neck.

As a result of the repetitive activity to which these structures are exposed, the basic physical changes in overused tissues can ultimately lead to such injuries as abrasion, tearing, or stretching of muscle tissue, tendons, ligaments, and other supporting structures around the joints (Dawson, 2008). Chronic pain can also cause long-term changes in the circuitry of the spinal cord, which may result in sensations that were previously innocuous to become painful (Watson, 2009). Wan and Shan (2016) explain, "Muscle injuries from physical activity fall into two main categories: (1) impact injuries where the physiological limits of the individual are surpassed, and (2) repetitive stress injuries (RSIs) where the accumulation of micro-injury from physical overuse surpass the individual's physiological tolerance" (p. 2). Musician's *typically* fall into the second category.

Like sports athletes, musicians are a special group of professionals who develop many occupation-specific injuries. Unfortunately, unlike sports athletes, musicians often assume their painful condition is normal and find ways to mask the effects of an injury. The musician's "don't ask, don't tell" policy is a frame of mind due in part to a performance culture including a long-standing philosophy that "the show must go on" and in part to a common fear among professional musicians of being labeled as a musician with an injury (Feldman, 2010; Stanhope,

2015; Watson, 2009). Musicians who experience musculoskeletal disorders experience a range of negative emotions such as self-blame, shame, frustration, guilt, embarrassment, isolation, stress, and depression. This culture of silence for musicians with injuries creates barriers to accessing social and organizational support as well as appropriate healthcare (Stanhope, 2015). Recent literature indicates that many playing-related health issues are already present by the time a music student decides to enter college and study music seriously (Ackermann, 2013).

Another characteristic that separates micro- and macro-athletes is that sportspeople are trained from the very beginning how to optimize performance and play as safely as possible to avoid injuries. The training of musicians generally does not include education about injury prevention. Musical training focuses primarily on the quality of sound and intonation (Stanhope, 2015). Often at the professional level, musicians do not continue to receive musical instruction, unlike professional sportspeople who continue to receive training during their careers (Stanhope, 2015).

According to Rensing et al. (2018), performance-related musculoskeletal disorders affect approximately 70% of instrumental musicians, with string players having the highest risk at rates of 65%-88%. The upper-string instruments require complex neuro-musculoskeletal interaction and a high frequency of repetitive movements, dynamic and static muscle load, and awkward postures. This combination of factors causes musculoskeletal strain (Liu and Hayden, 2002). Shan and Visentin (2003) quote Dr. Earl Owen, a leading authority on musicians' injuries:

> No doubt that violinists (and viola players) are the most damaged group of musicians. Their instrument playing position is the most un-advantageous of all. It combines neck twisting, flexion, and downward pressure; left shoulder upward thrust: fixation of the left scapula bone by both left rhomboids muscles to stabilize the shoulder with the assistance

> of the pectorals muscle contracting on the chest. This is all smoothed over by the partial contraction of the latissimus dorsi. All that is to solidly hold the blunt end of the violin quite fixed. Then the left elbow is flexed and held in flexion mainly by the biceps…the support muscles for the wrist…hold it in a 'position of balanced but relied activity'…so that their playing fingers are in the best position to flex onto the strings AND play without strain. But for every muscle in obvious activity (take the biceps for example) there is another muscle also working to balance it. And we haven't yet discussed the action of the forearm muscles in fingering a note, which cannot be done smoothly without the skilled use of the hand's unique interosseous and lumbrical intrinsic muscles […] All this static holding on the left side (which is contrary to what keeps muscles healthy) is in contrast to the free play activity of the right side and wrist muscles. (p. 3)

The neck, jaw, shoulder, hands and back are the most commonly affected regions of the body in the upper-string instrumentalist (Rensing et al., 2018; Zaza and Farewell, 1997). In ergonomic terms, holding the violin or viola under the chin can disturb the symmetry of the head and shoulders, leading to issues in the surrounding areas. Many of the problems facing violinists and violists can be categorized on extrinsic and intrinsic factors. A musician's size, strength, flexibility, and presence of underlying disease are intrinsic risk factors for PRMDs. A musician's performance technique and the playing environment account for extrinsic factors (Rensing et al., 2018). Violists experience more pain in the shoulder and arms than do violinists because of the greater weight and size of the viola compared to the violin (Maran, 1998).

Examining Musculoskeletal Injuries

Many studies in the in the area of performing arts medicine suggest that an asymmetric playing posture, associated muscle activity, and increase load on joint and muscular structure contribute to musculoskeletal problems in violin and viola players.

Neck and Thoracic Spine

Park et al. (2012) illustrated that while playing the violin, the angle of the left lateral bending and leftward rotation of the cervical spine were significantly greater in violinists with neck pain than among those without neck pain. Range of motion for left axial rotation was significantly lower in the neck pain group. Findings indicated that an asymmetrical playing posture, increased muscle activity, and decreased neck rotation could contribute to neck pain in violinists and violists. Barczyk-Pawelec et al. (2012) evaluated the spinal curvature in the sagittal plane (the anatomical area that divides the body between right and left) and found that the curvature in thoracic spine was greater in violinists compared to non-violinists.

Coon (2007) found that prolonged asymmetric positioning (approximately 2-to-3 hours of playing) caused pain in the right (bow) arm resulting in pain at the origin of the middle trapezius/rhomboid muscles on the right, with palpable pain at the upper trapezius muscle during eccentric contraction. Similarly, Steinmetz and Jull (2013) demonstrated that violin players with neck pain had sensory impairment due to more activity in the left upper trapezius, both sternocleidomastoid muscles, and cervical extensors than violinists without neck pain.

Lower Back

Steinmetz et al. (2010) showed that musicians with PRMDs had significantly impaired scapular stabilizers, dysfunction in the lumbo-pelvic stabilizing muscles alongside tightened pectoral, trapezius, sternocleidomastoid, and elevator scapulae muscles. Greater impairment of the lumbo-pevlic stabilizing muscles was also found in upper- and lower-string payers when compared to symmetrically played instruments. Paarup et al. (2012) illustrated that the lumbar lordosis (the natural curvature of the lower spine) in the standing position were significantly lower than in the sitting position. These results indicated a more unbalanced weight distribution while sitting than while standing. Barczyk-Pawelec et al. (2012) also found that the spinal curvatures showed that the lumbar lordosis displayed more thoracic kyphosis in violinists compared to non-violinists.

Shoulder

Ackermann and Adams (2003) found a greater external and internal rotation of the left shoulder than of the right shoulder in violinists. Correlations were found that suggest left and right arm pain originate in the cervical-thoracic region. Similarly, Araujo et al. (2009) showed that on the G string, only 3 of 33 violinists had both shoulders that were well positioned. When looking at three shoulder-rest conditions—maximum height, minimum height and no shoulder rest, and their affects on asymmetry of the head on the body, Rabuffetti et al. (2007) concluded that increasing the height of the shoulder rest correlated with a significant decrease in head rotation.

Spahn et al. (2014) demonstrated that violinists exhibit worse posture while sitting than while standing. Turner-Stokes and Reid (1999) found that left-elbow flexion decreased

progressive range of shoulder movement in violinists when compared to cellists. Fjellmann-Wiklund et al. (2004) also found greater trapezius muscle activity in upper-string instrumentalists when compared with cellists. Berque and Gray (2002) established that violinists generated greater upper trapezius muscle activation performingmore challenging pieces. Results also indicated a higher activity of the same muscle under resting conditions among participants already suffering from shoulder-neck pain. Complementarily to Berque and Gray (2002), Ackermann et al. (2002) found that when using athletic tape on the left scapula, there was significantly less stress on right upper-trapezius, sternocleidomastoid muscle, and left and right scapula retractors when playing pieces with high speed and intensity. Nyman et al. (2007) determined correlations between the high prevalence of neck/shouder pain in violinists and violists and practicing more than three hours each week, while Steinmetz et al. (2008) uncovered that the tendency of extreme external rotation contributes to both the pain experienced by violinists and exacerbation on the lumbar spine. Steinmetz et al. (2012) found that when compared to non-music students, music students had more musculoskeletal dysfunctions. Findings indicated that speed could be a factor for musculoskeletal demands in upper-string instrumentalists.

Elbow

Shan and Visentin (2003) revealed that increasing speed of bowing was a factor for increased range of motion in the right elbow, while Shan et al. (2004) showed correlations between the right deltoid/shoulder activation and bicep activation and with increased speed. On the other hand, Visentin et al. (2015) measured biomechanical factors and motor control patterns

related to shifting on the violin, and concluded shorter subjects required more elbow flexion on lower shifting speed.

Wrist, Hand, and Fingers

Ackermann and Adams (2003) also found that range of motion and hand variables showed a higher wrist motion on the left arm than the right, but that the right arm might be a factor in potential injury risk. Conversely, Sugawara (1999) found that the right hand demonstrated more range of motion than the left hand. Turner-Stokes and Reid (1999), on the other hand, discerned no differences between hands in wrist range of motion, but ergonomics of the violin were in question. In addition to findings regarding the elbow, Visentin et al. (2015) also found that range of motion in the wrist and hand affected smaller players as opposed to taller players. Findings indicate that the smaller players were working closer to their anatomical limits.

Kinoshita and Obata (2009) determined that pressing the string with increasing speed required lower force, but that in contrast, force increased with increased dynamic level. These findings imply that string players are more vulnerable to playing with too much tension. There were also correlations noted between increased of force in the left hand and playing with higher volume. Both Baader et al. (2005) and Kazennikov and Wiesendanger (2009) examined coordination between stopping the strings with the left hand, and stopping the strings holding the bow in the right hand. The former found that the coordination was dependent on the speed that the notes were being played, while the latter found that the time interval was longer when shifting between positions in the left hand.

Chapter 5: Training the Micro-Athlete

Micro-athletes work small and large muscle groups. Micro-athletes must engage in healthy practice habits through implementing deliberate practice and self-regulatory behaviors. Micro-athletes face cognitive challenges that can be alleviated through mindfulness training. Micro-athletes must understand their bodies. A better understanding of the various psychological and physiological loads on violin and viola playing provides the basis for facilitating healthy practice habits, cognitive resilience, and injury prevention strategies that promote mind/body health.

Chapter 5 of this dissertation will: (1) explain the anatomical body as it relates to ideal and incorrect body postures that musicians often find themselves in, and what the body does naturally resting at neutral without the instrument, (2) illustrate how violin/viola muscles learn from the perspective of veteran Suzuki teacher Susan Kempter, (3) examine existing research in injury prevention, (4) explore yoga postures and strengthening exercises that are specifically beneficial for string players, (5) examine research-based mindfulness exercises that promote relaxation, and (6) provide practice prescription templates.

The Anatomical Body

The body craves to maintain symmetry—recall the term “homeostasis” from Chapters 1, 2 and 3. However, playing upper-string instruments disturbs this symmetry both while actively playing and while at rest. It is therefore important to understand the anatomically correct postures that can ease tension, discuss the various unhealthy body postures that violinists/violists

find themselves in, and then build a violinist/violist from the ground-up, incorporating exercises that both help maintain healthy posture and build strength.

Standing Posture

In a neutral standing posture without holding an instrument, the center line of the body goes from the top of the head through the middle of the body (see Figures 78 and 79). The shoulders are broad and relaxed with the head, shoulders, pelvis, hips, knees and feet are facing straight forward. There is equal balance and equal load between the right and left. Here joints are stacked and muscular balance is optimized (Larsen et al., 2008).

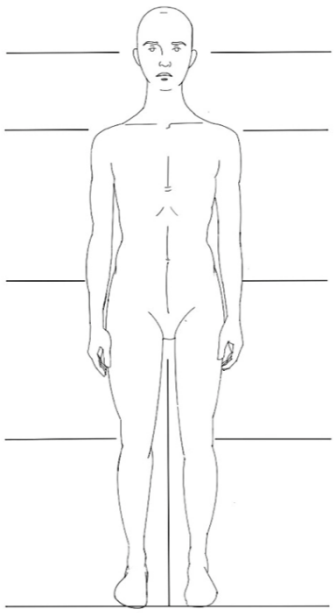


**Figure 78. Neutral standing posture without the instrument from the front*

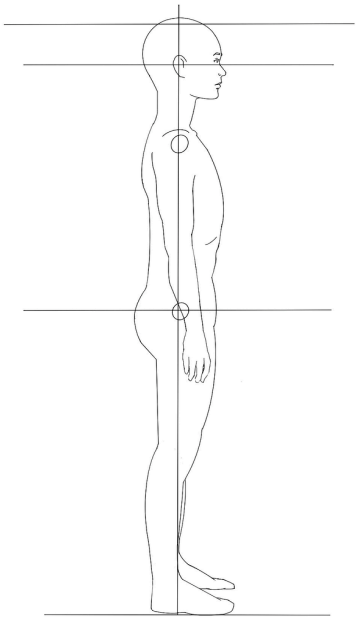


**Figure 79. Neutral standing posture without the instrument from the side*

With the addition of the instrument, the neutral standing posture changes slightly (see Figures 80 and 81). The center line of the body now goes down from the shoulders through the middle of the body, as the head is now turned slightly toward the left. The arms are also no

longer resting at the body's side, but engaged asymmetrically at different heights—the right elbow noticeably higher than the left. The shoulders, however, should remain broad and relaxed and stacked above the hips. Torso and hips should still face forward. There should also still be equal balance and equal load between right and left. The changes to the neutral posture from standing without the instrument to standing in playing position with the instrument are significant because these asymmetrical differences can lead to tension both on and off of the instrument.

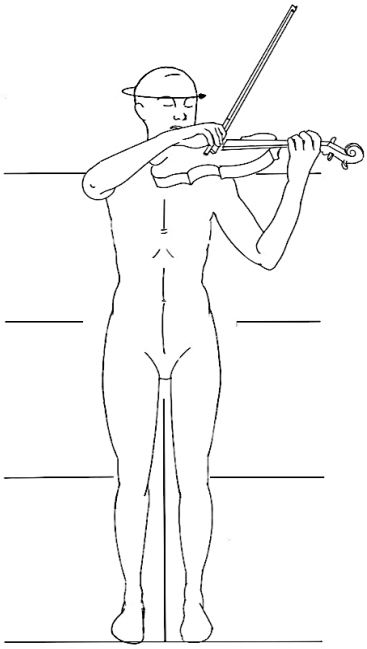


**Figure 80. Neutral standing posture with the instrument from the front*

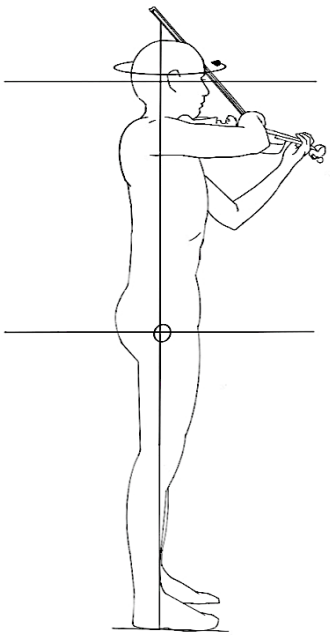


**Figure 81. Neutral standing posture with the instrument from the side*

Unfortunately, asymmetrical positions that violinists and violists are required to endure can lead to bodily imbalances while actively playing the instrument and can lead to bodily imbalances while at rest. One common asymmetrical standing position is when the shoulder and

hips are pulling in opposite directions (see Figure 82). Here, the center line no longer falls through the middle of the body. The pelvis is shifted in the opposite direction from the thorax. Instead of resting naturally, there is muscle compensation to keep the body in this position. This asymmetrical posture increases stress on the spine and continues upwards to the head and jaw joints (Larsen et al., 2008). Another asymmetrical posture is one where the center line falls through the middle of the body, but the pelvis is turned in the opposite direction from the chest (see Figure 83). This posture also increases stress on the spine, head and jaw joints as well as knee and ankle joints. Another standing posture that is common but unfavorable is where shoulders are slumped and the sternum has sunk (see Figure 84). The hanging shoulders disturbs muscle strength along the backline and through the shoulders. This posture is compensated by undue muscle tension throughout the entire body (Larsen et al., 2008).

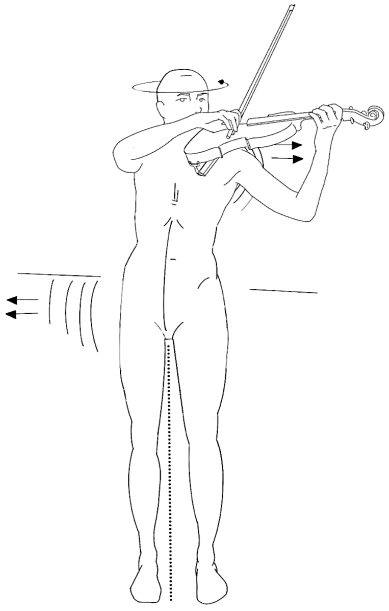


**Figure 82. Asymmetrical standing position where the shoulder and hips are pulling in opposite directions*

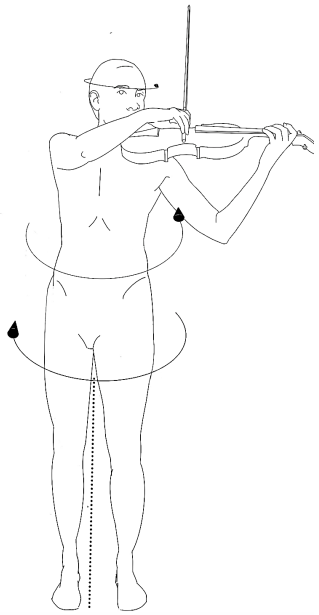


**Figure 83. Asymmetrical posture where the center line falls through the middle of the body, but the pelvis is turned in the opposite direction from the chest*

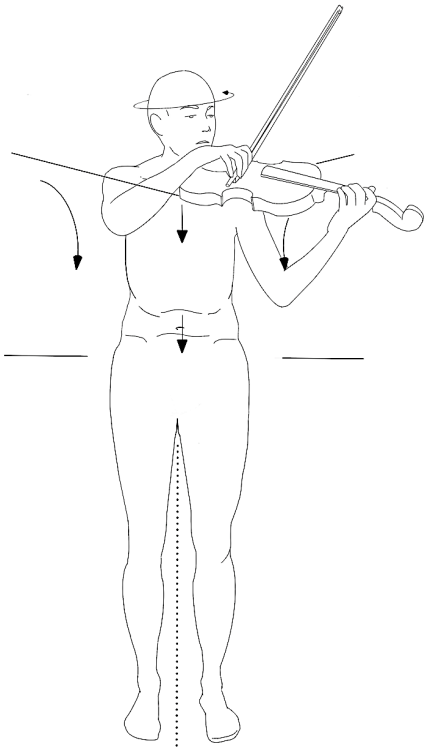


**Figure 84. Shoulders are slumped and the sternum has sunk*

From the profile of the micro-athlete there are two common asymmetrical stances. One is a posture where the chest is pushed outward with a hyperextension in the back and an overly curved lumbar lordosis (see Figure 85). In this stance, knee joints are pushed toward the back and locked. The neck is well erect and slightly hyperextended. This overstretched thoracic spine and cervical spine causes undue muscle tension between the shoulder blades and on the spine. Another asymmetrical posture is one in which the shoulders are sloped forward with sternum sunken down (see Figure 86). This posture exacerbates the curve in the upper-thoracic and cervical spine and pushes the stomach forward (Larsen et al., 2008).

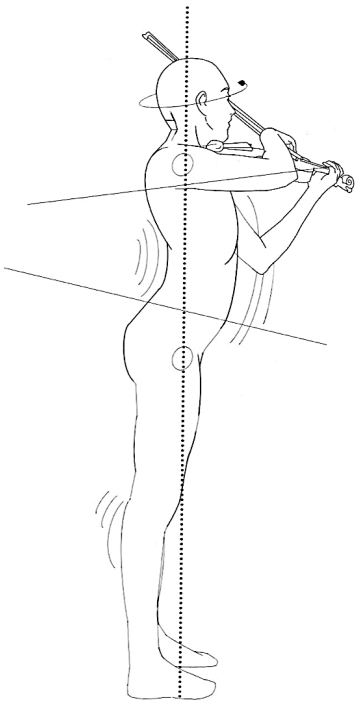


**Figure 85. Chest is pushed outward with a hyperextension in the upper back and an overly curved lumbar lordosis*

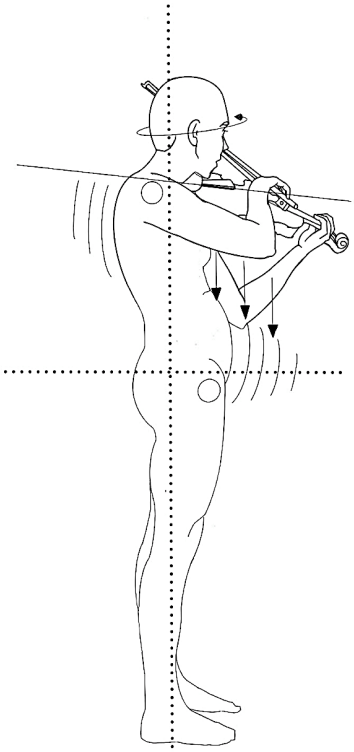


**Figure 86. Shoulders are sloped forward with sternum sunken down*

Seated Posture

Upper-string instrumentalists are expected to be able to play both while standing and sitting. Standing is important during private practice because it encourages good posture, builds endurance, and combines small motor movements and large muscle stabilization. It is also expected that one stands while performing solo music. Upper-string instrumentalists typically are seated while performing chamber and orchestral music. This means that when learning to play this style of music, it is important to practice both while standing up (to reinforce good posture and work on muscle engagement), and while sitting down (to gain performance practice).

The anatomically correct seating position without the addition of the instrument is one in which the pelvis and head are upright with the weight resting equally on both sides of the sits

bones (see Figure 87). In this posture the spine is elongated and being pulled equally up and down. The lumbar spine has a slight lordosis curve. Shoulders should be relaxed and stacked above the hips. This sitting posture is ideal for active or dynamic sitting because it allows for optimal posture and freedom of movement in the spine in all directions (Larsen et al., 2008).

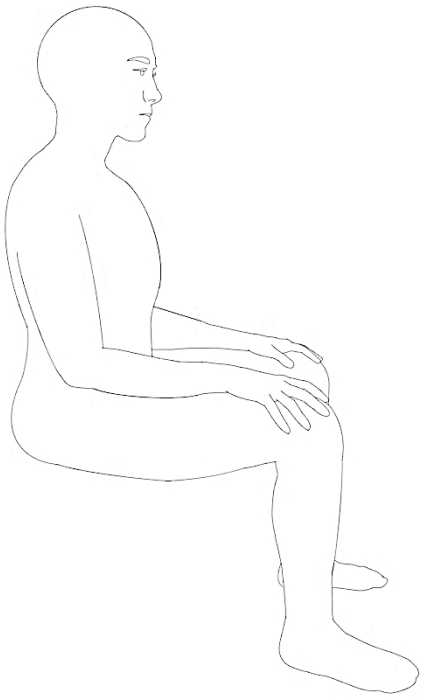


**Figure 87. Natural seat without the instrument*

The natural, tension-free seat with the addition of the instrument changes in a similar fashion to the standing posture (see Figure 88). The head becomes slightly off kilter as it meets the instrument and the arms no longer rest symmetrically at the body's side. The pelvis and head still remain upright with the weight resting equally on both sides of the sits bones. The spine continues to be elongated and pulled equally up and down (Larsen et al., 2008).

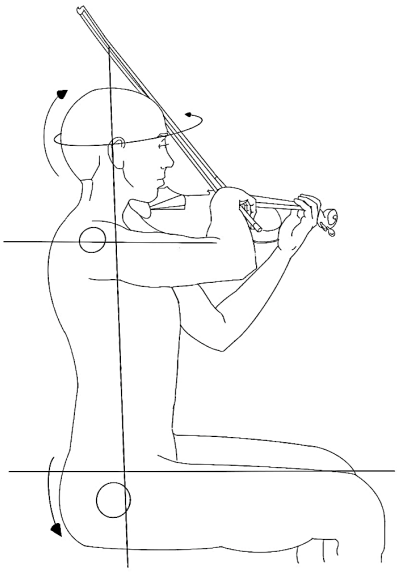


**Figure 88. Natural seat with the instrument*

Incorrect sitting postures that are typical during seated playing include one in which the back is rounded with the shoulders hunched forward (see Figure 89). Here, the chest is collapsed while the pelvis is tilted backwards. Instead of sitting on the sits bones, this posture forces the body to rest on the tailbone. In this posture the entire chest and stomach areas are compressed while over-stretching the muscles in the thoracic and cervical spine. Another incorrect sitting posture is one in which the chest is pronounced forward and the pelvis tilted forward (see Figure 90). Here, the spine is hyperextended, exacerbating the lumbar lordosis (Larsen et al., 2008).

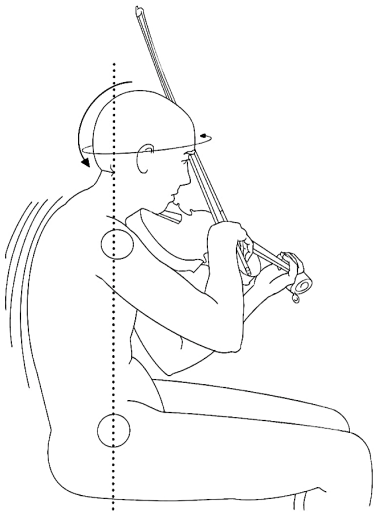


**Figure 89. Incorrect posture where the back is rounded with the shoulders hunched forward*

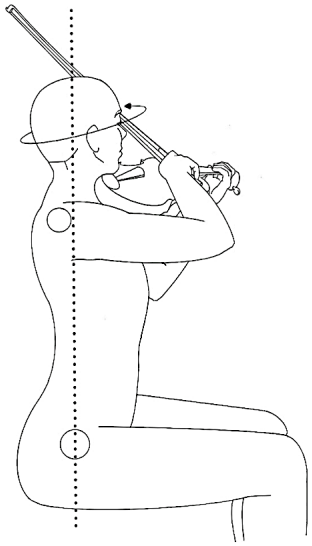


**Figure 90. Incorrect sitting posture where the chest is pronounced forward and the pelvis tilted forward*

Head Placement and Rotation

The natural position of the head on the shoulders without the addition of the instrument is one in which the ears are directly over shoulders, and the bottom of the chin sits at a 90-degree angle to the neck, creating a long and open neck (See Figure 91). In this posture, the joints in the cervical spine are optimally loaded while the shoulder and neck muscles remain relaxed (Larsen et al., 2008).

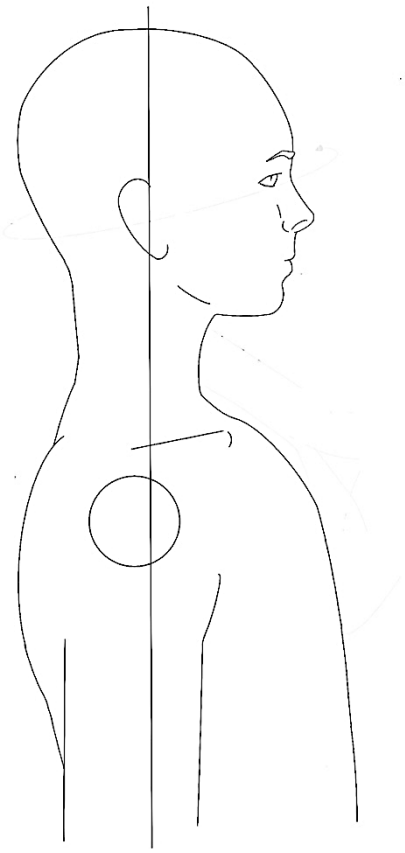


**Figure 91. The natural position of the head on the shoulders without the instrument*

With the addition of the instrument, the natural position of the head on the shoulders changes only slightly (see Figure 92). The neck should remain long and open. The 90-degree angle from the chin to the neck changes only that the chin may rotate to the left toward the instrument.

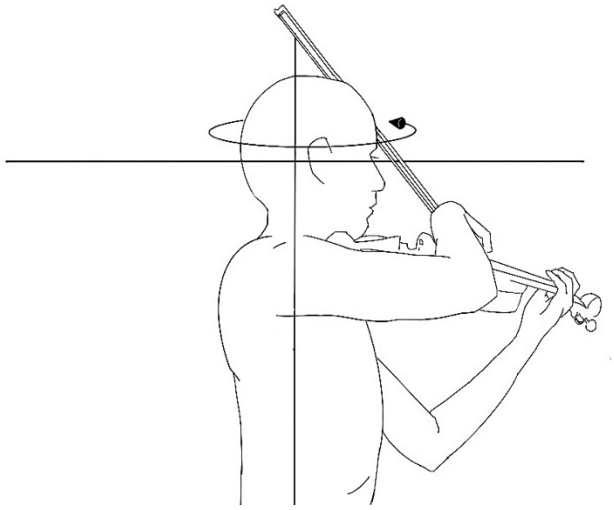


**Figure 92. Natural position of the head on the shoulders with the instrument*

There are two ways that the upper-string instrumentalist can immediately disturb symmetry with added tension. One is by lurching the head forward from the spinal column (common among beginning violinists/violists who want to bring their chin/jaw to the instrument instead of the opposite way around), causing muscle tension in the shoulder, neck and jaw (see Figure 93). The other is by bringing the chin in towards the chest to hold the instrument, hyperextending the cervical spine and pushing it backwards. This causes intense physiological stress on the cervical spine and even premature osteoarthritis of the smaller joints of the cervical spine (see Figure 94) (Larsen et al., 2008).

**Figure 93. Lurching the head forward from the spinal column*

**Figure 94. Bringing the chin in towards the chest to hold the instrument, hyperextending the cervical spine*

The anatomical head turn, without holding the instrument, is one in which the face and chest are both turned in the same direction, with the neck remaining long and open, shoulder and neck muscles remaining relaxed. The movement here is evenly distributed throughout the cervical and thoracic spine (see Figure 95) (Larsen et al., 2008).

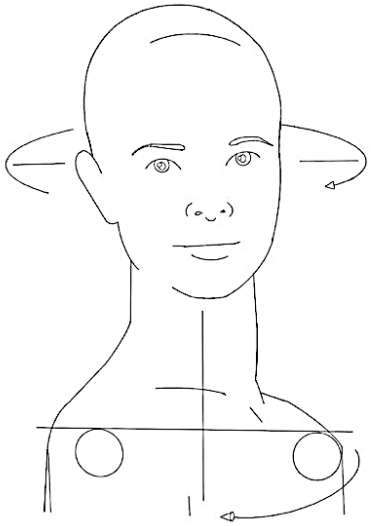


**Figure 95. The anatomical head turn without holding the instrument*

With the addition of the instrument, the correct head turn for upper-string instrumentalists is one that isn't completely anatomical, but not necessarily harmful. What makes this head rotation anatomically incorrect is that the movement is not evenly distributed throughout the cervical and thoracic spine. The head rotates in a slightly independent fashion from the chest (see Figure 96) with the chin tilting to the left while the chest remains open to the front. The deviation from the spinal column is minimal. But when engaging in this posture without counteracting the asymmetry with stretching and strength building, tension can lead to bodily imbalances (Larsen et al., 2008).

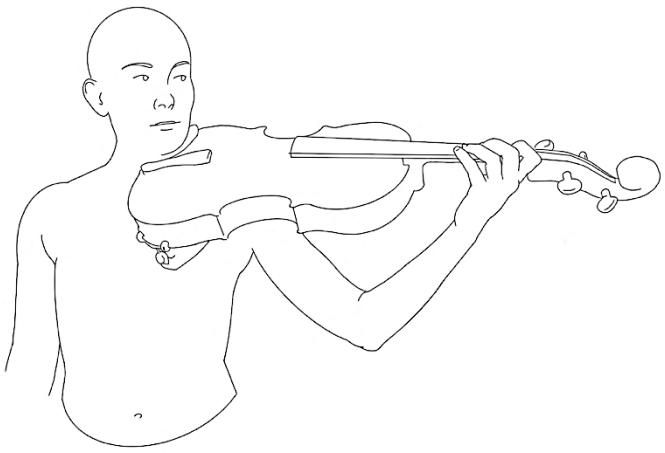


**Figure 96. Correct head turn with the instrument*

There are two additional anatomically incorrect rotations of the head and neck when holding the instrument with the chin/jaw area that are considered to be poor technique: (1) the top of the head rotating to the left, chin to the right to access the jaw (see Figure 97), or (2) the top of the head rotating to the right, chin to the left, to access the chin (see Figure 98). In both postures the forced head rotation is too much, taking place exclusively in the cervical spine and leading to tension (Larsen et al., 2008). An important factor to consider in how a performer holds the head when playing an upper-string instrument is that no one hold should be static. This means that changing the head position from time to time while playing can reduce head/neck tension.

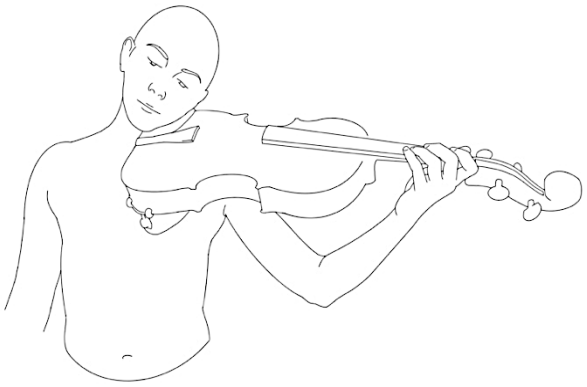


**Figure 98. The top of the head rotating to the left, chin to the right, to access the jaw*

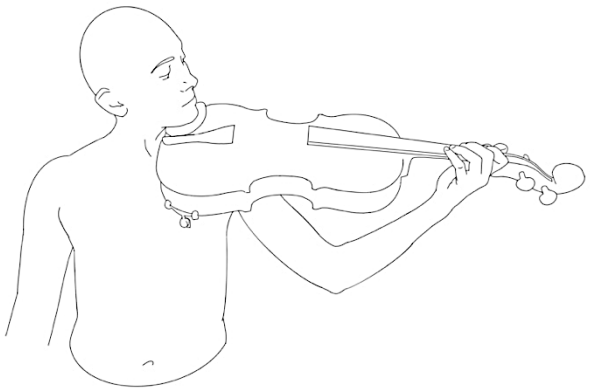


**Figure 97. The top of the head rotating to the right, chin to the left, to access the chin*

Shoulder Placement

As with the anatomically correct positioning of the head without the addition of the instrument, the natural positioning of the shoulders are relaxed and broad (see Figure 99). In this position, the neck is relaxed and long, the head balances easily and the shoulders are parallel to the ground. Shoulder blades rest in a relaxed manner broad on the back. This position also allows for the hips to be balanced between the sternum and the spine. Ideally positioned shoulders enable more relaxed and expressive arm movements (Larsen et al., 2008).

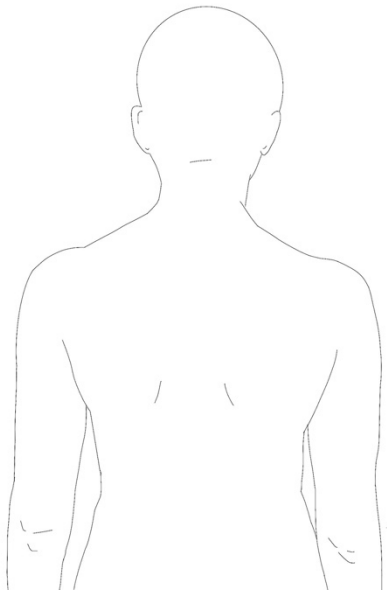


**Figure 99. The natural positioning of the shoulders without the instrument*

With the addition of the instrument, the shoulders still should remain in as symmetrical a position as possible. The asymmetry of the arms can disturb the relaxed neck, which is why it is important to be very mindful of the potential tension that can occur. Even with the asymmetry inherent with violin/viola playing, good technique still will allow the shoulders and shoulder blades to be as relaxed and broad as possible, and for the hips to remain balanced (see Figure 100).

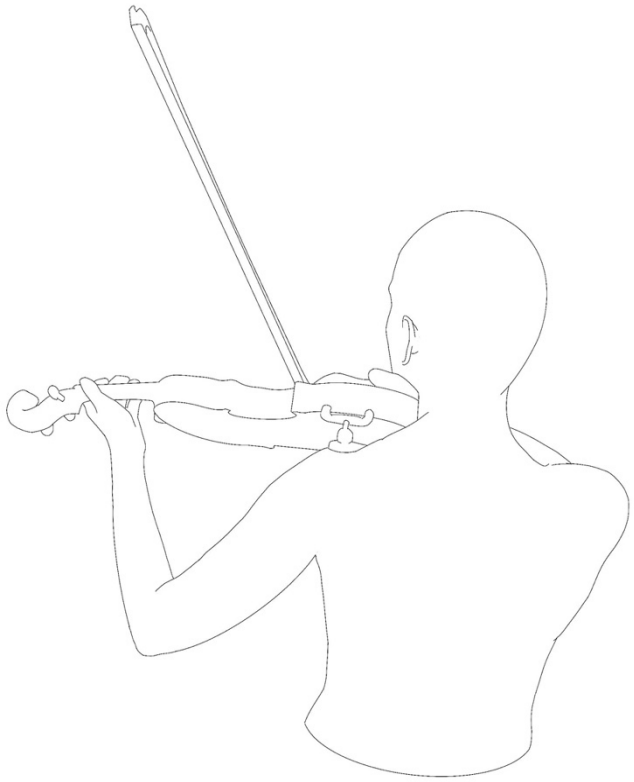


**Figure 100. The correct positioning of the shoulders with the instrument*

Due to the complexity of playing the violin or viola, it is understandable that maintaining a neutral, relaxed neck is difficult. These instrumentalists are vulnerable to unhealthy postures that affect them on and off the instrument. Poor habits include shoulders slouching forward while playing, which forces the muscles between the shoulder blades to become overstretched (see Figure 101). This creates instability between the shoulder blades and the ribs, and between the head and the trunk. The chest collapses, compressing the entire abdomen (Larsen et al., 2008).

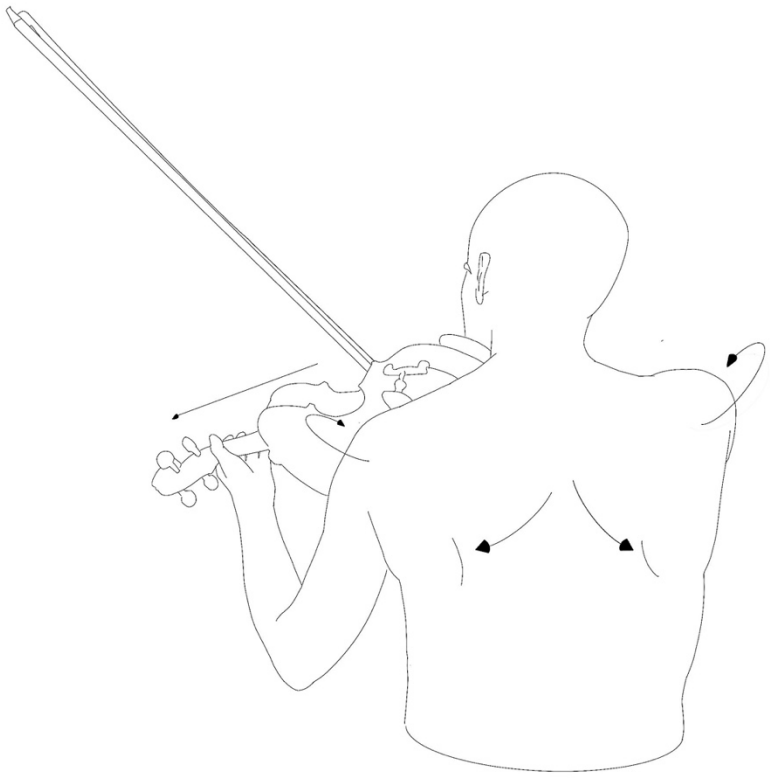


**Figure 101. Shoulders slouching forward while playing*

Another unhealthy playing posture is when both shoulder blades pull together symmetrically towards the spine, hyperextending the neck and the spine. This forces the muscles between the shoulder blades (the rhomboids) to become tense and cramped (Larsen et al., 2008) (see Figure 102). Unfortunately, this posture is often what violinists/violists do to counteract the sloping shoulders. The asymmetric nature behind playing the violin and viola can also cause the relaxed body to maintain asymmetrical sloping shoulders, which contributes to continuous tension.

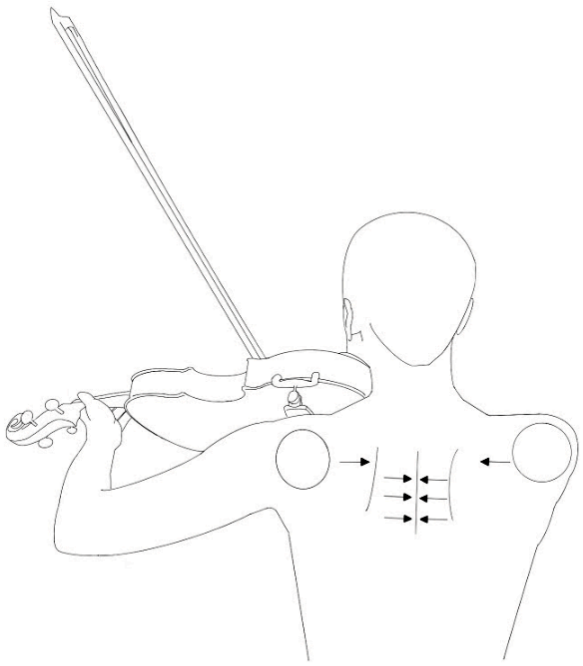


**Figure 102. Shoulder blades pulled together symmetrically towards the spine*

Elbow and Shoulder Placement

Violinists and violists bend/extend both elbows. The right (bow) arm is both more kinetic than the left (violin/viola) arm and also moves in a more ergonomic fashion. The left arm, however, engages in a particularly ergonomically challenging posture. In this section I will focus on the left arm. The anatomically neutral position of the left bent elbow, without holding the instrument, is one in which both shoulders are still broad and relaxed. The upper arm lifts slightly, and the forearm rotates slightly toward opposite shoulder, as in the classic "hand-to-mouth" motion (see Figure 103). In this position, the ball joint of the shoulder, elbow and wrist are optimally loaded (Larsen et al., 2008).

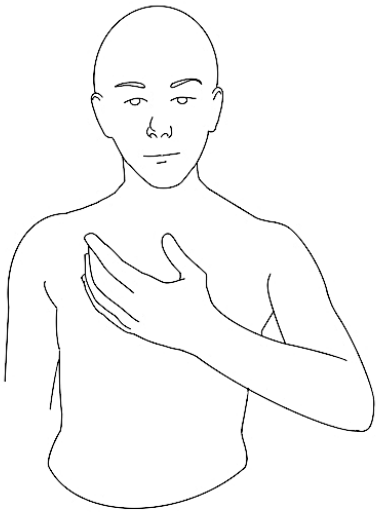


**Figure 103. The anatomically neutral position of the left bent elbow*

With the addition of holding the instrument, unhealthy elbow/arm/shoulder postures of these instrumentalists are unavoidable simply because of the faulty ergonomics of these instruments. When playing the violin or viola, the ball joint of the shoulder, elbow and wrist are not optimally loaded (see Figures 104 and 105). Due to the supination of the left arm (the palm of hand pointing toward the face), the shoulder rotates to the left while the elbow rotates to the right. This arm position puts strain on the rotator cuff muscles of the shoulder.

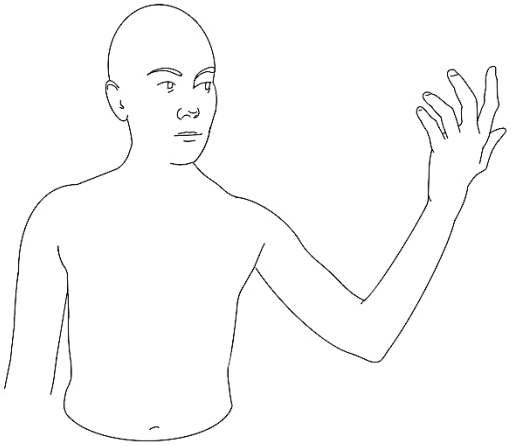


**Figure 104. Correct position of elbow for playing the instrument shown without the instrument*

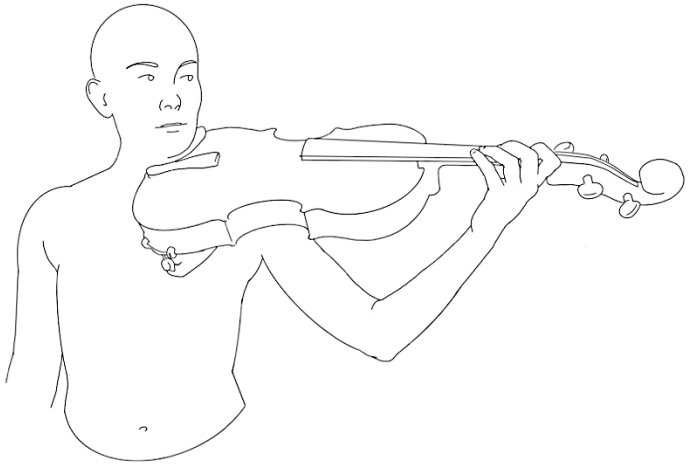


**Figure 105. Correct position of elbow for playing the instrument shown holding the instrument*

On the violin/viola, something as basic as changing string level quickly (see Figures 106 and 107) or shifting into high registers (see Figure 108) is disruptive to the elbow and its surrounding structures. Another unfavorable position that is disruptive to the elbow and its surrounding structures is for the shoulders to sit asymmetrically from one another, either one raising up or rolling forward, and for the scroll of the instrument to point toward the ground (see Figure 109).

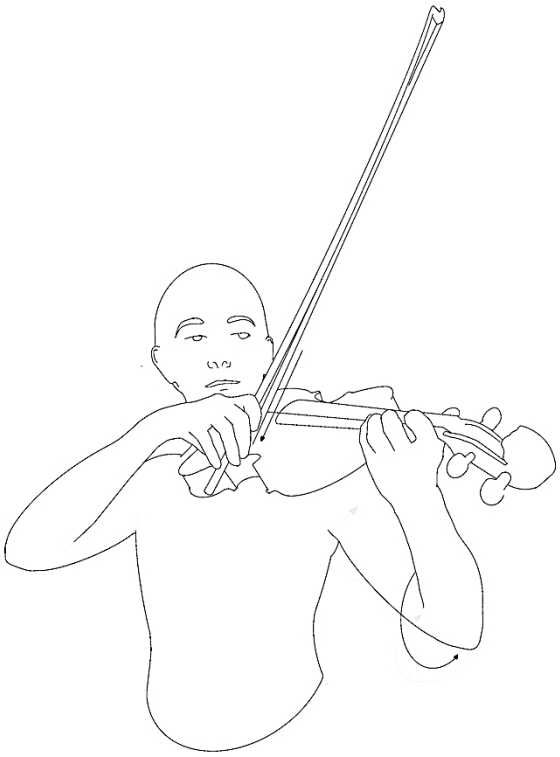


**Figure 106. Playing on a high string*

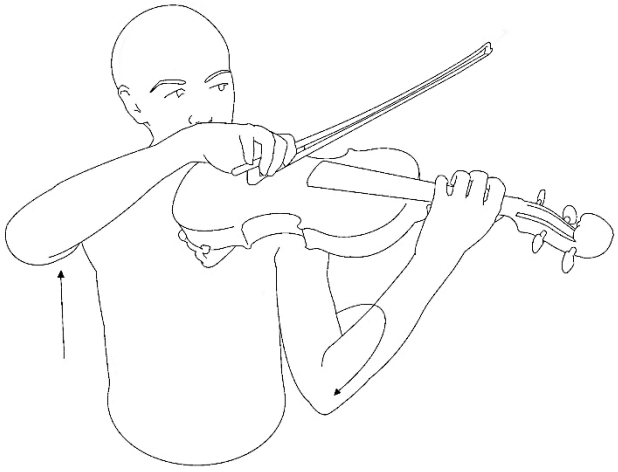


**Figure 107. Playing on a low string*

**Figure 108. Shifting high on the instrument*

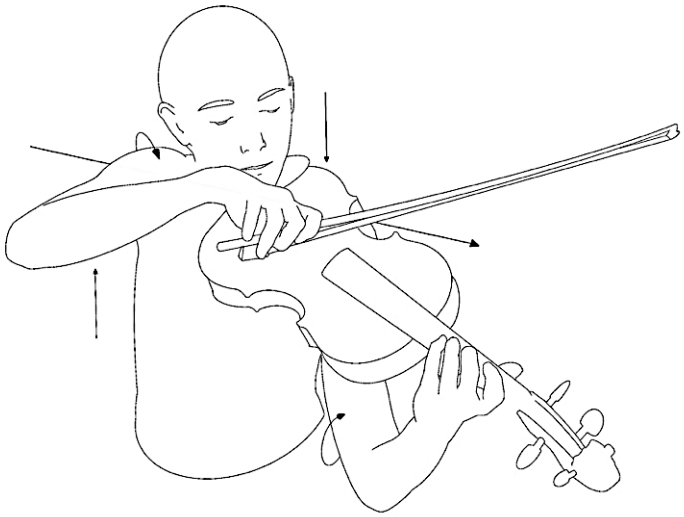


**Figure 109. Tense shoulders asymmetric from one another*

Hip/Pelvic Alignment

Proper anatomical hip and pelvic alignment is when the lumber spine is slightly curved at the lower back (lumber lordosis) (see Figures 110 and 111). The pelvis and hip contours are symmetrical, and there is optimal loading of the upper body onto the lower body. In this position the abdomen is engaged and the lower back is lengthened and relaxed (Larsen et al., 2008).

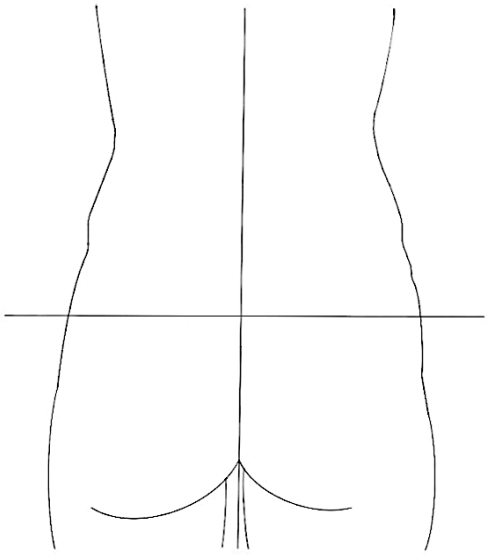


**Figure 110. Anatomical hip and pelvic alignment from the back*

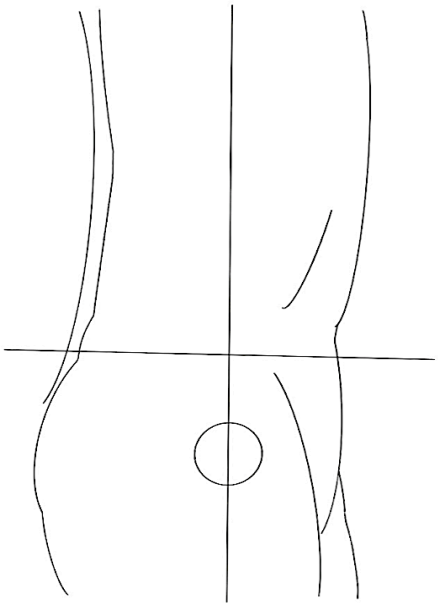


**Figure 111. Anatomical hip and pelvic alignment from the side*

Due to the intensity of playing the violin or viola, tension in the upper body can put stress on lower areas, which can throw the hips off-kilter (see Figures 112 and 113). When an upper-string instrumentalist has uneven hips, this can cause a deviation in the spinal column leading to chronic asymmetric stress on the spine and its surrounding muscles/joints (Larsen et al., 2008).

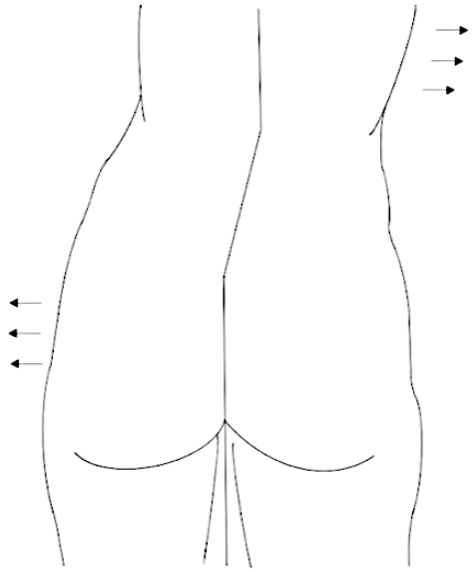


**Figure 112. Hips shifting in opposite direction from ribs*

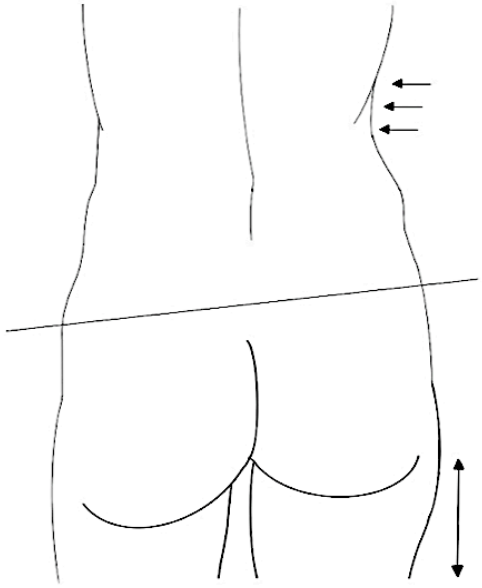


**Figure 113. One hip higher than the other*

Knee Alignment

Healthy knees are crucial for tension-free playing. Micro-athletes are not as kinetic as macro-athletes but certainly are not static. Unlocked knees maintain a slight bend to provide the necessary "shock absorption" for unrestricted, tension-free movement (see Figure 114). In this posture feet can be properly loaded. Knees that are hyperextended, or "locked" (see Figure 115) allow weight to be unevenly distributed through the feet. This ergonomically incorrect posture increases the load on the knees and surrounding structures such as the hips (Larsen et al., 2008).

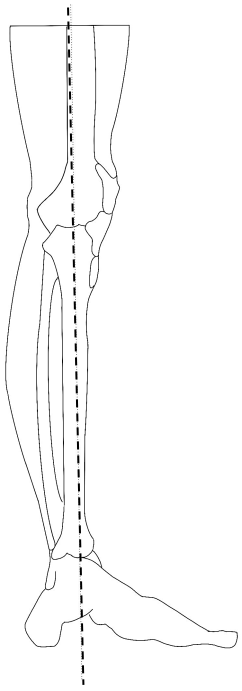


**Figure 114. Unlocked knees*

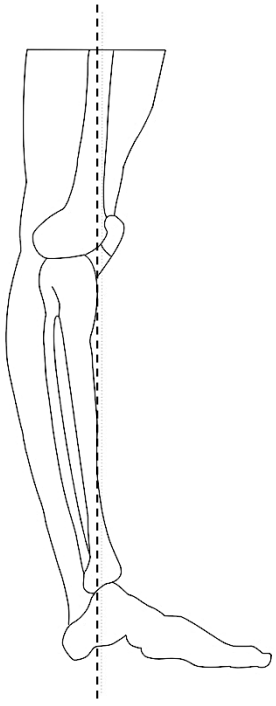


**Figure 115. Locked knees*

How Violin/Viola Muscles Learn

Veteran Suzuki violin teacher Susan Kempter views the introduction to the violin-playing- process as establishing the elements that contribute to a coordinated body, and that a coordinated body is foundational for developing musical skill and technique (Kempter, 2003). Emphasizing the physical set-up of the student should dominate early lessons. Without the correct foundation, bad habits are sure to set in. Kempter illustrates six key physical aspects to starting the violin playing process: "1) Placement of the feet with heels directly under the thigh sockets. 2) The trunk of the body is upright and pelvis is centered over the legs, shoulders are down in their normal, relaxed position, the back is elongated and the belly button is centered between the pelvic bones. 3) The neck is free of tension. 4) The right hand is holding the bow in "the best" bow hold the student can make. 5) The left hand is at the correct height and is soft, with curved, separate fingers which fold easily over the fingerboard. 6) The student is quiet and ready to receive instruction." (Kempter, 2003, p. 8).

Kempter suggests that the first year or two should be devoted to these six elements in order to reduce the chances of bad playing habits setting in. Even then, it takes many more years to develop fluid motions, light touch and natural balance. Teaching violin/viola students about the body can be a challenge for those teachers who feel that enforcing accuracy in intonation and rhythm are the immediate goals of instruction. In addition, teaching violin/viola students about the body can be especially challenging for teachers, who themselves, do not know about the body. This is why teacher preparation courses should include physiology, kinesthetic and movement analysis as part of teaching music performance (Kempter, 2003).

Examining Injury Prevention

Injury prevention for musicians has received more attention in the last three decades than ever before. However, only a limited number of studies exist that have examined how musicians can prevent playing-related injuries.

Zaza and Farewell (1997) found that warming up before practicing was preventative of a recurrent PRMD. Ackermann and Driscoll (2013) found that parents of students at a musically selective school believed that pain while playing an instrument was normal, while conversely, parents of music students at an academically selective school believed pain to be abnormal. The parents in the latter category appeared to recognize the importance of their children having good knowledge of health and normal body function in order to optimize musical performance, and to minimize the adverse impact of the playing on their children health.

Ackermann et al. (2002) and Chan et al. (2014) examined the implementation of a strength and endurance regimen for upper-string instrumentalists. Ackermann et al. (2002) concluded that implementation of a strength and endurance regimen increased both strength and endurance in a group of undergraduate music majors. The improvements in the endurance group were significantly greater than those in the strength group for the lateral raise and back extension exercises. There was also a decrease in frequency and intensity of PRMDs. Chan et al. (2014) found that a purposely designed exercise program boosted “ratings of perceived exertion” (RPE)—a measure of monitoring intensity of playing—while strengthening performance-related factors such as the muscles that support playing, and techniques that aid in healthy playing posture. A tailored exercise program was effective at managing PRMDs and reducing severity of PRMDs. Similar to these studies, Boyle et al. (2004) found that a single session of yoga

attenuated peak muscle soreness in women following a session of eccentric exercise. This has implications for string players as they engage in actions that are also eccentric in nature.

The following three studies are not about music but I feel carry important implications for maintaining health as a musicians. Comyns et al. (2006) found that inserting periods of rest is crucial between bouts of physical exertion. Nawawi (2014) concluded that mixed-impact aerobic exercise can lower body fat percentage and increase overall health. Boudenot et al. (2015) examined interval training versus continuous training and found that more moderate interval training was able to produce faster bone adaptations than moderate continuous training.

Yogic Postures and Strengthening Exercises that Help Fortify the Cognitive and Physical areas that Upper-String Instrumentalists Use and Abuse

Engaging in mindfulness and yogic postures (discussed in Chapter 3) can help relieve music performance anxiety and increase overall wellbeing in musicians. Based on the information regarding the body found in Chapter 4, Chapter 5 illustrates the many physical benefits that yogic postures have on improving musculoskeletal health, and aiding in the prevention of future injuries (Ryba, 2006). Celebrated violinist Yehudi Menuhin was the first well-known violinist who was an outspoken proponent of yoga. He explains, “In my life Yoga is an aid to well-being, permitting me to do more and to do better. First and foremost, of course, Yoga made its contribution to my quest to understand consciously the mechanics of violin playing” (Menuhin, 1977, p. 248-51).

Through my own dedicated yoga practice, certification as a yoga instructor, and subsequent research about uncovering the upper-string instrumentalist as a micro-athlete, it is

clear that gentle mindfulness activities, as well as a strengthening and stretching regimen integrated into (and out of) the practice room, can benefit music-making and overall wellbeing.

A basic knowledge and functional understanding of anatomical structures allows a musician to move both in and out of music with intention. Dynamic and active yogic postures increase blood flow through the body, which heats and loosens connective tissue. Heat enhances the tissue's ability to soften and relax. For this reason it is important to stretch after muscles have been warmed up. Integrating yogic postures into a music practice can help build awareness about the body. Yogic postures can improve both posture and structural alignment by balancing the muscular and soft-tissue tension pulling on opposite sides of a joint. Engaging in these postures helps fortify bodily symmetry as well as build multi-joint coordination. Yogic postures involve a combination of isometric and eccentric/concentric contractions (recall these contractions discussed in Chapter 4).

There are six yogic principles congruent to playing the violin and viola: (1) understanding neutral anatomical position (recall the anatomical body from earlier in Chapter 5), (2) establishing a firm base, (3) stacking joints—where joints and surrounding supportive structures are placed under heavier loads—for maximum support, (4) creating core stability, (5) relaxing shoulders back and down the spine, and (6) aligning the spine (Corepower Teacher Training Manuel, 2016).

The following yogic postures and micro-strengthening exercises help alleviate tension and strengthen the areas of the body that upper-string instrumentalists use and abuse. Note: These postures and exercises are not meant to be overwhelming. For questions or concerns about these postures and exercises please consult a medical professional, certified yoga teacher or personal trainer.

“Child’s Pose”

This active-rest posture lengthens the muscles along the backline by reaching arms forward and stretching hips toward the heels. This pose relieves tension in the lumbar spine while simultaneously stretches the outer muscles of the hips. The act of pressing the forehead on the ground helps massage the muscles above the eyebrows. This posture is beneficial at the beginning of a practice session, while taking a break during the music workout, or engaging in after finishing a practice segment (see Figure 116).

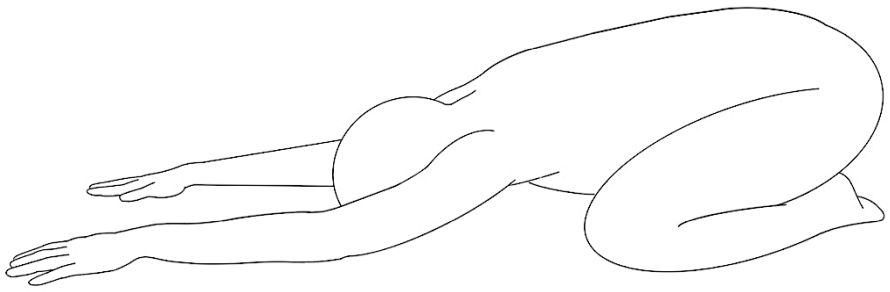


**Figure 116. Child’s pose*

“Cat/Cow Pose”

These active-rest postures warm up the spine by moving the spine in opposing movements. In cow pose, the navel sinks down, while the tailbone and chin lift up (see Figure 117). In the counter cat pose, the navel draws in toward the spine and back rounds (see Figure 118). These postures can be implemented at any point during a practice session to stretch the muscles in the front and back of the abdomen.

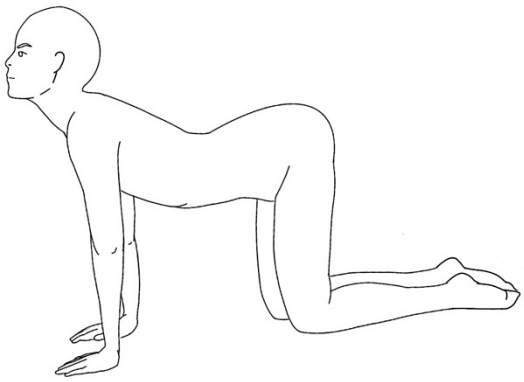


**Figure 117. Cow pose*

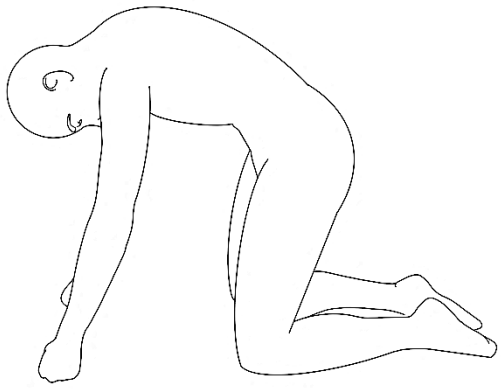


**Figure 118. Cat pose*

“Revolved Table-Top” to “Thread The Needle Pose”

These active-rest postures benefit the muscles of the arms, shoulders, upper back and torso. In revolved table-top pose, the torso, while keeping hips level to the floor and one hand planted, twists in the direction of the free arm, which bends at the elbow and reaches up. This movement provides a generous stretch to the back line and chest (see Figure 119). For thread the needle pose, the torso then twists in the direction of the planted hand and the free arm sweeps under the body and reaches through the bent arm (see Figure 120). This movement stretches the muscles of the hips and the shoulder of the once lifted arm. Both of these postures target the areas in which violinists/violists hold a lot of tension—namely, in the shoulders and the hips—and can be implemented into the practice session at any point.

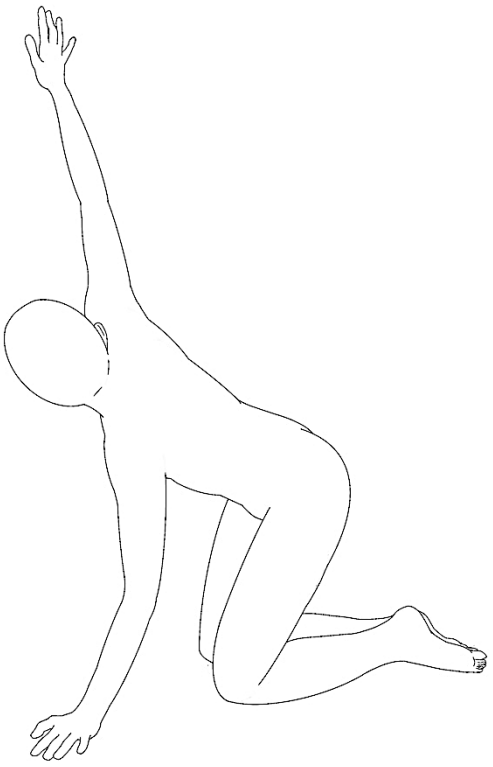


**Figure 119. Revolved table-top pose*

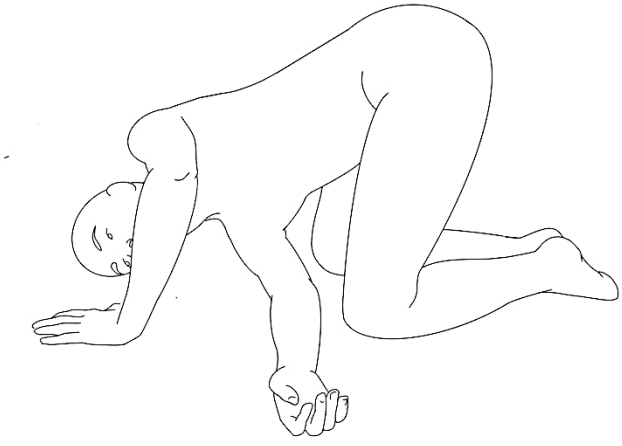


**Figure 120. Thread the needle pose*

“Downward Facing Dog Pose”

This strength/relaxation posture strengthens the muscles of the legs, core, shoulders and arms by placing hands shoulder-width distance apart, sending hips up and back and, and stepping feet hip-width distance apart. Small muscles can relax as large muscles activate to help build stability. This posture can be added to a music workout at any point for a micro-boost of arm/ core/leg strengthening work (see Figure 121).

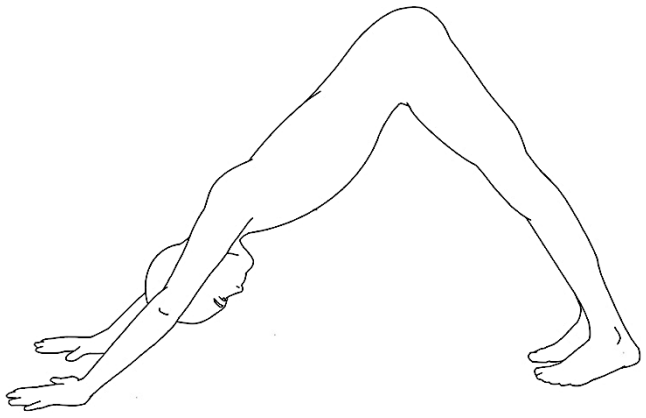


**Figure 121. Downward facing dog pose*

“Ragdoll Pose”

This active-rest posture lengthens the muscles along the backline of the body by stepping feet directly below shoulders hip-width distance apart, and can relieve tension in the lumbar, thoracic and cervical spine. The weight of the head pulls the cervical spine in the opposite direction from the lumbar spine, allowing for a full body stretch. Violinists/violists hold tension in the spine and can benefit from the stretch that this activity produces along the spine. The hanging weight of the head also produces a helpful counter stretch from the base of the neck to the top of head. This posture can be added in at any point during a practice session (see Figure 122).

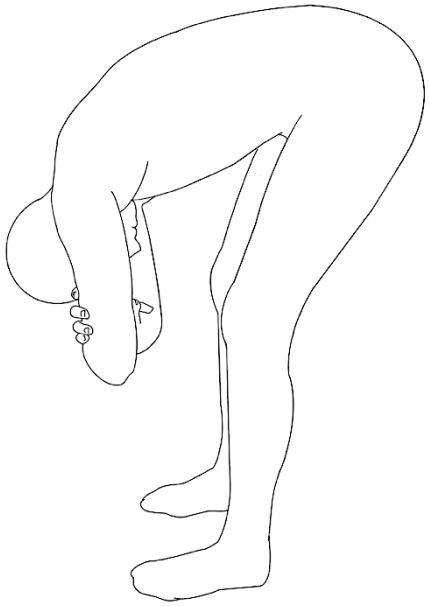


**Figure 122. Ragdoll pose*

“Revolved Forward Fold with Lifted Arm”

Similar to “revolved table-top pose,” this active-rest posture stretches and lengthens the muscles of the arms, shoulders, upper back, and torso by planting one hand on the floor, and turning the chest in the opposite direction and reaching up the free arm. This posture, however, is done from a standing position, with the knee of the planted hand bent slightly while the chest turns upward in the opposite direction and the free arm reaches upward. This posture can be implemented at any point during a music workout (see Figure 123).

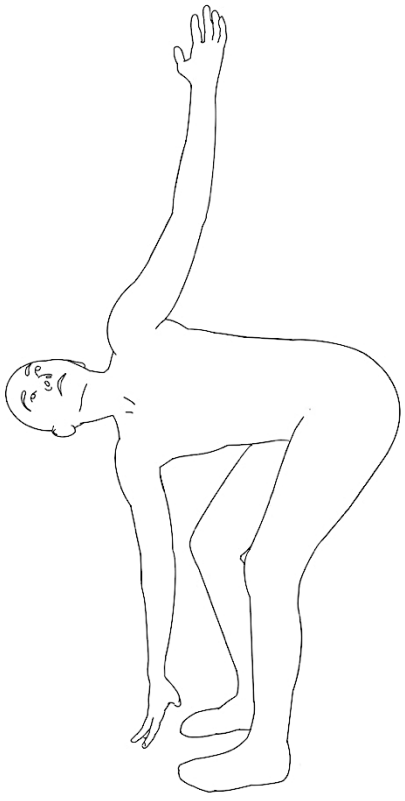


**Figure 123. Revolved forward fold with lifted arm*

“Stand at Attention Pose”

This seemingly simple posture strengthens the muscles of the legs and torso using the larger muscle groups of the body by pressing down the four corners of the feet and lifting up inner arches while simultaneously drawing down the tailbone—slight tuck of the pelvis toward the front—to relieve tension in the lumbar spine. By drawing shoulder blades together and down the back while lengthening the back of the neck with a slight tuck at the chin, this posture can relieve full body tension. The body of the violinist/violist endures a high degree of asymmetry due to playing the violin/viola, which can be quite detrimental. This posture encourages the standing body to take an inventory of any brewing asymmetry by emphasizing the body’s intended symmetry and can be added in at any point during a music work out (see Figure 124).

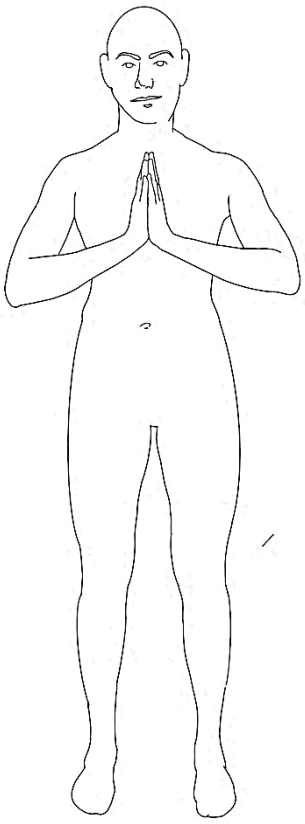


**Figure 124. Stand at attention pose*

“Mountain Pose”

Similar to “standing at attention pose,” this active rest posture both strengthens the muscles of the front legs and torso and allows the body to assess anatomical symmetry. By reaching arms up and rotating palms inward, this posture also strengthens the muscles of the shoulders and arms. This posture can be placed at any point during a practice session (see Figure 125).

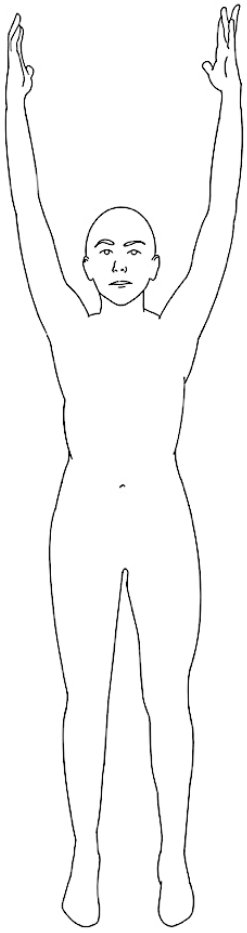


**Figure 125. Mountain pose*

“Standing Forward Fold Pose”

This relaxation posture is similar to “ragdoll pose” but differs in that the hands reach to the ground as opposed to arms interlocked. This position is a slightly more intense spine stretch because it requires a deeper bend at the hips as the arms reach toward the floor. The backline of a violinist/violist can hold a lot of tension from the eccentric, concentric, and isometric motions of the right and left arms. This posture specifically targets the entire back line from the tailbone through the shoulders and can be implemented during the practice session at any point (see Figure 126).

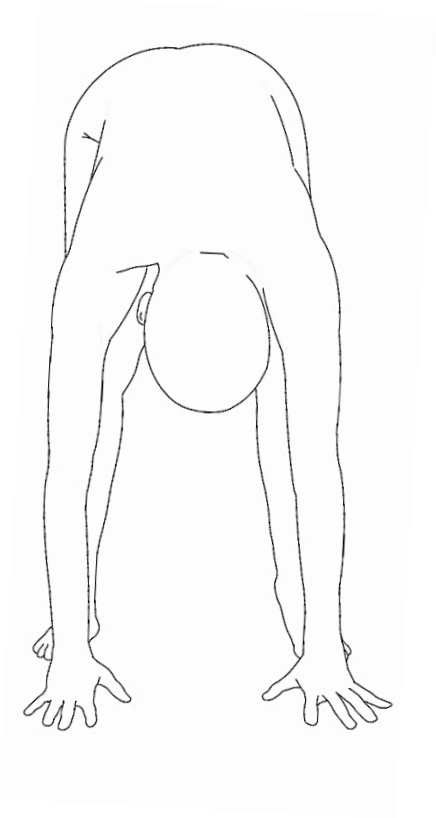


**Figure 126. Standing forward fold pose*

“Halfway Lift Pose”

This active-rest posture is an active forward fold by lifting the back to be parallel with the floor and pressing hands against shins. By slightly tucking the chin, this posture lengthens and strengthens muscles along the spine as well as the abdominal wall. This posture can be done at any point during a practice session for light stretching and strengthening (see Figure 127).

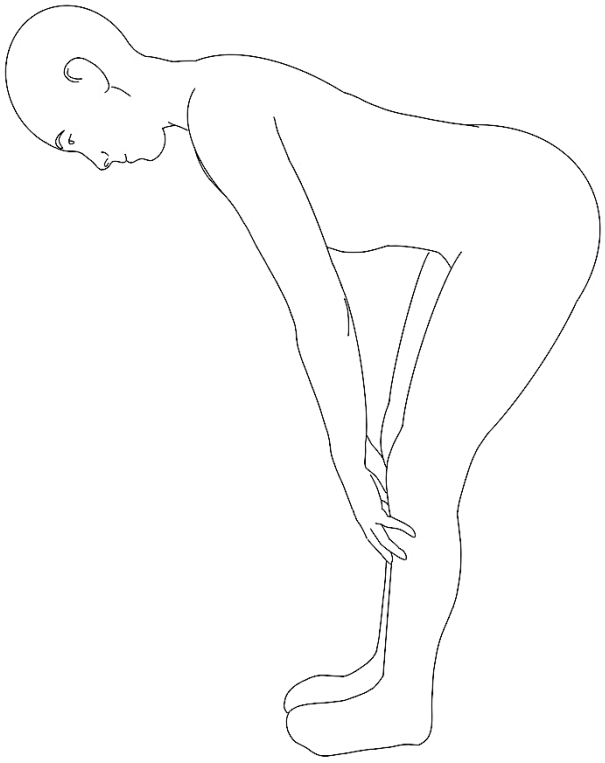


**Figure 127. Halfway lift pose*

“High Plank/Forearm Plank Pose”

From hands or forearms, plank pose is an active isometric posture that strengthens the muscles of the legs, torso, shoulders, and arms. This posture requires full-body muscle contraction by placing hands or forearms shoulder-width distance apart, stacking shoulders over wrists/elbows and stepping feet back hip-width distance while keeping torso parallel to the floor. This posture can be inserted into a music workout after the body has already started to warm up—either through stretching or warming up on the instrument (see Figures 128 and 129).

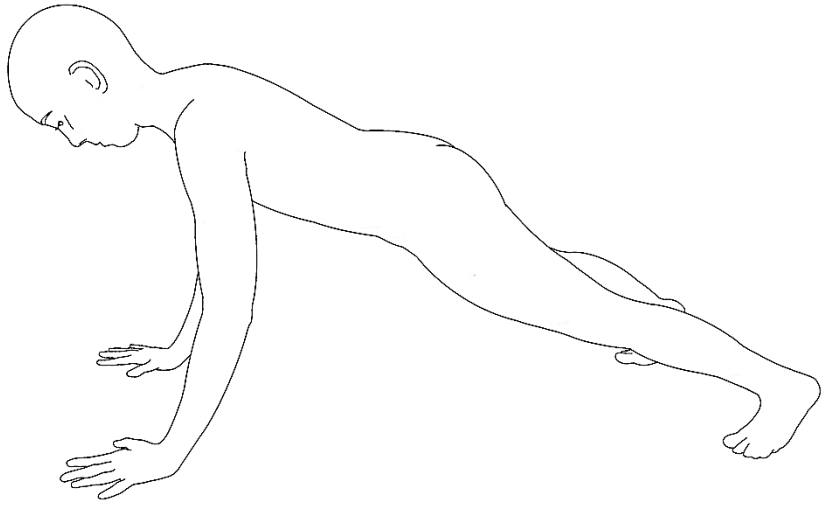


**Figure 128. High plank pose*

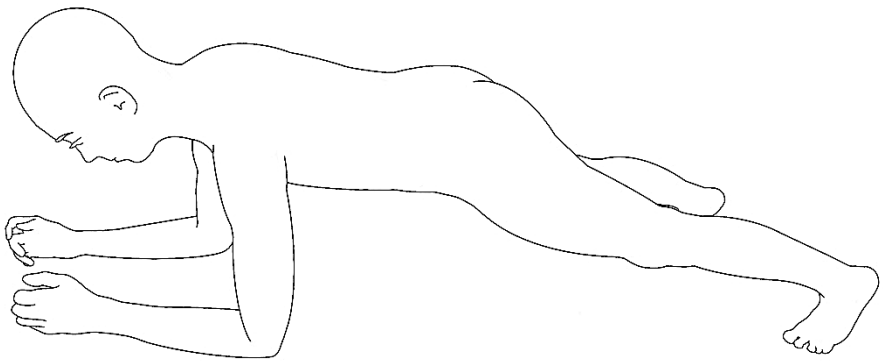


**Figure 129. Forearm plank pose*

“Chair Pose”

This active-strengthening posture activates and strengthens the muscles of the legs and torso by creating intensity using the larger muscles to bend the knees and sink tailbone back and down. This posture also strengthens the arm and shoulder muscles by holding them by the ears. This posture is a beneficial strengthening posture targeting the muscles that support the body of a violinist/violist and can be implemented at any point before, during or after a practice session (see Figure 130).

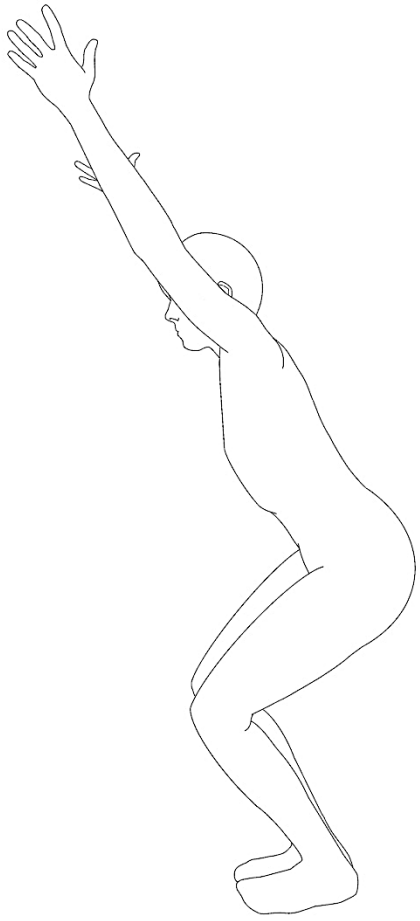


**Figure 130. Chair pose*

“Crescent Moon Pose”

This active-rest posture stretches the entire spine, hip flexors and muscles of the legs by bending the front knee, extending the torso up through reaching arms, and extending the back leg long along the floor. This posture is beneficial at any point during a music workout (see Figure 131).

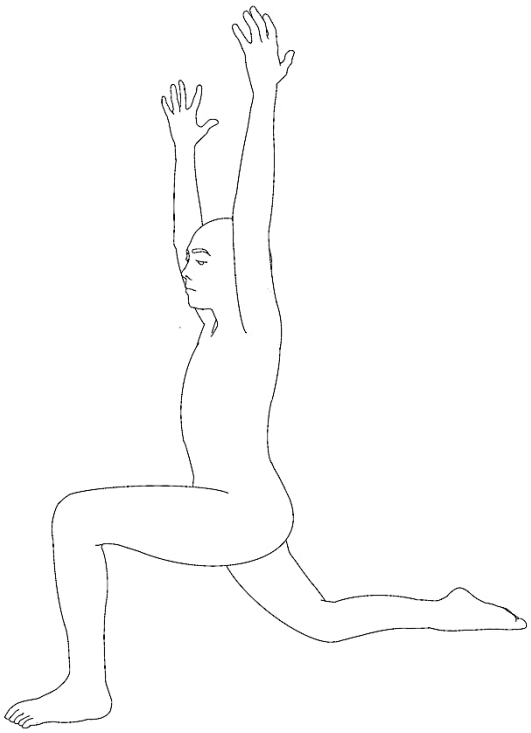


**Figure 131. Crescent moon pose*

“Crescent Lunge Pose”

This active-strengthening posture is similar to “crescent moon pose,” except it is more active because it is taken from the feet. This posture strengthens the muscles of the torso, legs, and arms. It can be inserted into a practice session after the body is warmed up—either through previously discussed stretches and postures or by warming up on the instrument (see Figure 132).

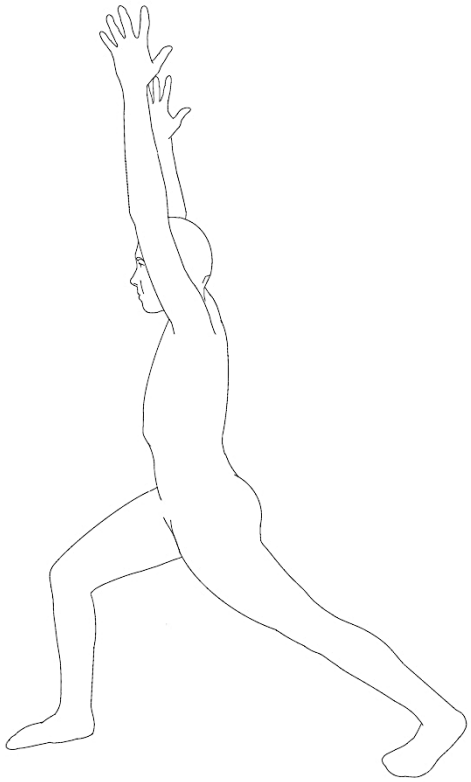


**Figure 132. Crescent lunge pose*

“Warrior Two Pose”

This active-strengthening posture trains the muscles of the legs, torso, shoulder and arms. It strengthens the body by engaging in a number of ways. By facing the side and staying erect while leaning into the front bent knee and maintaining balance and strength through the straight back leg, a person using this posture creates immediate intensity in different sides of the body. “Standing at Attention Pose” and “Mountain Pose” allow for analysis of the body’s symmetry. On the other hand, “warrior Two Pose” allows for analysis of both symmetry and asymmetry. This type of mindful asymmetry can in fact strengthen symmetry by magnifying certain asymmetrical elements (i.e. the turned head, bent front knee, and asymmetric feet) while also focusing on symmetrical alignment of other certain elements (i.e. the hips and shoulders). This posture can be implemented after the body is warmed up—either through stretching or warming up on the instrument (see Figure 133).

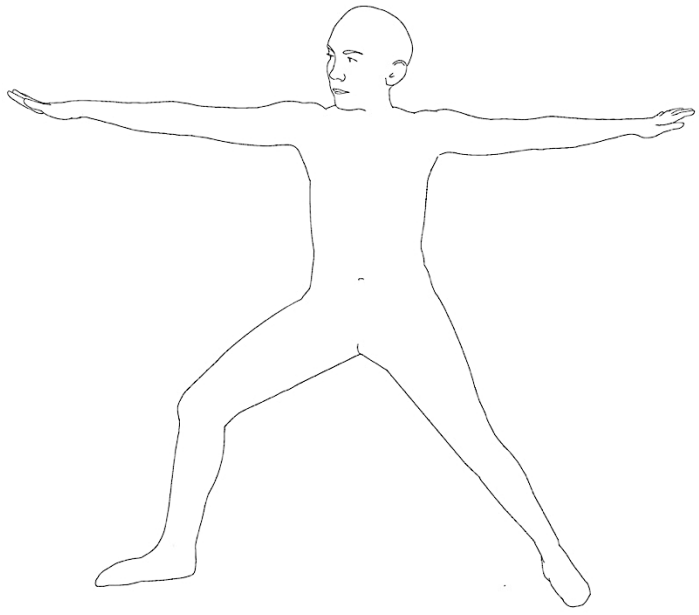


**Figure 133. Warrior two pose*

“Extended Side-Angle Pose”

This active-strengthening posture emphasizes the muscles of the legs and torso similar to the “warrior two pose.” The difference: This posture focuses more on side body strength by leaning the front side body closer to the front bent knee, stacking both shoulders above front knee and engaging arms vertically. This posture creates a stretch along the side body closer to the back leg. Similar to “warrior two pose” is the asymmetrical/symmetrical positioning of the body, which also creates immediately intensity in different sides of the body. This posture can be implemented at any point during a practice session after the body is warmed up and is most typically placed after the warrior two pose (see Figure 134).

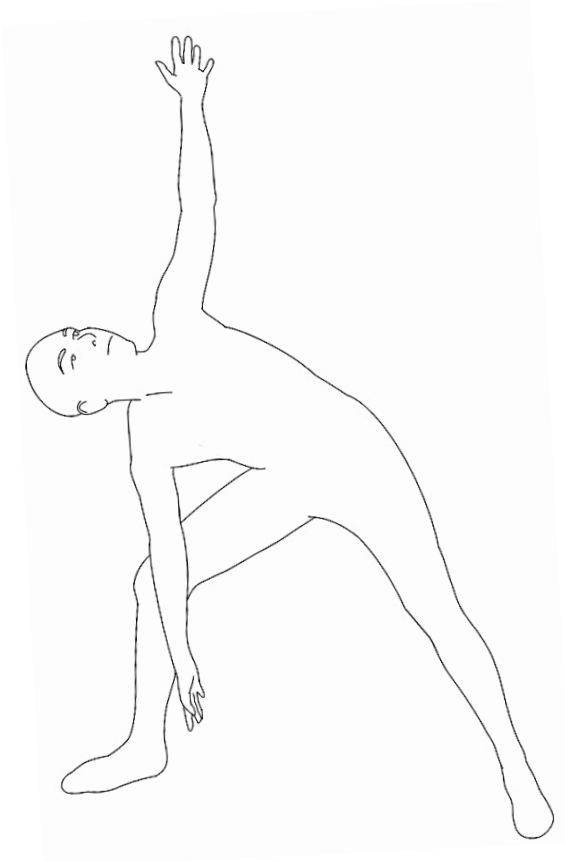


**Figure 134. Extended side angle pose*

“Reverse Warrior Pose”

This active-strengthening posture, similar to the “extended side-angle pose,” maintains a front bent knee and a straight back leg. Here, the torso leans up and back, with front arm reaching up and over. This posture stretches the side body closer to the front leg. Similar to the “warrior two pose,” and the “extended side-angle pose,” this posture examines both asymmetry and symmetry. This posture can be added at any point during the music workout but is most typically used after “warrior two pose” and “extended side-angle pose” (see Figure 135).

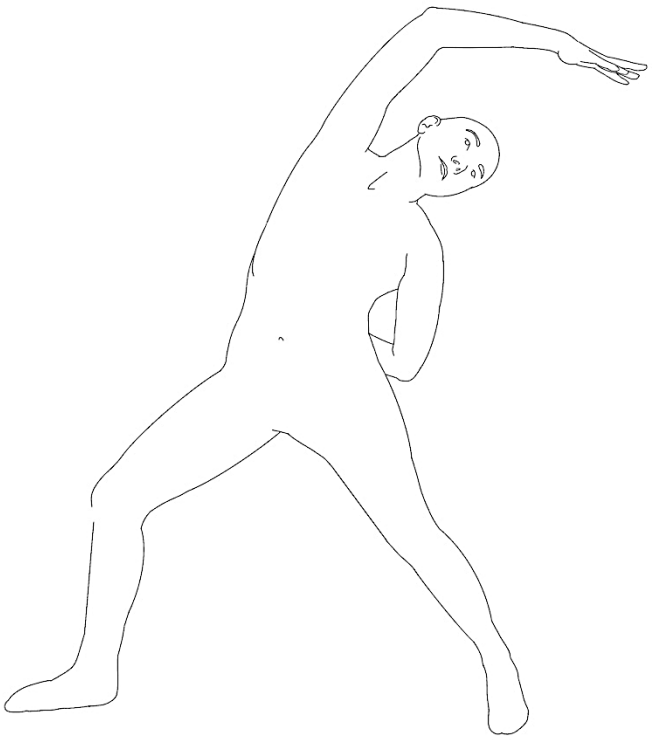


**Figure 135. Reverse warrior pose*

“Star Pose”

This active-strengthening posture utilizes every muscle in the body. It strengthens the legs, abdomen and backline while also improves circulation and respiration. This posture is also known as a “power pose,” which means it also can increase self-confidence and decrease the body’s levels of cortisol (the stress hormone). This posture can be implemented at any time during a practice session (see Figure 136).

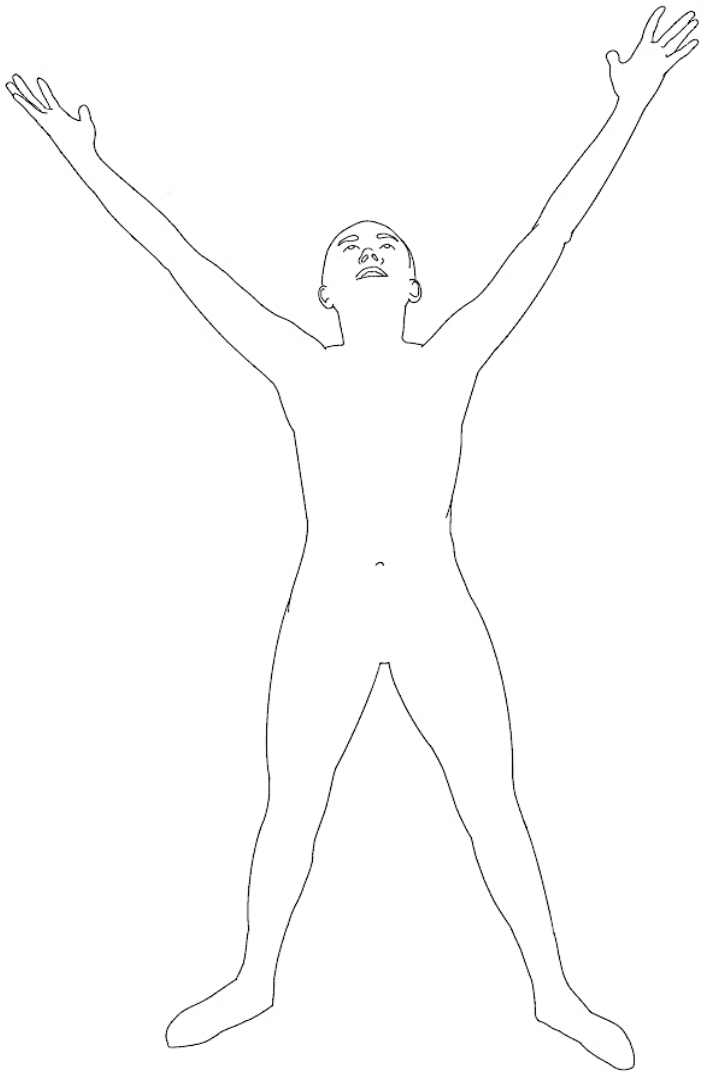


**Figure 136. Star pose*

“Wide-Legged Forward Fold Pose”

This active-strengthening posture lengthens the muscles on the back and front lines of the body and can release tension in the lumber spine and lower back. This posture can be implemented after the body is warmed up, either through stretching or warming up on the instrument (see Figure 137).

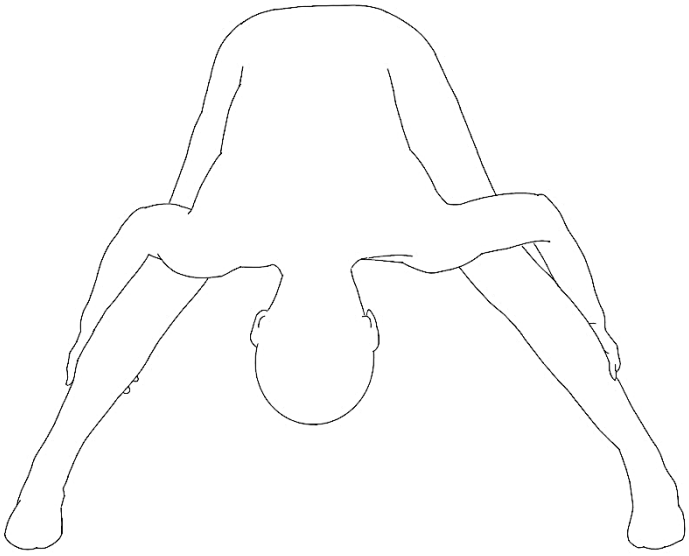


**Figure 137. Wide-legged forward fold pose*

“Horse Pose”

This isometric or dynamic posture helps strengthen the muscles in the legs and glutes. This pose also opens up the inner thighs and improves posture by keeping the spine long. This posture can be implemented at any point during a practice session (see Figure 138).

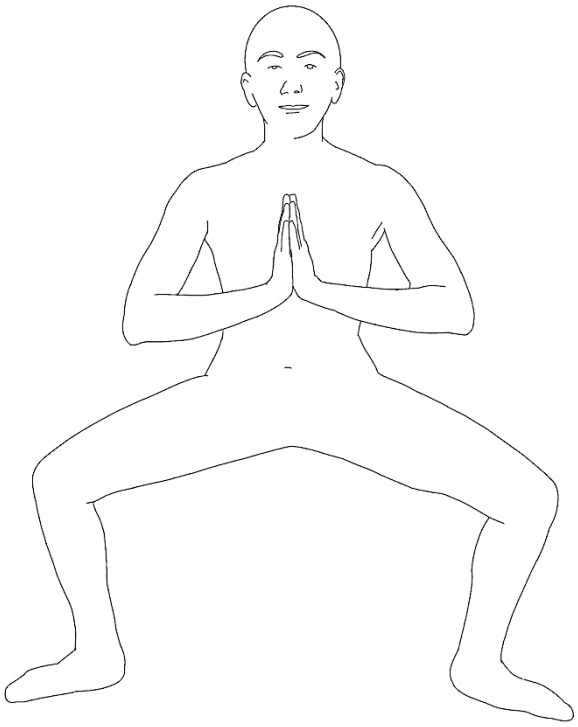


**Figure 138. Horse pose*

“Boat Pose”

This isometric strengthening posture strengthens and stabilizes the abdominal wall and hip flexors by balancing weight on the sits bones and creating a V shape with legs extended long and arms reaching forward. This posture can be inserted into a practice session at any point for a quick boost of strengthening power (see Figure 139).

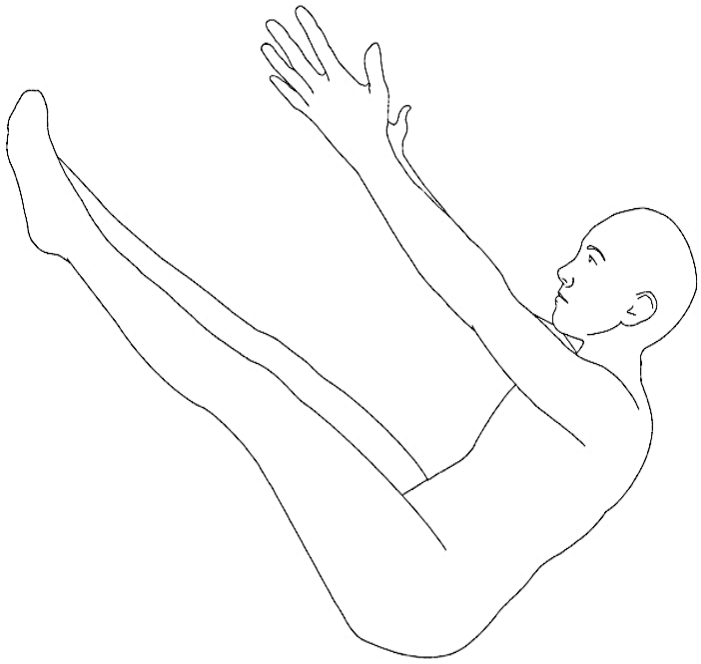


**Figure 139. Boat pose*

“Cobra Pose”

This isometric-strengthening posture firms the muscles of the backside of the body by contracting the back muscles toward the back, and lengthens the muscles of the frontside, by lying on the stomach, inner thighs squeezed together, chest lifted slightly off of the floor, with hands lightly pressed. Other benefits of this posture are that it decreases stiffness in the lower back and increases flexibility. This posture can be implemented at any point during a practice session (see Figure 140).

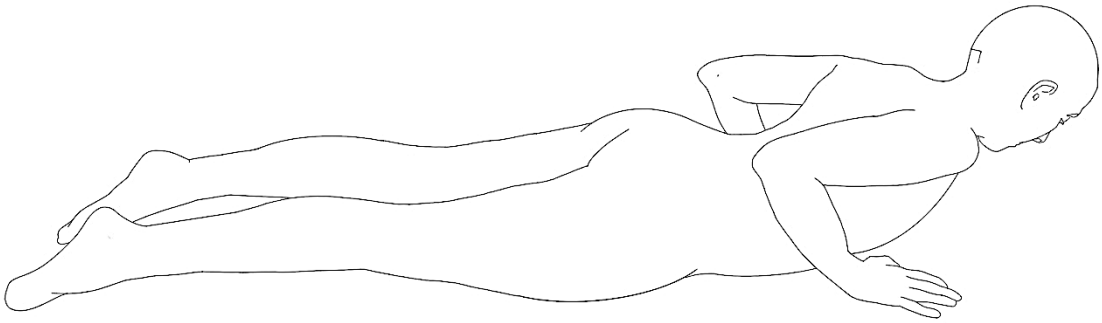


**Figure 140. Cobra pose*

“Bridge Pose”

This active-rest posture strengthens the muscles on the front and backside of the body and the leg muscles. The position also lengthens and opens the muscles of the chest and abdomen. This posture can be implemented at any point during a practice session. To engage in bridge pose with an added core challenge, one can try bridge pose with one lifted leg at a time (see Figures 141 and 142).

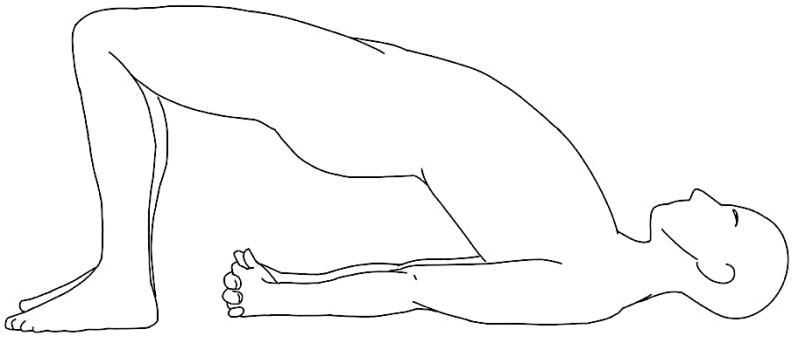


**Figure 141. Bridge pose*

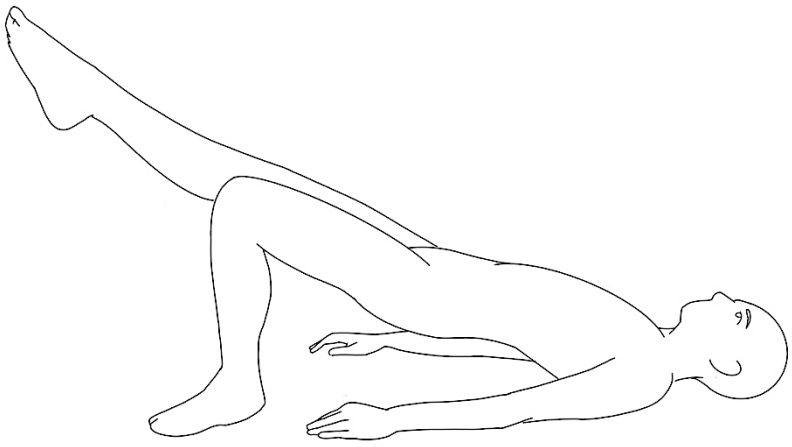


**Figure 142. Bridge pose with lifted leg*

“Reclined bound Angle Pose or Butterfly Pose”

This posture can either be taken sitting up (butterfly pose) or lying down (reclined bound angle pose). The benefits of these postures are the same: It stretches the hip flexors. This posture can be implemented at any point during a practice session (see Figures 143 and 144).

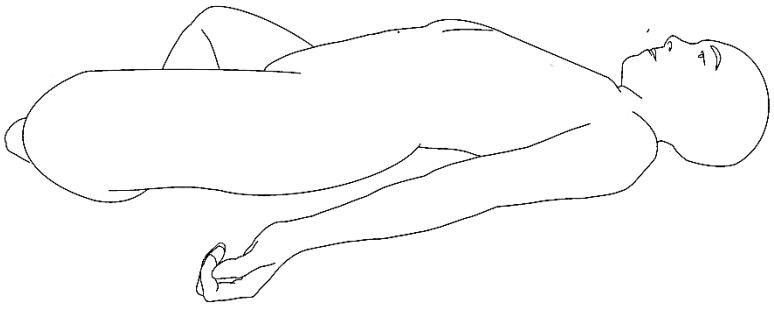


**Figure 143. Reclined bound angle pose*

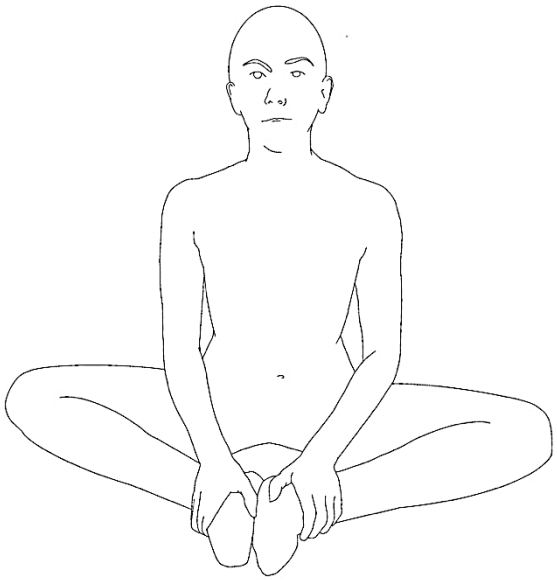


**Figure 144. Butterfly pose*

“Seated Forward Fold Pose”

This restorative posture lengthens the muscles along the backside of the body by keeping the back straight, which can relieve tension in the lumber spine and lower back. This posture is beneficial at any point during a practice session (see Figure 145).

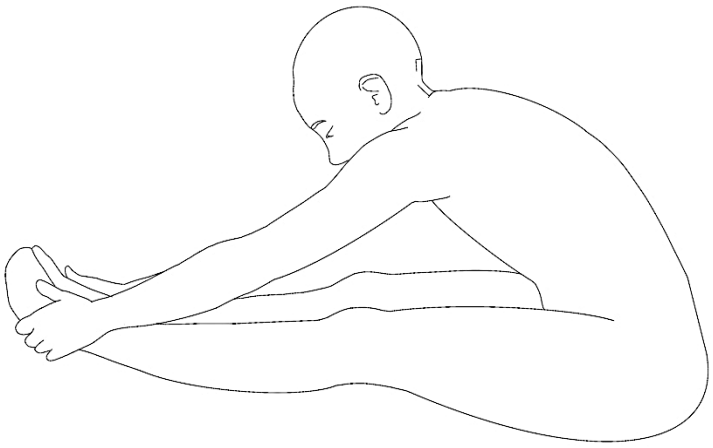


**Figure 145. Seated forward fold pose*

“Happy Baby Pose”

This restorative posture stretches the outer muscles of the hips and glutes by lying on the back, bringing knees toward the chest, and taking hold of feet. Gently rocking from side to side can relieve tension in the spine as well (see Figure 146). This posture is beneficial at any point during a practice session.

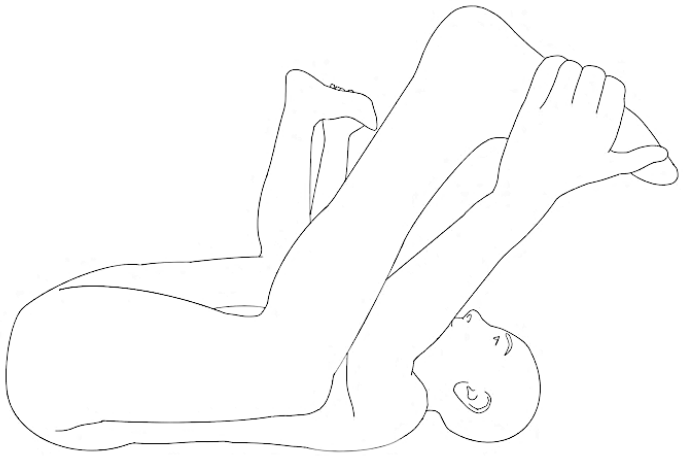


**Figure 146. Happy baby pose*

“Supine Twist Pose”

This restorative posture promotes the mobility of the lumber spine and lower back. It also stretches the back muscle and glutes while lengthens, relaxes, and realigns the spine (see Figure 147). The twist in this posture also stretches the body’s “iliotibial” band which runs along the outside of the legs and hips. This posture is beneficial at any point during a practice session.

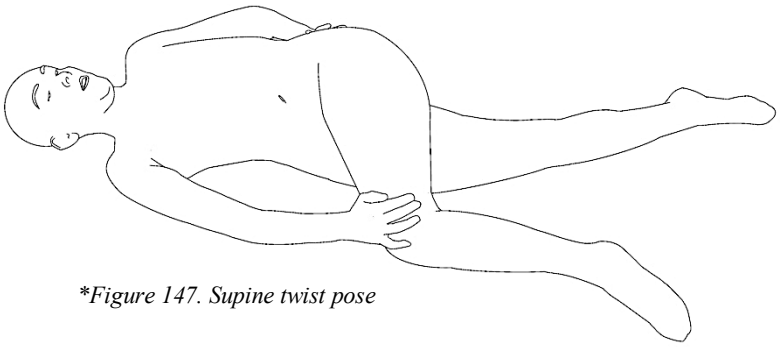


**Figure 147. Supine twist pose*

“Corpse Pose”

This restorative posture deepens awareness of breath and allows every muscle in the body to become quiet (see Figure 148). While this posture relaxes the body, it also calms the mind. This posture is beneficial at any point during a practice session.

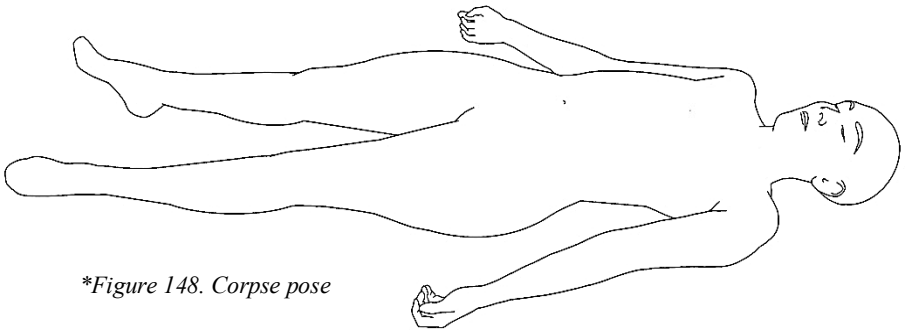


**Figure 148. Corpse pose*

Squats Hip-Width Distance Apart

In addition to yogic postures, more traditional strengthening exercises are complementary to building overall body strength, and are beneficial to building and maintaining strength for violin/viola playing. While keeping the chest open to the front, abdominal muscles are engaged and weight is shifted back toward heels and while sinking into a sitting position. The hips are lowered until thighs are parallel or almost parallel to the floor. This exercise should be felt in the thighs and glutes. Inhale takes place with the bending of the knees, and exhale happens when coming back up (see Figure 149). This exercise strengthens the core and reduces risk of injury by strengthening the muscles that aid in balance, mobility and posture. In addition to strengthening the muscles of the lower body, squats also strengthen the tendons, ligaments and bones. This exercise can be implemented at any point during a practice session after the muscles are warmed up.

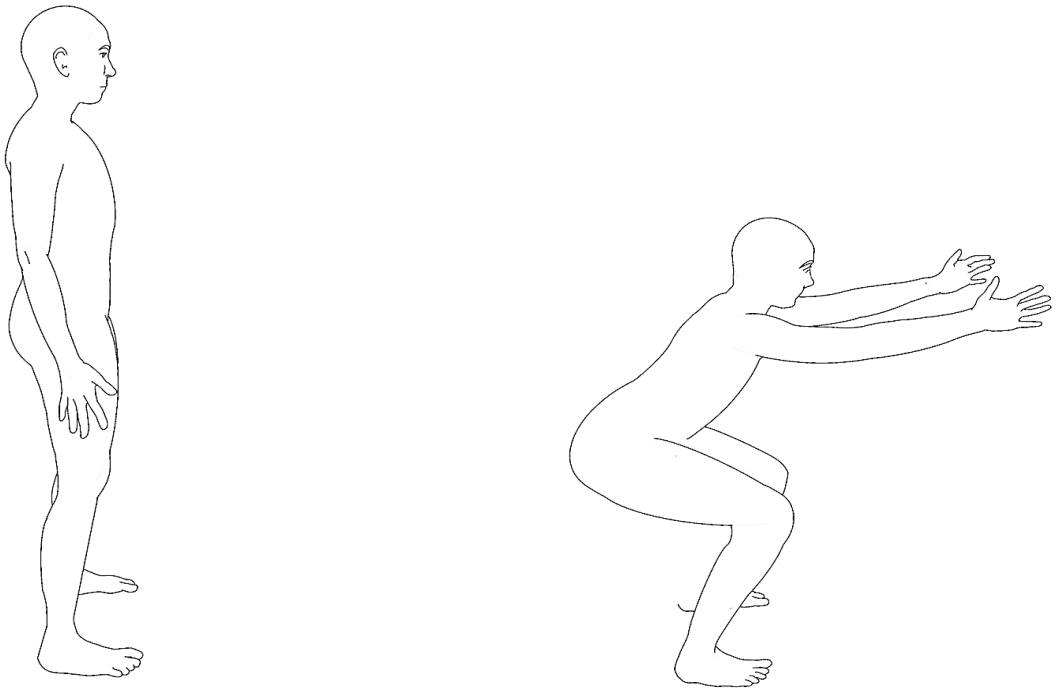


**Figure 149. Hip-width distance squats*

Wide-legged Squats

Wide-legged squats result in greater muscle engagement of the muscles around the hips than hip-width distance squats. Beginning with legs out wide with toes turned out, the body then bends at the knees and sinks down. During this exercise, the glutes and inner thigh muscles work harder, while quadriceps engagement is reduced (see Figure 150). A narrower stance like with hip-width distance squats increases quadriceps engagement and minimizes hip muscle involvement. Inhale takes place with the bending of the knees, and exhale happens when coming back up. This exercise can be implemented at any point during a practice session after muscles are warmed up.

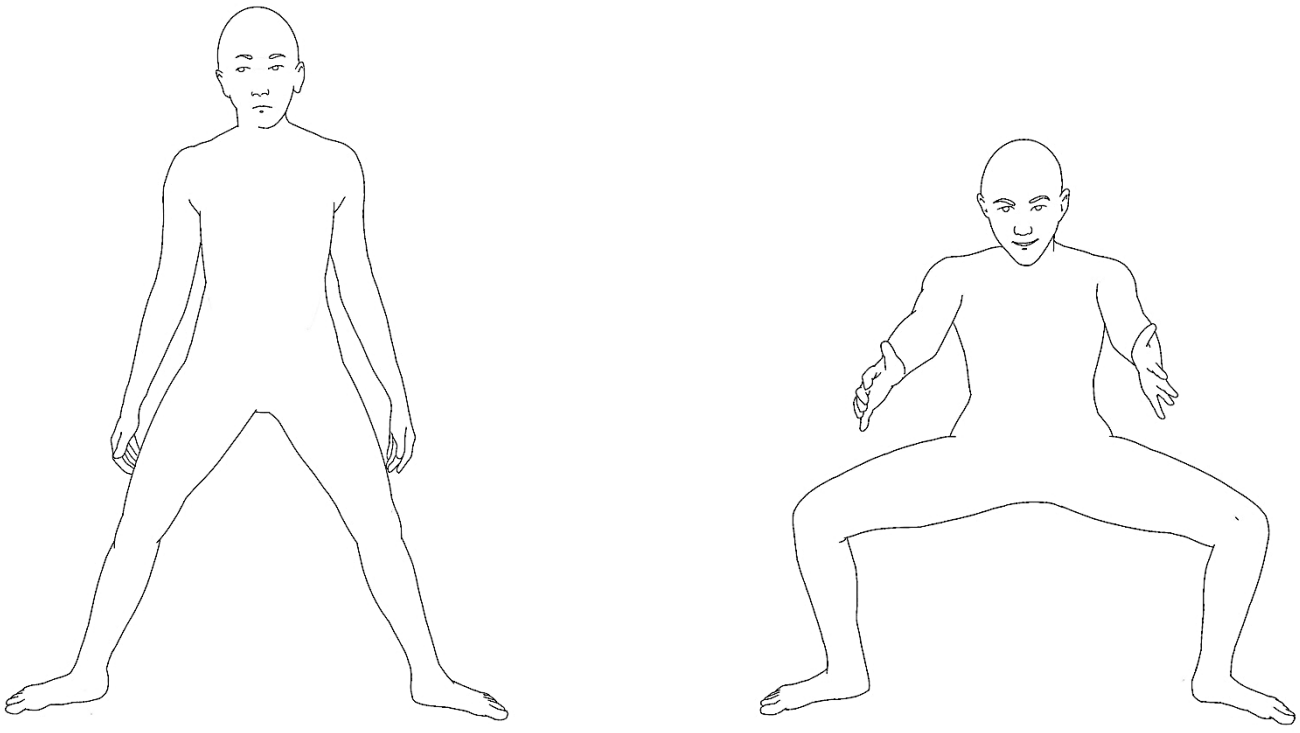


**Figure 150. Wide-legged squats*

Diamond Squats

When first engaging in diamond squats, it is best to hold onto a firm structure such as a piece of furniture or a wall for balance. In this exercise, heels are pressed together and toes are separated. Maintaining this diamond posture with the legs, the body bends at the knees and sinks down any amount and then comes back up. Inhale takes place with the bending of the knees, and exhale happens when coming back up. The body maintains a flat back, an open chest and firm core (see Figure 151). This exercise can be performed either on the flat of the feet, or balancing on toes. Diamond squats can be implemented at any point during a practice session after muscles are warmed up.

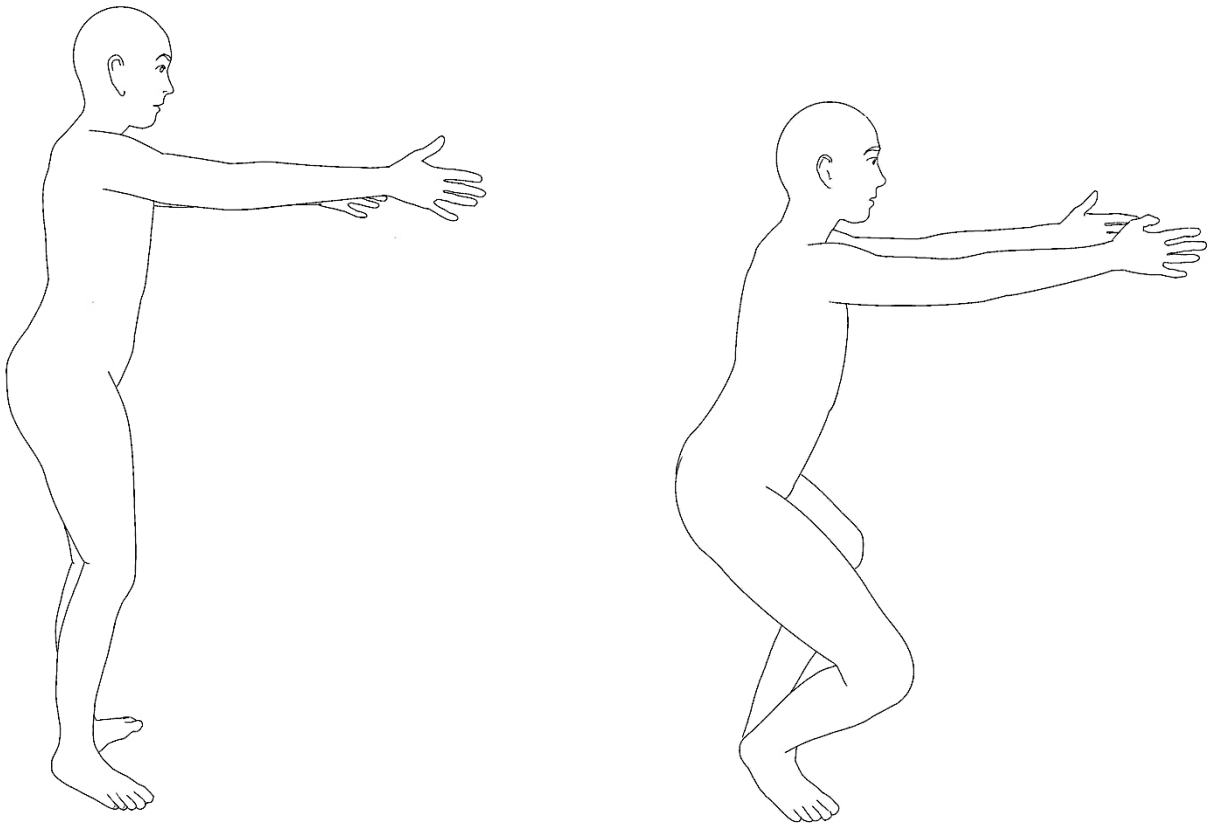


**Figure 151. Diamond squats*

“Shiva Squats”

Shiva squats are beneficial for developing core and hip strength. The exercise begins by lifting a leg toward the back, and reaching torso and hands toward the ground. Maintaining balance, both legs then bend toward the ground while the knee of the lifted leg taps the back of the sanding leg before coming back up. Inhale takes place with the bending of the knees, and exhale happens when coming back up. This exercise also provides a workout for the hamstrings, glutes, and adductor muscles. In addition, this exercise strengthens the knee and ankle joints (see Figure 152). Shiva squats can be implemented at any point during a practice session after muscles are warmed up.

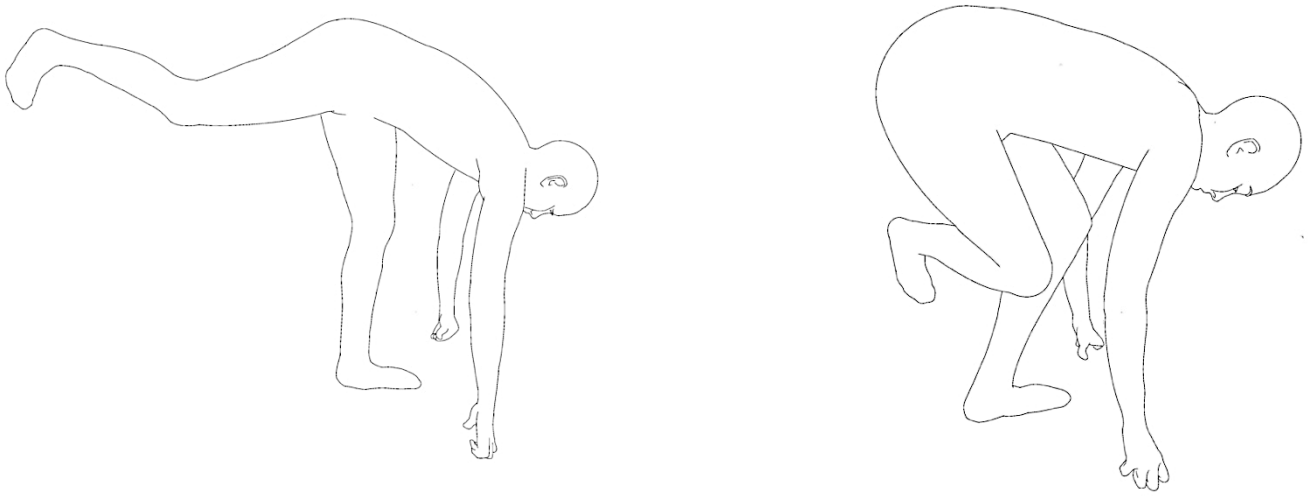


**Figure 152. Shiva squats*

One-Legged Squats

One-legged squats are effective for challenging balance, which can also help to work on the core muscles of the body (see Figure 153). The exercise begins with a lifted leg toward the front, balancing on the standing leg. The body then lowers by bending the standing leg any amount before coming back up. Inhale takes place with the lifting of the leg, and exhale happens when coming lowering leg back down. This exercise benefits the glutes, calves, shins, thighs and abdominal muscles. One-legged squats can be implemented into a practice session if student feels stable enough to balance on one leg, and after the muscles are warmed up.

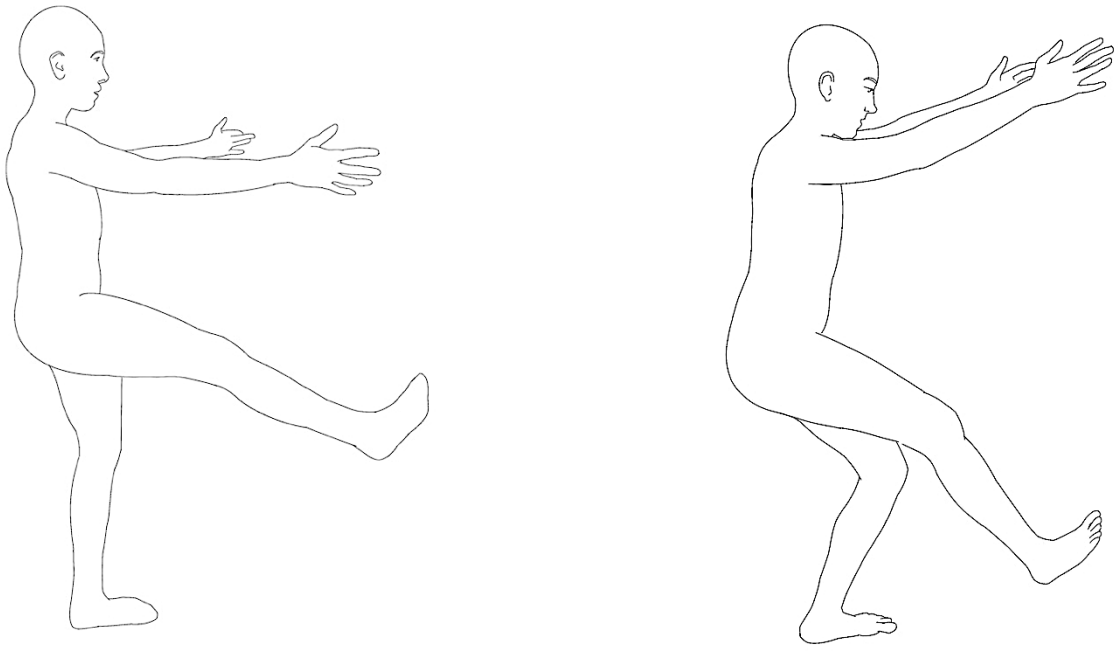


**Figure 153. One-legged squats*

Standing Lateral Leg Lift

This exercise helps build stabilization muscles and achieve a greater range of motion on the hips (see Figure 154). The exercise begins by standing tall on both feet, and then while maintaining a strong core, lifting one leg to the side. Inhale takes place with lifting of the leg, and exhale happens when lowering leg. Engaging in standing lateral leg lifts builds core strength, builds upper and lower back strength, improves muscle endurance, neck strength, and glute strength. This exercise also reduces pressure on the joints. Standing lateral leg lifts can be implemented into a practice session if student feels stable enough to balance on one leg, and after the muscles are warmed up.

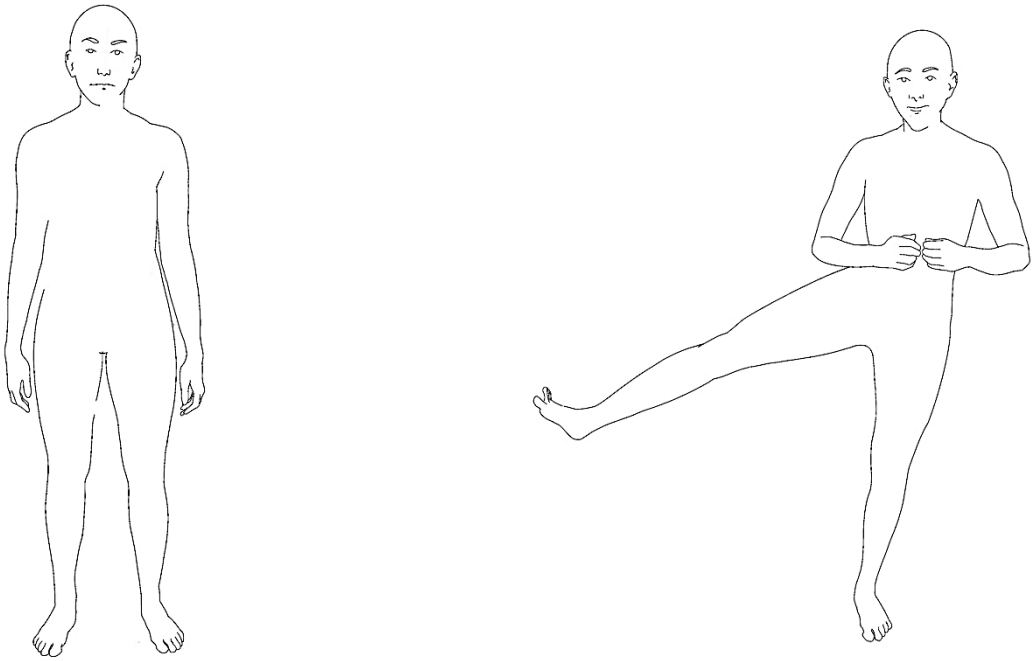


**Figure 154. Standing lateral leg lift*

Standing Back Leg Lift

This exercise increases strength in the lower body with an emphasis on the glutes, core, hip flexors, hamstrings and lower back muscles (see Figure 155). The exercise begins by standing tall on both feet, and then while maintaining a strong core, raising a leg toward the back. Inhale takes place with the lifting of the leg, and exhale happens when lowering the leg back down. In addition to increasing strength, standing back leg lifts also improve core stability and balance. Standing back leg lifts can be implemented into a practice session if student feels stable enough to balance on one leg, and after the muscles are warmed up.

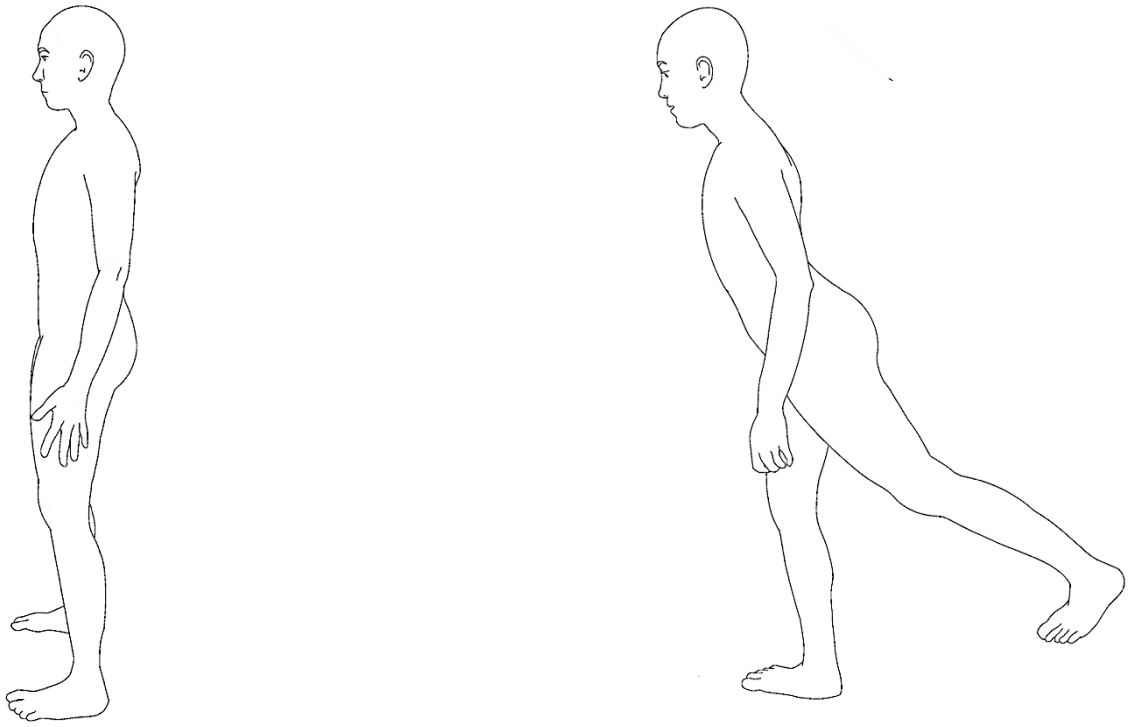


**Figure 155. Standing leg raise toward the back*

Narrow Row

This strengthening exercise targets the areas that the upper-string instrumentalist engages regularly: Areas of the neck, shoulders, upper and middle back, and upper arms (see Figure 156). The exercise begins with knees slightly bent, torso leaned forward, and arms straight out in front. Arms then bend at the elbows and contract, hugging the body as the elbows reach the backside. Inhale takes place with the bending of the arms, and exhale happens when arms straighten toward the front. Narrow rows can be implemented into a practice session at any point after the muscles are warmed up. Weights are optional in this exercise.

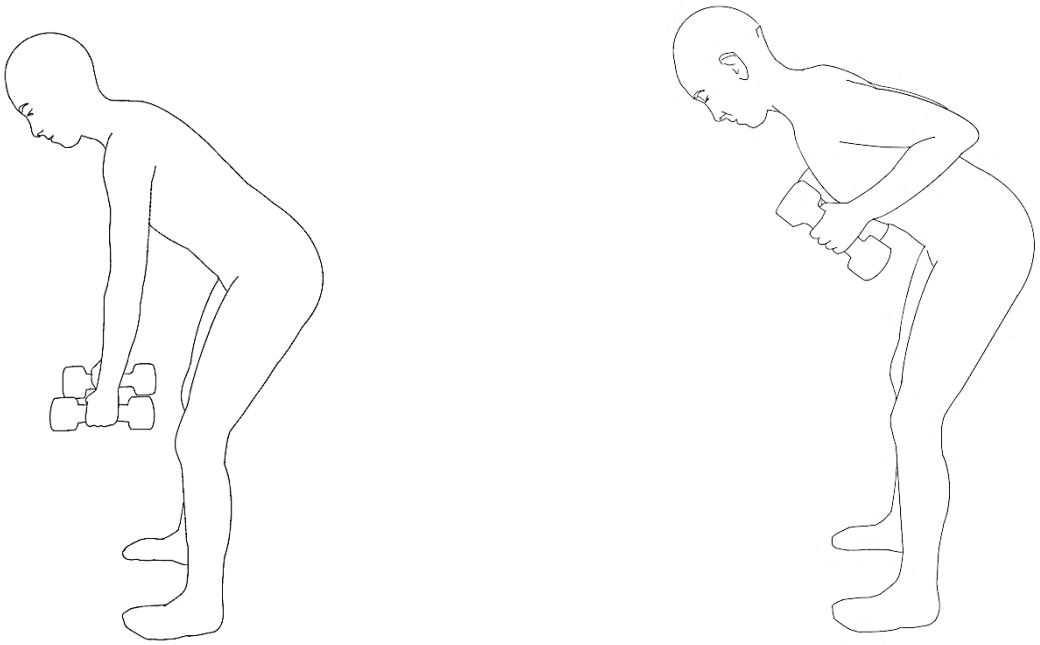


**Figure 156. Narrow row*

Wide Row

Similar to a narrow row, this strengthening exercise works the areas of the neck, shoulders, upper and middle back, and upper arms (see Figure 157). This type of row begins with knees slightly bent, torso leaned forward, and arms straight out in front. Instead of arms contracting back hugging the torso like with the narrow row, arms contract with elbows out to the side, upper arms parallel to the ground. Inhale takes place with the bending of the arms, and exhale happens when arms straighten toward the front. Wide rows are more effective at working the latissimus dorsi, vs. narrow rows that are more effective in working the shoulders (subscapularis—deep shoulder internal rotator). This exercise can be implemented at any point during a practice session once the muscles are warmed up. Weights are optional in this exercise.

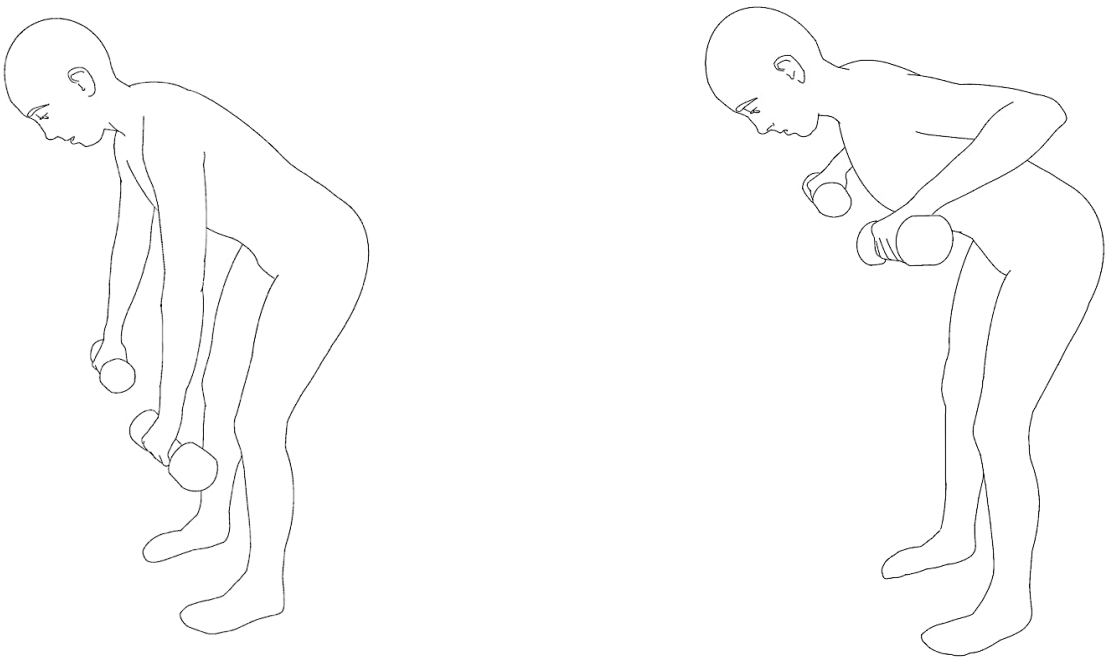


**Figure 157. Wide row*

Reverse Fly

This exercise strengthens the rhomboid muscles and posterior deltoids by extending the arms out in front of the body, and then opening them out wide with elbows slightly bent (see Figure 158). Developing a strong upper back helps balance shoulder strength and helps protect shoulders from injury. This exercise can be implemented into a practice session when the muscles are sufficiently warmed up. Weights are optional in this exercise.

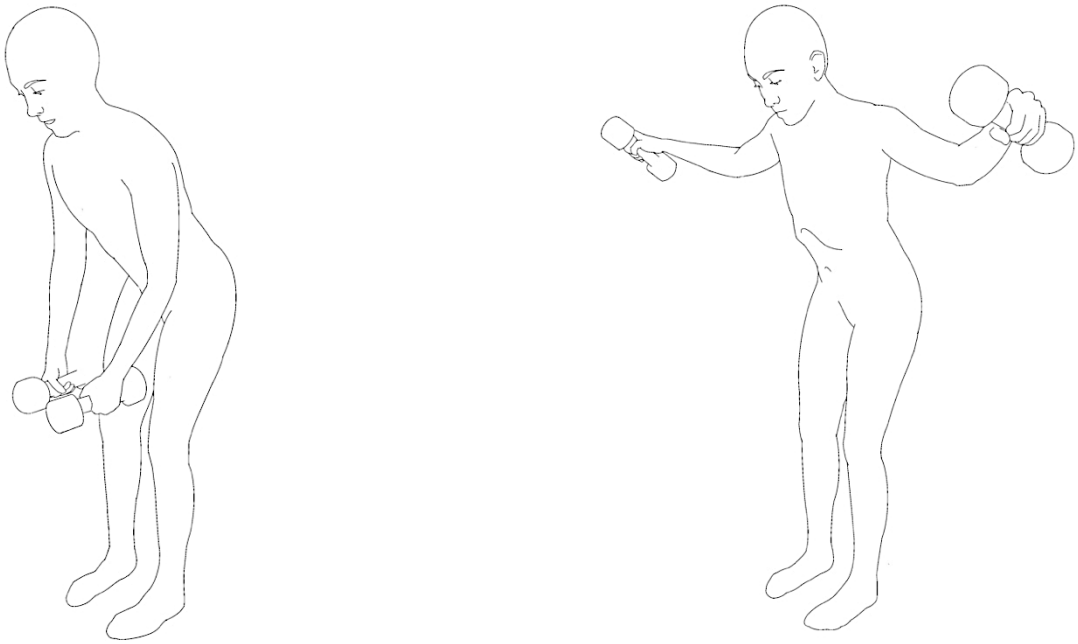


**Figure 158. Reverse fly*

Cross-Body Mountain Climbers

This cardio core-strengthening exercise targets the entire abdominal region. The body begins in a push-up-like position, and then one after the other, each knee diagonally reaches the opposite elbow. Breathing is slow and steady through this exercise. The cross-body movement actively engages the obliques (sides of abdomen) and hip flexors (stabilizing muscles of hips) (see Figure 159).

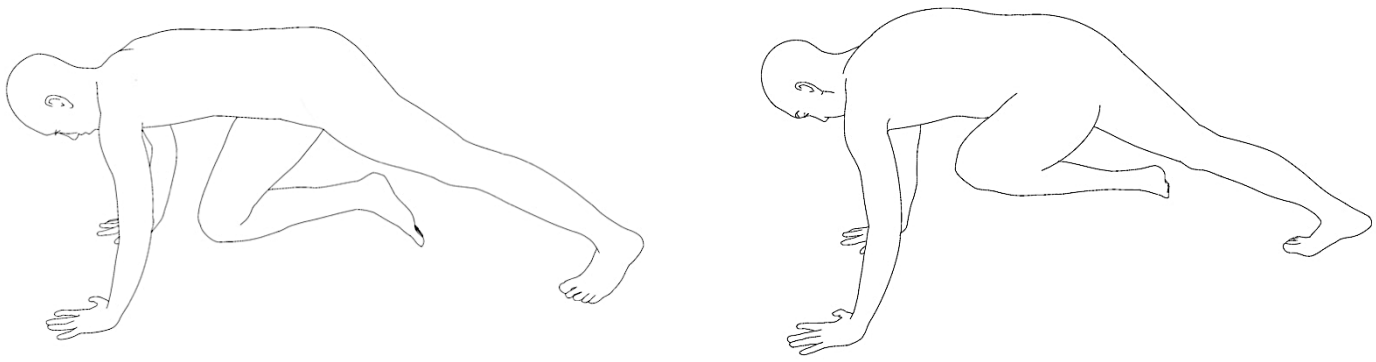


**Figure 159. Cross-body mountain climbers*

Mindfulness Activities

Mindfulness activities are intended to reduce anxiety and bring awareness to habit formation. Dr. Katrin Schubert specializes in helping people heal their bodies with natural medicine. Long before today's COVID-19 global pandemic, Schubert understood that many elements of modern life cause psychological issues that compromise health and well-being. She and her colleagues realized their patients were suffering from ever-increasing and often debilitating anxiety and stress. Schubert (2016) illustrates tools that people can apply effectively to help cope with stress of every day life. For musicians, integrating these techniques in (and out of) the practice room potentially can help alleviate anxiety associated with music performance. These techniques include:

Square Breathing—This technique involves looking at a square or rectangular object (a sheet of music, tablet, door frame, etc.). Starting at the top left corner, the person very slowly moves their eyes to the right side while inhaling, then down the right side while exhaling, then across the bottom to the left side while inhaling, then up the left side while exhaling to the point and place of beginning. This exercise can be repeated for several rounds from two to five minutes, or whenever uneasy thoughts come about. Actively and mindfully regulating breathing and heart rate during times of stress is very important for overall anxiety reduction.

"Happy Point" Acupressure—Acupressure is a technique without needles that makes use of the body's meridian system and was discovered thousands of years ago by Chinese physicians. The meridian system is similar to the nervous system but is separate from the anatomical structures that are recognized in Western medicine. The meridian system consists of twelve

channels of energy that flow symmetrically and vertically throughout the body. Applying gentle pressure to a pressure point can balance the flow of electrical energy and create a self-healing response in the body. The "Happy Point" Acupressure technique involves locating the acupressure point called the "large intestine meridian 4." It is located in the fleshy, muscular part of the hand between the thumb and index finger. When pressed, this acupressure point can make a person feel a general sense of happiness. This exercise can be repeated for 3-to-5 minutes.

Heart Mender Acupressure—This exercise is done by using the thumb to massage the Heart meridian 7 pressure point, located on the inside of both wrists, on the side of the little finger. Pressing this acupressure point for 1 minute can help alleviate emotional distress.

In a Pinch—Not all acupressure is Chinese. French physician Paul Nogier discovered the power of the "reflex organs" in the ear (Litscher et al., 2018). He found that when there is a dysfunction or problem in a particular part of the body, specific points on the ear are tender to the touch, and when stimulated, also shift the person's pulse wave. For this exercise, using the thumb and index finger, steadily pinch the area where earlobes meet the side of the head and roll the skin back and forth or in small circles on both earlobes. Search for the "good ache" when massaging the area, but do not press too hard to cause bruising. This exercise can be done for 1-to-2 minutes.

BodyTalk Cortices—The BodyTalk and BodyTalk Access are energy medicine methods that act as gentle ways to balance, alignin and synchronize one's body and its functions. These exercises involve a series of tapping motions with the right hand while maintaining various still positions with the left hand. The right hand tapping motions include tapping the forehead

followed by tapping the chest bone. The first left hand still position is at the base of the head, where the head meets the neck. The second left hand still position is centered on the back of the head. The third left hand still is resting on the top of the head. The fourth left hand still position is pressing against the forehead (the right hand will tap on top of the left hand in this position). The fifth still position involves first placing both hands on either side of the head just above the ears for a cycle of breath, then taking turns tapping with the right and left hands while maintaining pressure against the side of the head with each still hand. This exercise aims to bridge the brain's cortices (the sides of the brain which play an important role in consciousness) through the "corpus callosum" (the path that connects the two sides of the brain) to develop a stronger energetic connection. Stress can cause a disconnect between the right (creative) and left (logical) sides of the brain. The cortices technique can reset brain pathways which can help to rebalance one's nervous system and allow a healing process to happen.

The Grief (Anger, Fear, or Other Upset) Box—For this mental exercise, a person picks a special box or container. The person then pays attention to the body and notices where there might be feelings of tension, pain, or other discomfort. One can imagine collecting these feelings and placing them in the chosen receptacle. Placing these feelings in a grief box can make the mind-body connection feel lighter for the moment without suppressing or denying the emotion.

Healthy Thought Exchange—During times of self-judgment and self-criticism it is typical for one's mind to dwell on what went wrong, or what shouldn't have been done—a series of "what ifs." During these moments of internal negative dialogue, it is most important to focus the mind

on more positive thinking. Reciting an affirmation aloud or silently can re-focus the mind in a more positive direction. Here is an example of an affirmation (Schubert, 2016):

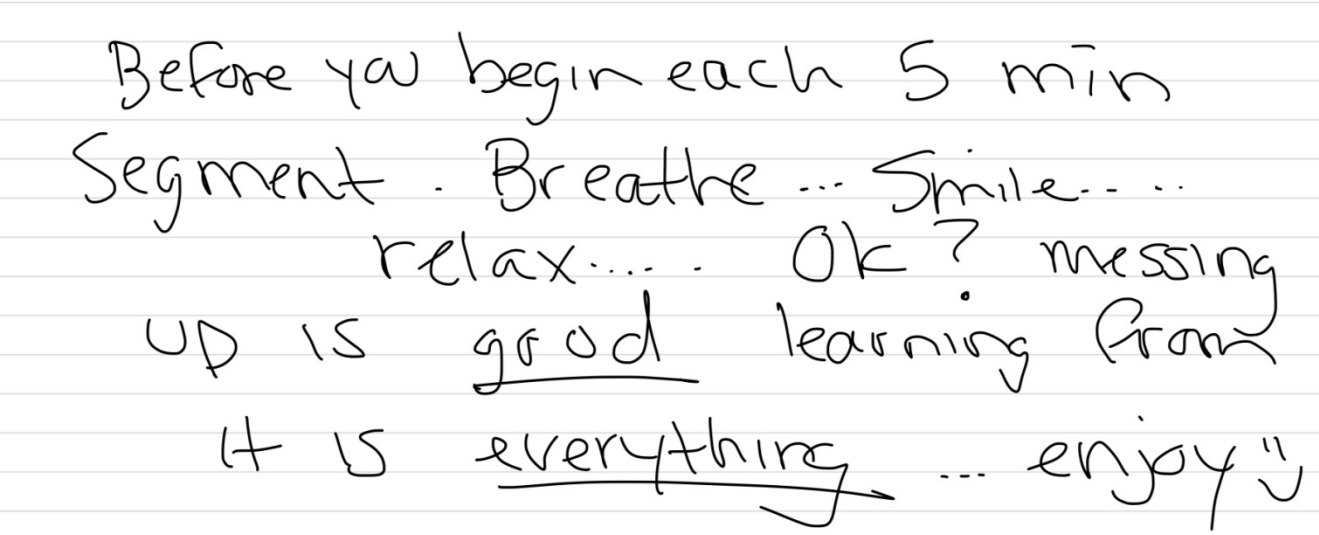
"From the power of the creating within me,
From the essence of all that I am,
I let go of all energies within and around me
That are not of love and light,
That do not bring me joy.
I let go of them right now…
So be it!"

After reciting the affirmation, it is appropriate to take three deep breaths, and while exhaling, send the unwanted energies out and away.

Ocean-Sounding Breath—While breathing is one of the body's automatic functions, the quality of breath is influenced by deeper states of mind. When people become anxious or stressed, the act of breathing tends to suffer by becoming shallower. This exercise involves breathing more deeply and deliberately by gently tightening the back of the throat, engaging the whisper muscles—the muscles at the back of the throat—and, without forcing the breath, slowly begining to breathe in and out through the nose. This technique reduces the flow of air going in and out of the lungs. The sound produced is reminiscent of ocean waves. This method of breathing delivers more oxygen to the cells and the brain while also allowing the mind to become more present and thoughts to become more balanced. There are also positive effects of the ocean sounding breath on the intestines because it causes the diaphragm, the body's breathing muscle, to contract more

fully, thus gently massaging the insides of the abdomen. This can improve blood flow, lymph drainage, nutrient uptake, and detoxification.

The Micro-Workout Regimen



The micro-workout regimen begins with a plan and a timer—this is what I call the practice prescription. The above hand-writing is from the beginning of a practice prescription I wrote for a student who had a propensity to experiencing a fear of making errors even while practicing alone at home. The point of the practice prescription is to provide an individualized plan to help students with their unique issues. What I have learned is that many times a student's ability to practice and play with confidence has to do with how they practice at home, and how they feel about themselves. Playing music is a vulnerable experience, and teaching music without the knowledge that it can be vulnerable for students can be detrimental to their progress.

Deliberate practice and self-regulation are important for both concrete learning and maximizing time, but as previously discussed, are not inherently enjoyable. On the other hand, mindless, excessively long practice sessions can contribute to performance-related

musculoskeletal disorders. This is where developing motivating practice techniques that teach deliberate practice, but also reinforcing mindfulness and strength-building is crucial.

Recall "tool kit vs. recipe," "101 Ways to Differentiate a Scale," "101 Ways to Play Anything," "chunking," "cross-training," "periodization" and "the Pomodoro Technique" from Chapter 2 as conducive for engaging in deliberate practice and self-regulation. The idea of cross-training, or interval training, could be an important factor in creating motivating and productive practicing for violinists and violists. The micro-workout regimen, or music workout, as I also like to call it, involves breaking up a practice session into meaningful segments that include working on bite-sized portions of a desired piece/etude/etc, and alternating that with engaging in short spurts of strengthening/relaxation techniques.

Recall "yogic postures," "mindfulness," and "flow" from Chapter 3 and earlier in this chapter as coping mechanisms to combat music performance anxiety and physical tension. This next section of Chapter 5 will illustrate how these various mindfulness exercises, and low-impact strengthening exercises are beneficial techniques for building cognitive and physical strength, increasing flexibility, and sustaining symmetry. These types of exercises are especially beneficial for micro-athletes when engaging in them the correct way.

The aforementioned Pomodoro Technique from Chapters 2, 3, and 5 is a method that can help with engaging in self-regulatory behavior because of the presence of the timer. But timed practice segments are ineffective when students are unclear on how to engage with their material while they are practicing. So cue deliberate practice! The practice prescription is intended to provide explicit directions on what to practice—recall "chunking" from Chapter 2—for how long, and how to use periods of rest effectively. When practicing can be an immersing experience—whether it be thirty minutes, or two hours—students can maximize their time with

quality, purposeful practicing. In addition to engaging with the practice prescription, students are encourage to keep a practice log to monitor their progress from their own point-of-view. This helps students take accountability for their own progress.

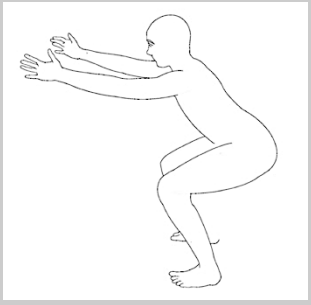
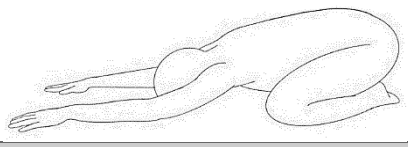
Practice Prescription Templates

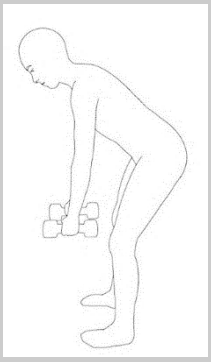
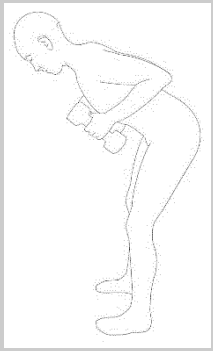
The remaining pages of this chapter are practice prescription templates intended for any music student who wishes to have a guide while they practice. The 30-minute practice templates are intended for beginners due to the length of practice session and amount of repertoire that one can cover in that time. The 60- and 90-minute practice templates are intended for more intermediate/advanced players due to the length of practice session and the more repertoire that can be covered in a longer session. The timed segments will have suggestions on how to practice material, and what to do when engaging in active rest.

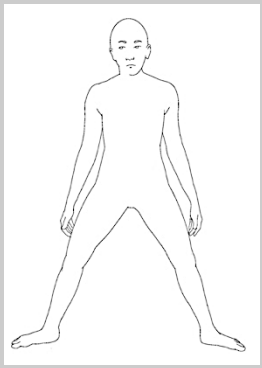
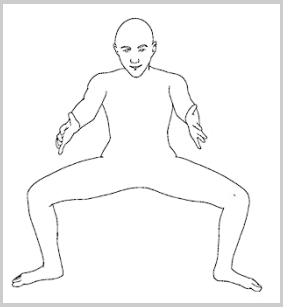
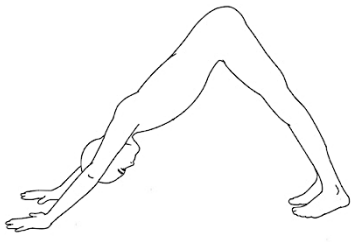
Note: the following templates are intended for students of varying levels to learn with or without the use of typical beginner, finger-board tapes. Students are encouraged to have a yoga mat, or another kind of soft mat, out at all times. Some of these exercises are demonstrated while holding weights, but are beneficial without weights as well.

Students are encouraged to engage in whatever level they feel comfortable with (omitting any postures as necessary, or adding heavier weights as desired). Students are also welcome to modify any template as necessary. These are only guides to teach the principles of developing good practice habits, staying present and mindful, and knowing that building overall body strength is crucial to preventing musculoskeletal injuries from occurring.

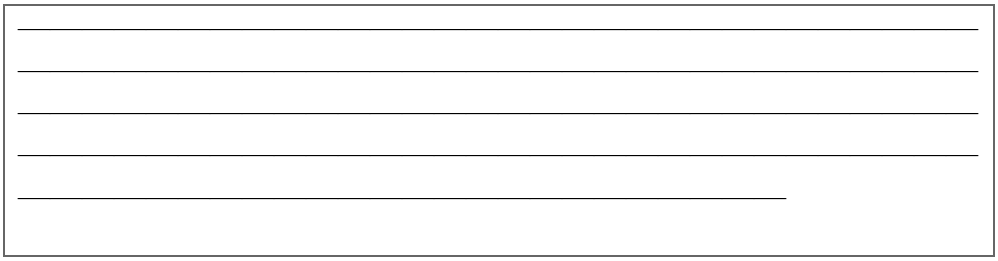
30 Minute Practice Template #1

Time/Description	Actions
5 minutes: Tuner Work and Hip-Width Distance Squats	Pick a scale
	Each note is a slow half note (imagine quarter note equals 60 beats per minute).
	Start at the beginning of the scale and play each note while watching the tuner and watching your left hand.
	When one note doesn't line up with the needle at 0 (determining on how many cents you are away from "perfect" in equal temperament), stay on that note until it is perfectly in tune.
	While working on intonation, also practice hip-width distance squats (optional).
	Separate your feet hip-width distance and sink down, bending at the knees, and rising back up with each half note.  
	Keep back upright and spine straight the whole time.
	If you don't get through the scale, that is fine!
	Take note of common tendencies: Is your second finger constantly low? Is the distance between your second finger and third finger large enough? Do string changes make it hard to remember where your fingers go? Etc.
	How does the addition of squats affect your focus?
	You may find that your bow moves more smoothly after first trying this exercise with squats .
	[redacted]
1 minute: Modified Child's Pose	Place instrument in case. 
	Shift your hips from side to side in this posture to alleviate hip tension.

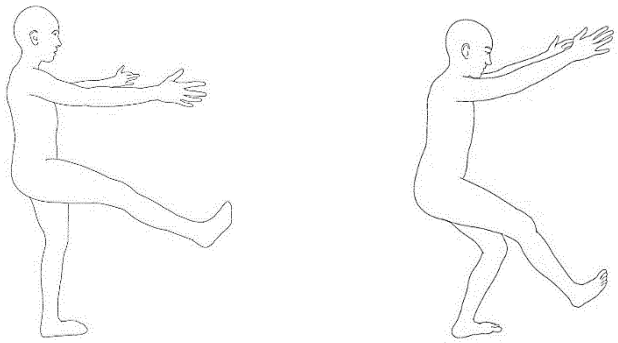
	Stretch arms out in front of you to alleviate shoulder tension.
	Stretch your fingers gently to alleviate finger tension.
	Roll forehead gently into mat to alleviate tension above the eyebrows.
5 minutes: Metronome Work	Pick a piece you are working on and determine whether it is intended to be in a faster or slower tempo.
	If tempo is fast and 4/4 or 6/8 (or some other time signature where the quarter note or eight note has the beat), set metronome to a slow quarter note or eighth note tempo (between 60-70 beats per minute). If tempo is fast and 2/2 (or some other time signature where the half note has the beat), set the eighth note to a moderately quick tempo (between 115-120 beats per minute).
	Choose the 5 hardest measures.
	Make sure to start in the correct bowing. Otherwise, if that measure begins in an up bow, for example, and you accidentally begin it as a down bow, you may learn this part incorrectly.
	Playing something out of context is good for your brain!
	Isolate specific notes that are incorrect.
	Enjoy the struggle.
	Intonation (the tuning of your fingers) is still important.
1 minute: Narrow Rows	Place instrument in case.  
	Weights are optional.
	Inhale with the bending of the arms, exhale with the straightening of the arms.
	Make sure to engage shoulder blades.
	Hug arms toward side body.
5 minutes: Tuner Work	Take that same piece from earlier.
	The same 5 hardest measures.

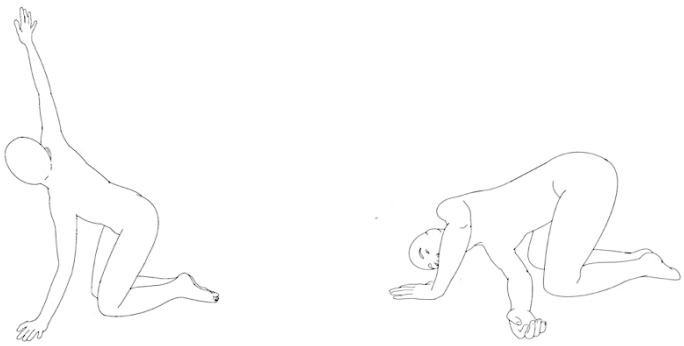
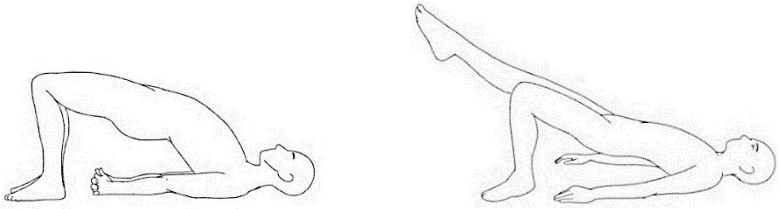
and Wide-Legged Squats	Eliminate rhythm and instead play each note like it is a slow half note (imagine quarter note equals 60 bpm).
	Remember that playing out of context increases your brain plasticity!
	At the same time engage in wide-legged squats (optional).  
	Separate your feet much wider than your hips. Aim for your heels in and toes out.
	Sink down into a wide-legged squat by bending at the knees and rising back up.
	Try one squat per half note.
	Take an inventory of yourself. Notice tendencies that you have, and common notes that are out of tune.
	Take mental pictures of what your left hand looks like.
	Are you moving past notes that aren't yet in tune?
	Do squats make focusing more challenging?
	Remember: Your bow may move smoother after trying this exercise with squats first.
	Patience is key here.
1 minute: Downward Facing Dog	Place instrument in case. 
	Bend one knee, then the other, to "walk your dog."
	Stretch your fingers.
	Play around with weight distribution throughout your body.

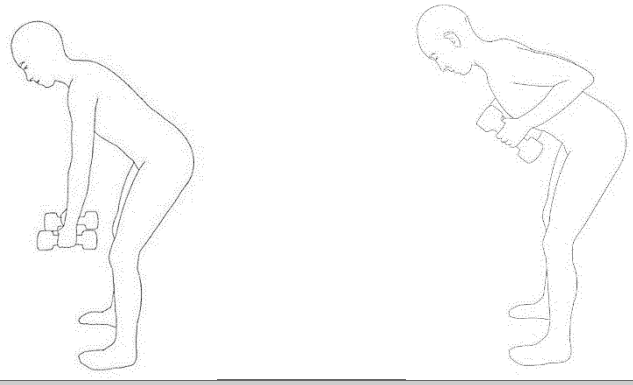
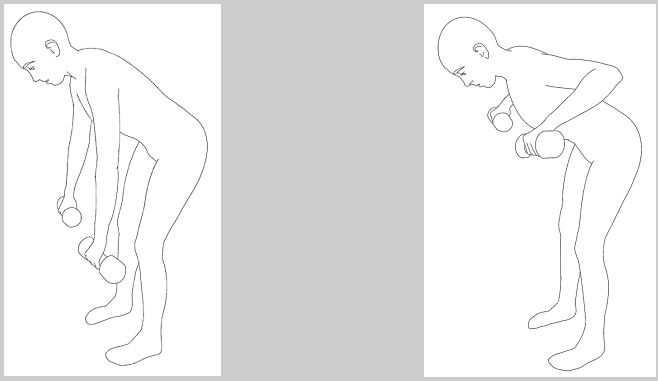
5 minutes: Improvisation Work	Go back to the scale you did at the start of the music workout.
	Play these notes out of order.
	Repeat notes.
	Skip notes.
	Make a melody out of the scale.
	All you have to do is NOT play the scale as written.
	And even if you play the scale as written, that's fine!
	Be as creative as you want.
	[redacted]
1 minute: Square Breathing	Mentally trace the outline of the page in front of you slowly.
	Inhale along the top, exhale along the right side, inhale along the bottom, exhale along the left side. Repeat.
	[redacted]
5 minutes: Metronome Work	Pick a different piece from earlier if you are working on multiple pieces. If not, choose the same piece.
	If tempo is fast and 4/4 or 6/8 (or some other time signature where the quarter note or eight note has the beat), set metronome to a slow quarter note or eighth note tempo (between 60-70 beats per minute). If tempo is fast and 2/2 (or some other time signature where the half note has the beat), set the eighth note to a moderately quick tempo (between 115-120 beats per minute).
	Find 3 transitions in your music—this can be going from the last measure of one line to the first measure of the next—so you can practice moving your eyes from one line to the next. Perhaps practice a challenging repeat (1st ending/2nd ending, etc.).
	Embrace errors and then do your best to learn from them.
	[redacted]
1 minute: Pressure Point	Find the pressure point in your hand between your index finger and thumb and press it gently (it may be tender).
	Breathe slowly.
	Think happy thoughts!
	[redacted]
Practice Log	Write down anything that you believe will help you for your next music work-out. _____ _____ _____ _____ _____ _____ _____ _____

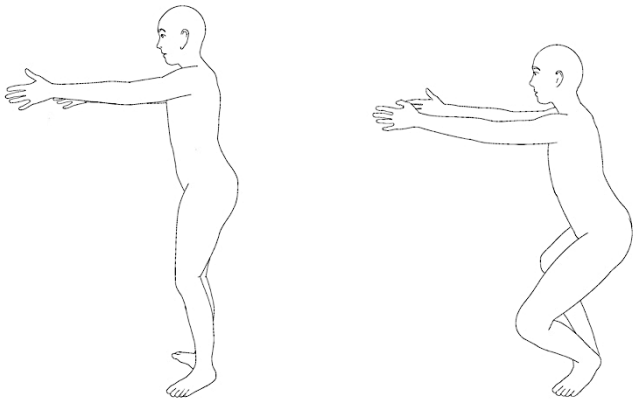
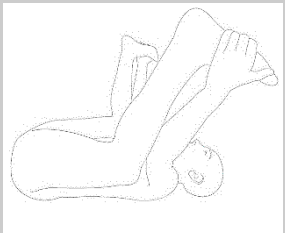


30 Minute Practice Template #2

Time/Description	Actions
5 minutes: Cultivating Resonance and One-Legged Squats	Place bow on string in between the bridge and the fingerboard but a little closer to the bridge.
	Open string work from frog to tip, tip to frog (down bow, then up bow) and the reverse, tip to frog, frog to tip (up bow, then down bow).
	Practice the resonance on each string.
	Aim for 5 bows in each direction before moving on to the next string (10 bows per string, 40 total across the four strings).
	Imagine an Olympic swimmer who does a summersault at each end of the pool before starting the next lap.
	In this spirit, imagine that each end of the bow has roughly 4 inches to prepare for the "turn around"—this is when the bow glides seamlessly in the opposite direction.
	The sound should be uniform across all areas of the bow.
	The sound should be seamless through the bow change.
	When you reach your destination (either at the frog or at the tip), release from the string to allow the instrument to keep ringing.
	Listen to the vibrations.
	At the same time, engage in one-legged squats (optional). 
	Lift one leg and squat on only the planted foot, bending at the knee (doesn't have to be very low) and rise back up.
	Stay on one foot for frog-tip/tip-frog and switch feet when you begin tip-frog/frog-tip.
	How does balancing and squatting on one leg change your focus?
	Remember: You may find that your bow moves more smoothly after trying this exercise with squats first.
	[redacted]
1 minute: Revolved Table Top to	Place instrument in case.

Thread the Needle Pose	
	Start to warm up the torso, and stretch through the rhomboids (the muscles in between the shoulder blades).
	Switch sides after about 30 seconds.
	[redacted]
5 minutes: Metronome Work	Pick a piece you are working on and choose the last two measures of one line, followed by the first two of the next.
	Set a metronome to a manageable tempo according to your time signature (i.e. the quarter note if 4/4, the half note if 2/2, and the eighth note if 6/8) and play the notes/rhythms/bowings as written.
	The goal here is to work on transitions (such as from one line to then next).
	[redacted]
1 minute: Bridge Pose and Bridge Pose with Lifted Leg	Place instrument in case.
	
	Work on raising each leg parallel to the ground in line with the bent knee.
	Change lifted leg every 15 seconds.
	Transition slowly through bridge pose.
	Engage abdominals.
	[redacted]
10 minutes: Practice Performance	Pick 15 measures from the piece from before and perform while audio recording.
	Take several seconds before you play your first note.
	Smile before you play your first note.
	Inhale/exhale before you play your first note.
	Take an inventory of yourself: Are you using your bow efficiently? Are you going to the frog when you should be? Is your bow hold

	soft? Are you pressing too hard with your left hand? How is your intonation?
	After recording, listen to it.
	Analyze yourself. but don't judge yourself!
	[redacted]
2 minutes: Narrow Row and Wide Row	Place instrument in case.
	Narrow rows. 
	Wide rows. 
	One repetition of narrow row, followed by one of wide row, etc.
	Inhale when arms bend, exhale when arms extend.
	[redacted]
5 minute: Tuner Work and Diamond Squats	Pick a scale.
	Each note is a slow half note (imagine quarter note equals 60 beats per minute).
	Start at the beginning of the scale and play each note while watching the tuner as well as your left hand.

	When one note doesn't line up with the needle at zero (determining on how many cents you are away from "perfect" in equal temperament), go back to the previous note, and then keep going.
	If you don't get through the scale, that is fine!
	With each slow half note, engage in diamond squats (optional). 
	Bring heels together, toes apart, bend the knees as far as you can go, and rise back up.
	Take note of common tendencies with tuning and focusing while doing squats. Is your second finger constantly low? Is the distance between your second finger and third finger large enough? Do string changes make it hard to remember where your fingers go? How does your focus change when adding squats? How does the intonation change when doing squats? Etc.
	Remember: You may find that your bow moves more smoothly after trying this exercise with squats first.
	[redacted]
1 minute: Happy Baby Pose	Place instrument in case. 
	Straighten one leg, then the other.
	Roll along your spine.
	[redacted]

Practice Log

Write down anything that you believe will help you for your next music work-out.

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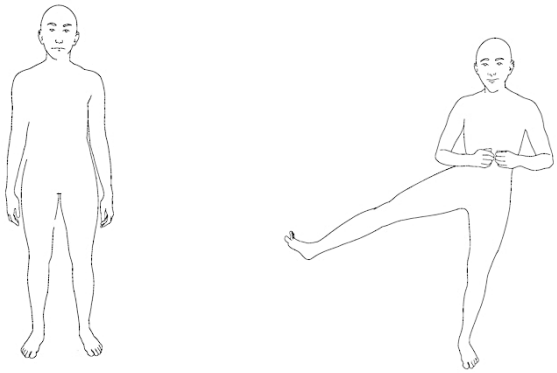
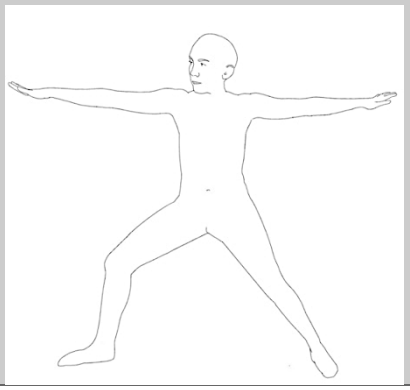
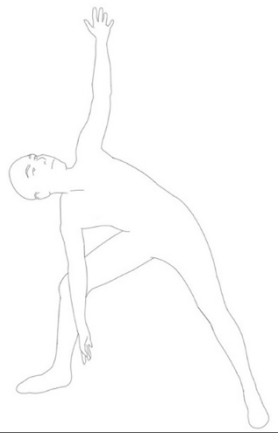
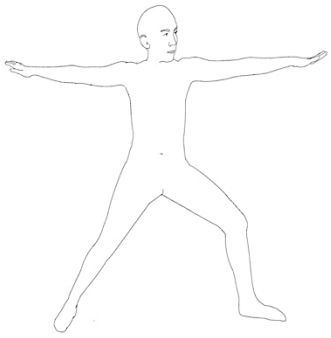
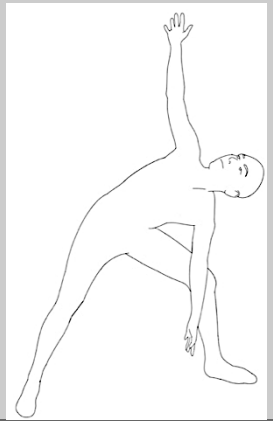
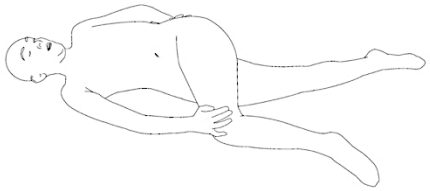
30 Minute Practice Template #3

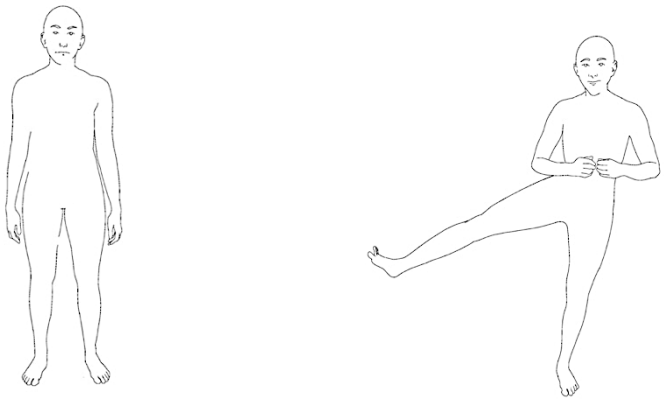
Time/Description	Actions
5 minutes: Sight Reading and Singing Rhythms	Pick 10 measures of a new piece.
	Look at the key signature and time signature.
	Make sure to observe the fastest rhythm in the 10 lines and put your tempo slow enough to accommodate those rhythms (for example, if you have sixteenth notes know that there are four of them in the quarter note).
	[redacted]
1 minute: Standing Lateral Leg Lift	Place instrument in case 
	Start with hip-width distance stance.
	This exercise strengthens your hips and helps counteract asymmetry.
	[redacted]
5 minutes:	Pick a piece you are working on.
Tuner Work	Locate the 5 hardest measures.
	Eliminate the rhythm and instead play each note like it is a slow half note (imagine quarter note equals 60 bpm).
	Remember that playing out of context increases your brain plasticity!
	Take an inventory of yourself (i.e. notice tendencies that you have, and common notes that are out of tune).
	Take mental pictures of what your left hand looks like.
	Are you moving past notes that aren't yet in tune?
	Patience is key here.
	[redacted]

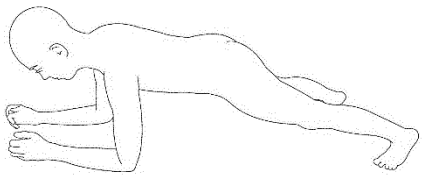
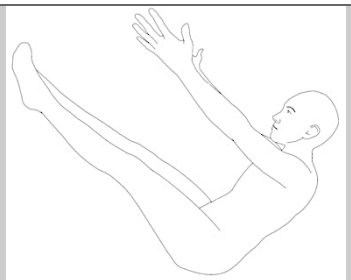
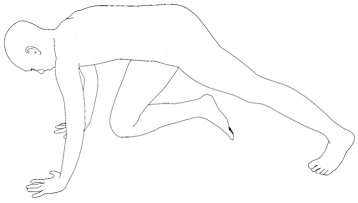
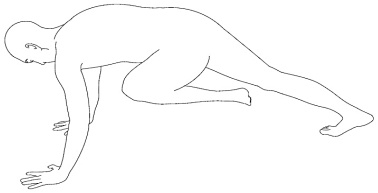
1 minute: Sun Salutations Sequence (right leg forward)	Place instrument in case. 20 seconds: Warrior two. 
	20 seconds: Extended side-angle. 
	20 seconds: Reverse warrior. 
	[redacted]
5 minutes: Metronome Work	With that same piece from earlier, put the rhythm/bowings back in and determine whether it is intended to be in a faster or slower tempo.
	If tempo is fast and 4/4 or 6/8 (or some other time signature where the quarter note or eighth note has the beat), set metronome to a slow quarter note or eighth note tempo (between 60-70 beats per minute). If tempo is fast and 2/2 (or some other time signature where the half note has the beat), set the eighth note to a moderately quick tempo (between 115-120 beats per minute).
	Choose the 5 hardest measures.

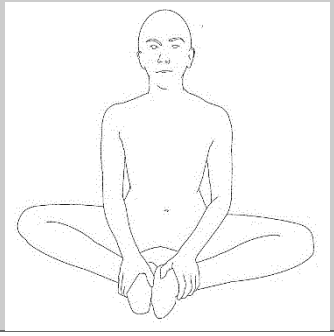
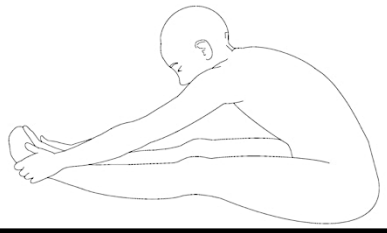
	Make sure to start in the correct bowing (if that measure begins in an up bow, for example, and you accidentally begin it as a down bow, you may learn this part incorrectly).
	Playing something out of context is good for your brain!
	Isolate specific notes that are incorrect.
	Enjoy the struggle!
	Intonation (the tuning of your fingers) is still important.
1 minute: Sun Salutations Sequence (left leg forward)	Place instrument in case. 20 seconds: Warrior two. 
	20 seconds: Extended side-angle. 
	20 seconds: Reverse warrior. 

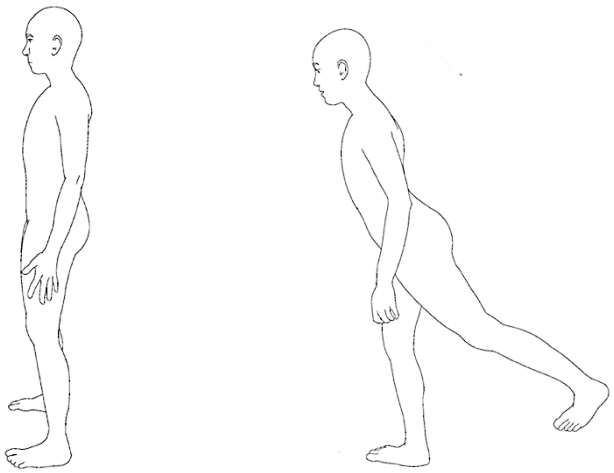
10 minutes: Practice Performance	Pick 15 measures from the same piece and perform while audio recording.
	Relax for several seconds before you play your first note.
	Smile before you play your first note.
	Inhale/exhale before you play your first note.
	Take an inventory of yourself: Are you using your bow efficiently? Are you going to the frog when you should be? Is your bow hold soft? Are you pressing too hard with your left hand? How is your intonation?
	After recording, listen to it.
	Analyze yourself. Don't judge yourself!
	[redacted]
2 minutes: Supine Twist	Place instrument in case. 
	One minute per side.
	[redacted]
Practice Log	Write down anything that you believe will help you for your next music work-out.

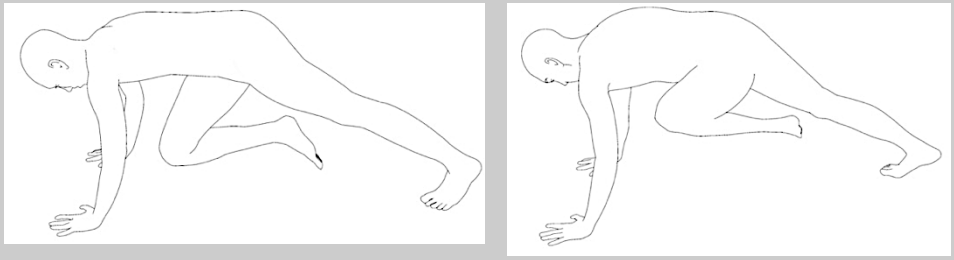
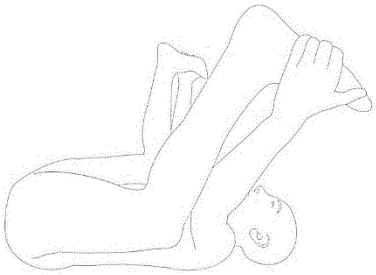
60 Minute Practice Template #1

Time/Description	Actions
5 minutes: Cultivating Resonance and Standing Lateral Leg Lift	Place bow on string in between the bridge and the fingerboard but a little closer to the bridge.
	Open string work from frog to tip, tip to frog, (down bow, then up bow) and the reverse, tip to frog, frog to tip (up bow, then down bow).
	Practice the resonance on each string.
	Aim for 5 bows in each direction before moving on to the next string (10 bows per string, 40 total across the four strings).
	Imagine an Olympic swimmer who does a summersault at each end of the pool before gliding to the other side.
	In this spirit, imagine each end of the bow has roughly 4 inches to prepare for the "turn around"—this is when the bow glides seamlessly in the opposite direction.
	The sound should be uniform across all areas of the bow.
	The sound should be seamless through the bow change.
	When you reach your destination (either at the frog or at the tip) release from the string to allow the instrument to keep ringing.
	Listen to the vibrations.
	At the same time as cultivating resonance, do standing lateral leg lifts (optional). 
	Standing on one leg, lift the other leg out to the side with each bow, and lower with the bow change.
	Stay on one foot for frog-tip/tip-frog and switch feet when you begin tip-frog/frog-tip.
	How does lifting one leg out to the side affect your focus? How does it affect your balance?
	Remember: You may find that your bow moves more smoothly after you engage your lower body with this exercise.
	[redacted]

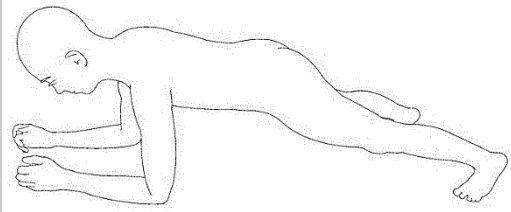
1 minute: Short Circuit	Place instrument in case.
	20 seconds: Forearm plank. 
	20 seconds: Boat pose. 
	20 seconds: Cross-body mountain climbers.  
	[redacted]
10 minutes: Tuner work	Pick a scale.
	Start at the highest point of the scale and work your way back to lowest point.
	Play each note slowly.
	Focus on the distance between notes and how they line up with the tuner.
	[redacted]
5 minutes: Metronome Work	Pick a scale.
	Set a metronome to quarter note = 75 bpm.
	Focus on two different bowings to work on during this time frame: i.e. slurring two notes together at a time, slurring three notes together at a time, slurring five notes together at time, etc.
	No matter what bowing you do, each note is 75 bpm.

	This means that the bow speed will have to change with each bowing depending on how much bow you need to use.
	[redacted]
10 minutes: Sight Reading	Pick 2 pieces ahead of the one you are currently working on (if working in a method book) or pick a part of a piece you are unfamiliar with.
	Glance at the first 3 lines.
	Notice the time and key signatures.
	Notice the desired tempo: Fast? Slow?
	Locate the smallest note value in the first three lines: is it the sixteenth note? Is it the eighth note? Etc.—This will help you fit rhythms into the desired tempo.
	Tap the tempo with your foot and speak the rhythms in the first three lines.
	If a rhythm is hard to count (like a dotted quarter note) you must *subdivide: T*his is when you think back to the smallest note value and mathematically figure out the rhythm (i.e. four sixteenth notes = one quarter note, three eighth notes = one dotted quarter note, etc.)
	[redacted]
1 minute: Stretches	Place instrument in case. 30 seconds: Butterfly pose. 
	30 seconds: Seated forward fold. 
	[redacted]
10 minutes: Metronome Work	Pick a piece you are working on and determine whether it is intended to be in a faster or slower tempo.
	If tempo is fast and 4/4 or 6/8 (or some other time signature where the quarter note or eighth note has the beat), set metronome to a slow quarter note or eighth note tempo (between 60-70 beats per minute). If tempo is fast and 2/2 (or some other time signature where the half note has the beat), set the eighth note to a moderately quick tempo (between 115-120 beats per minute).
	Choose the 20 hardest measures.

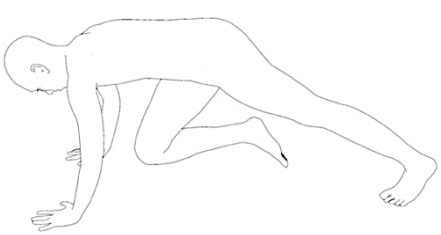
	Make sure to start in the correct bowing (if that measure begins in an up bow, for example, and you accidentally begin it as a down bow, you may learn this part incorrectly).
	Playing something out of context is good for your brain!
	Isolate specific notes that are incorrect.
	Enjoy the struggle.
	Intonation (the tuning of your fingers) is still important!
	[redacted]
5 minutes:	Take that same piece you just worked on.
Tuner Work and Standing Back Leg Lift	Locate 10 hard measures.
	Eliminate the rhythm and instead play each note like it is a slow half note (imagine quarter note equals 60 bpm).
	Remember that playing out of context increases your brain plasticity!
	Take an inventory of yourself (i.e. notice tendencies that you have, and common notes that are out of tune).
	Take mental pictures of what your left hand looks like.
	Are you moving past notes that aren't yet in tune?
	At the same time as the tuner work, do standing back leg lifts. 
	Standing on one leg, lift the other leg toward the back.
	Change legs after about five repetitions.
	How does lifting one leg in back of you affect your tuning? How does it affect your balance?
	Remember: You may find that your bow moves more smoothly after you engage your lower body with this exercise.
	Patience is key here.
	[redacted]
1 minute: Ocean Sounding Breath	Place instrument in case.

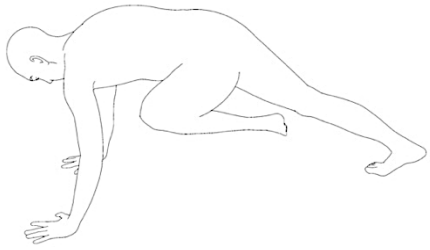
	This exercise involves breathing more deeply and deliberately by gently tightening the back of the throat, engaging the whisper muscles. Without forcing the breath, slowly begin breathing in and out through the nose. This technique reduces the flow of air going in and out of the lungs. The sound produced is reminiscent of ocean waves. This method of breathing delivers more oxygen to the cells and the brain while also allowing the mind to become more present and thoughts to become more balanced.
	[redacted]
10 minutes: Practice Performance	Take that same piece from earlier.
	Without a metronome or tuner, video record yourself playing through the 20 hardest measures you identified earlier.
	Pick a tempo that works for you.
	Don't stop until the end of the 20 measures.
	Mistakes are fine.
	Play back the performance.
	Notice any issues/errors that occurred.
	Repeat the process: Video record and watch back.
	Notice any improvements.
	[redacted]
2 minutes: Short Circuit	Place instrument in case. 20 seconds: Cross-body mountain climbers. 
	20 seconds: Happy baby pose. 

20 seconds: Forearm plank.

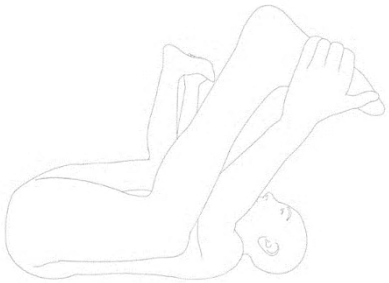


20 seconds: Cross-body mountain climbers.

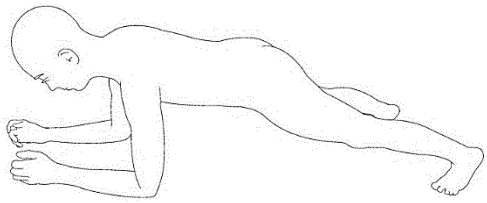




20 seconds: Happy baby pose.



20 seconds: Forearm plank.



Practice Log

Write down anything that you believe will help you for your next music work-out.

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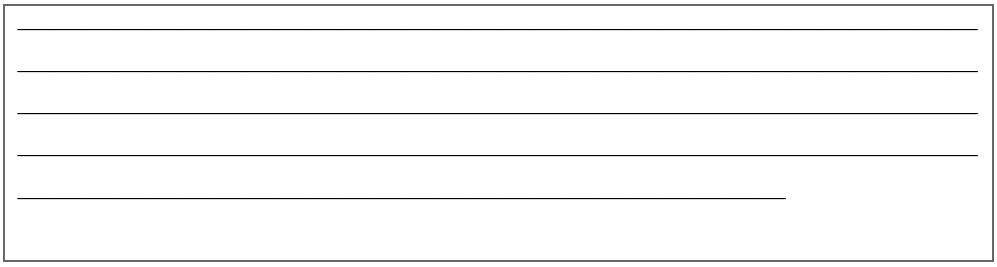
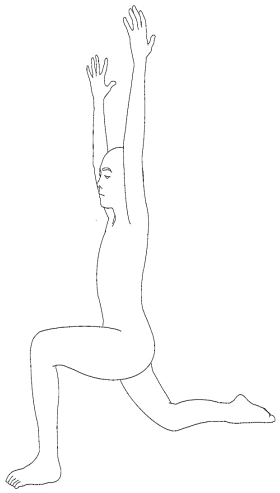
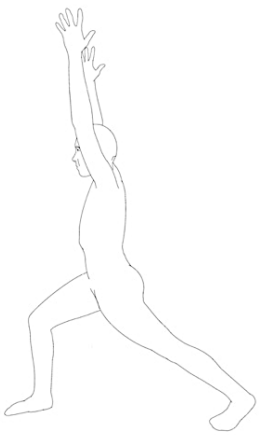
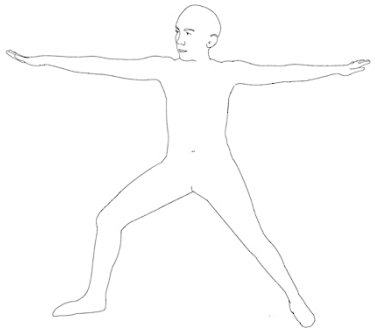
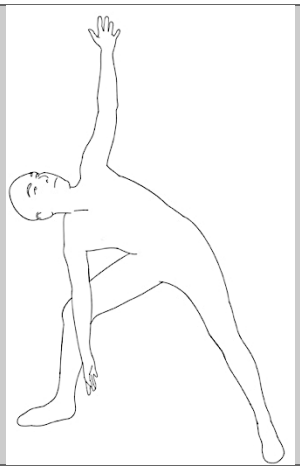
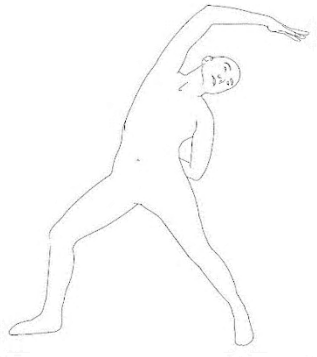
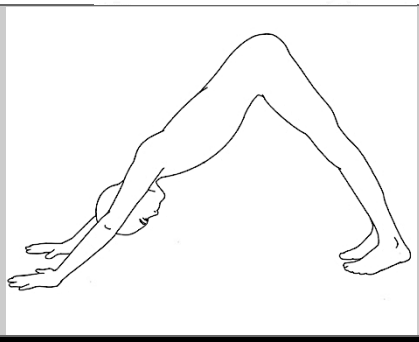
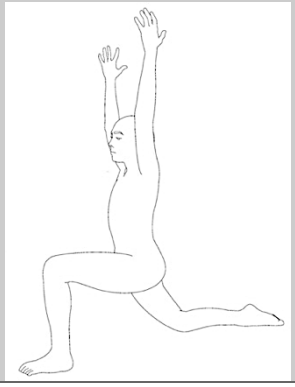
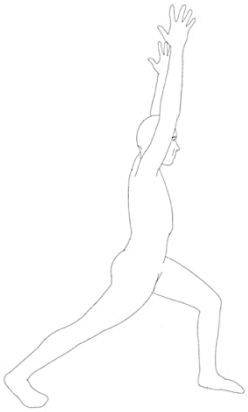
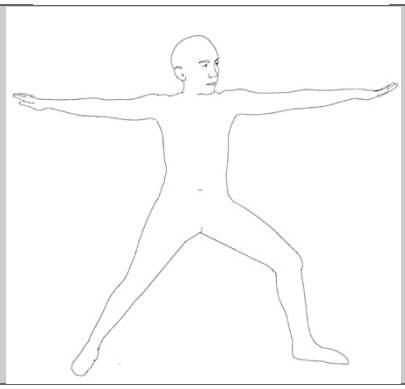
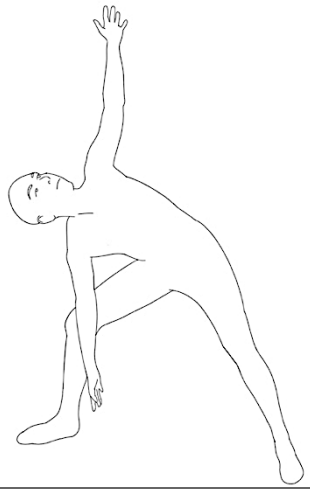


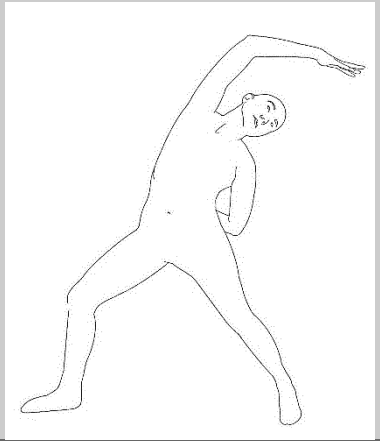
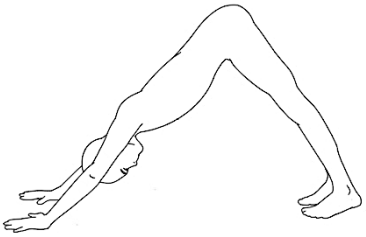
60 Minute Practice Template #2

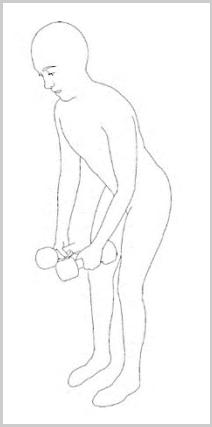
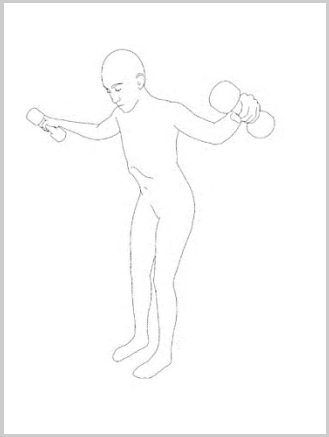
Time/Description	**Actions**
10 minutes: Improvisation	Take 5 measures from a piece of music you are working on.
	Look at the notes and rhythms.
	Start to stack the notes from lowest to highest throughout the five measures and notice them in a different form.
	Isolate a few notes at a time.
	Re-configure them in different ways.
	Explore longer and shorter strings of notes.
	Notice melodies that form.
	[redacted]
2 minutes: Sun Salutation Sequence (right foot forward)	Place instrument in case.
	20 seconds: Crescent moon. 
	20 seconds: Crescent lunge. 

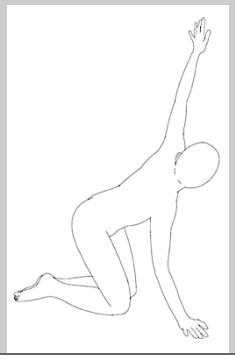
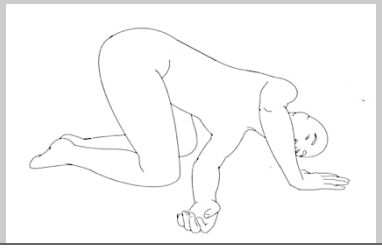
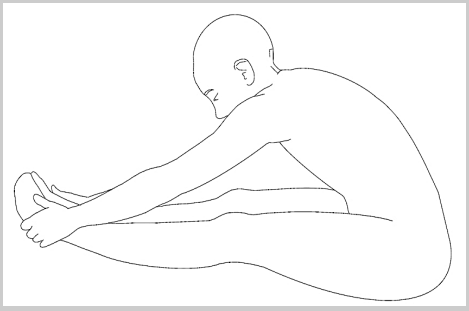
	20 seconds: Warrior two. 
	20 seconds: Extended-side angle. 
	20 seconds: Reverse warrior. 
	20 seconds: Downward facing dog. 
5 minutes: Tuner Work	Pick that same piece of music from the improvisation session and pick 10 measures to focus on.
	Play each note like a slow half note (quarter note = 60).

	Align each note with 0 on the tuner.
	Focus on where you put each finger.
	When one finger is too high/low, fix that finger before moving on.
	Isolate two notes at a time and go back and forth.
	Focus on hand position.
	Notice how far each finger is from each other.
	The more accurate you are getting with the tuner, the better you are getting at intonation (the exact tuning of your fingers).
	The more you can repeat something accurately five times in a row time after time, the more it illustrates how your fingers are becoming trained.
	[redacted]
1 minute: Cobra Pose	Place instrument in case. 
	Engage your shoulder blades, and feel the stretch along your neck.
	[redacted]
10 minutes: Metronome Work	Pick a different piece of music.
	Find a section with the fastest notes of the piece.
	Set a metronome marking that is significantly slower.
	[redacted]
2 minutes: Sun Salutation Sequence (left foot forward)	Place instrument in case. 20 seconds: Crescent moon. 

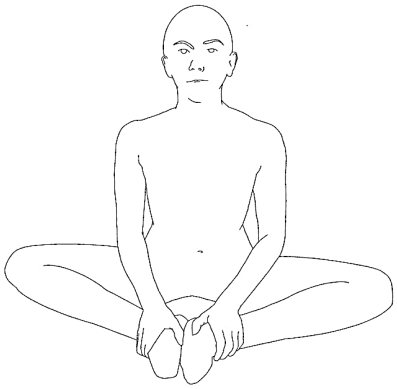
20 seconds: Crescent lunge. 
20 seconds: Warrior two. 
20 seconds: Extended side-angle. 

	20 seconds: Reverse warrior. 
	20 seconds: Downward facing dog. 
	[redacted]
5 minutes: Tuner Work	Pick another piece/etude/excerpt you are working on.
	Locate measures 10-20.
	Play each note slowly, omit rhythms that are written.
	Line each note up zero on the tuner to ensure the best intonation possible.
	When one note doesn't line up go back to the one that precedes it.
	Make "sensory images" when you practice with the tuner—this means that you are noticing where your left hand rests in relation to the shoulder of the instrument, the angle at which your wrist is bent, where your thumb is resting along the neck, how far your index finger is from the edge of the fingerboard by the scroll, etc.
	[redacted]

1 minute: Reverse Fly	Place instrument in case.  
	Alternate between these two postures every few seconds.
	[redacted]
10 minutes: Practice Performance	Pick a piece from earlier in the practice session.
	Record half of the piece and try to not stop.
	Notice if you are getting anxious or nervous—take note of your heart rate.
	Listen to it back.
	Make note of any intonation/rhythmic issues.
	After you have listened to it back pick three spots to work on briefly.
	Re-record half of the piece and listen to it back.
	Notice if anything improved.
	[redacted]
2 minutes: BodyTalk Cortices	The tapping motions with the right hand include tapping the forehead followed by tapping the chest bone. The first still position with the left hand is at the base of the head where the head meets the neck. The second still position with the left hand is centered on the back of the head. The third still position with the left hand is resting on the top of the head. The fourth still position with the left hand is pressing against the forehead (the right hand will tap on top of the left hand in this position). The fifth still position involves first placing both hands on either side of the head just above the ears for a cycle of breath, then taking turns tapping with the right and left hands while maintaining pressure against the side of the head with each still hand.
	[redacted]
5 minutes: Sight Reading	Pick a section of any piece that you are not familiar with—about 15 measures.
	Get a sense of the key signature/rhythms/tempo before you begin.
	Think of a slow enough tempo that you can digest the music in front of you.

	Try to gaze half a measure ahead of you.
	Once you reach the end of the 15 measures go back to the start of the section and read through it again—notice anything that has improved and what is still challenging.
	[redacted]
1 minute: Revolved Table-Top to Thread The Needle Pose	Place instrument in case.  
	Go in and out of these two poses every few seconds.
	[redacted]
5 minutes: Tuner Work	Pick a piece you are working on.
	Take the same piece from earlier OR another piece you are working on.
	Flip to a page in the middle.
	Locate 8 difficult lines.
	Eliminate the rhythm and instead play each note like it is a slow half note (imagine quarter note equals 60 bpm).
	Remember that playing out of context increases your brain plasticity!
	Take an inventory of yourself (i.e. notice tendencies that you have, and common notes that are out of tune).
	Take mental pictures of what your left hand looks like.
	Are you moving past notes that aren't yet in tune?
	Patience is key here.
	[redacted]
1 minute: Seated Forward Fold and Butterfly Pose	Place instrument in case. 30 seconds: Seated forward fold. 

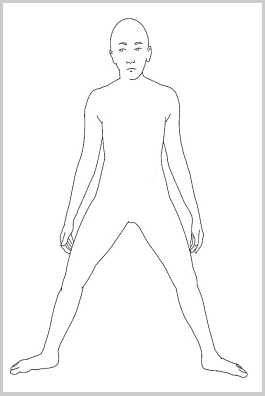
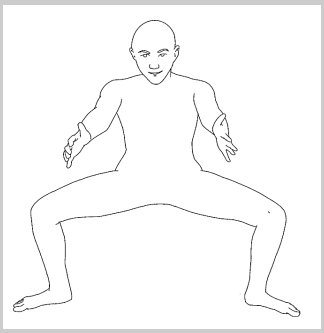
30 seconds: Butterfly pose.

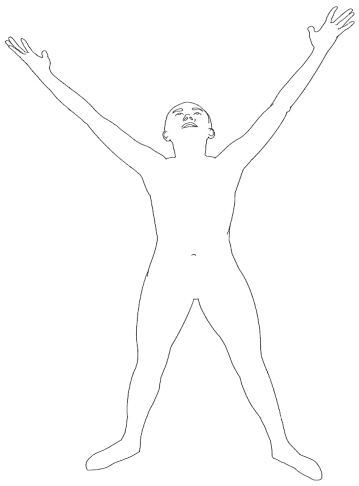


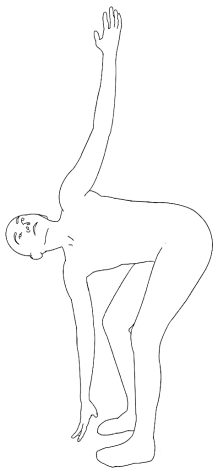
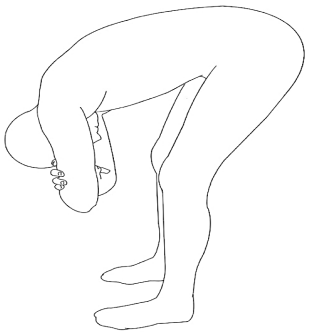
Practice Log

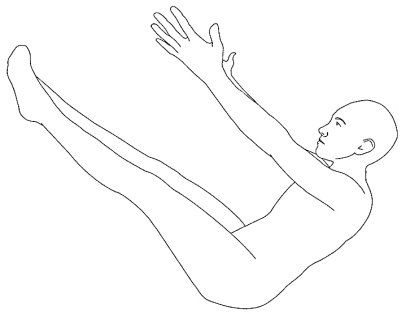
Write down anything that you believe will help you for your next music work-out.

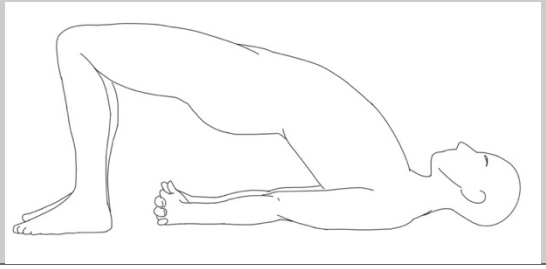
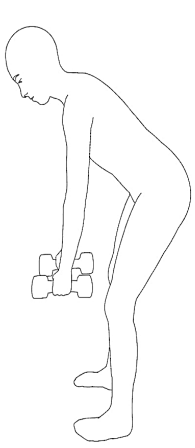
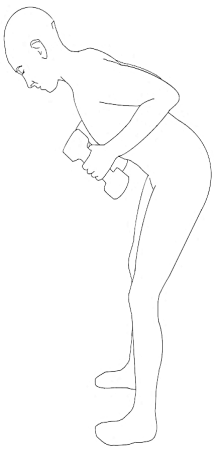
60 Minute Practice Template #3

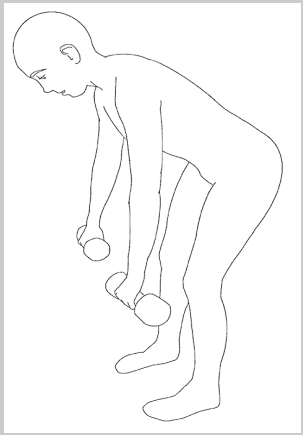
Time/Description	Actions
5 minutes: Cultivating Resonance and Wide-Legged Squats	Place bow on string in between the bridge and fingerboard with it being a little closer to the bridge.
	Open string work from frog to tip, tip to frog, (down bow, then up bow) and the reverse, tip to frog, frog to tip (up bow, then down bow).
	Practice the resonance on each string.
	Aim for 5 bows in each direction before moving on to the next string (10 bows per string, 40 total across the four srings).
	Imagine an Olympic swinner who does a summersault at each end of the pool before gliding to the other side.
	In this spirit, imagine each end of the bow has roughly 4 inches to prepare for the "turn around"—this is when the bow glides seamlessly in the opposite direction.
	The sound should be uniform across all areas of the bow.
	The sound should be seamless through the bow change.
	When you reach your destination (either at the frog or at the tip), release from the string to allow the instrument to keep ringing.
	Listen to the vibrations.
	At the same time, engage in wide-legged squats (optional).
	 
	Separate your feet much wider than your hips. Aim for your heels in and toes out.
	Sink down into a wide-legged squat by bending at the knees and rising back up.
	Try one squat per bow.
	Take an inventory of yourself: Notice tendencies that you have, and common notes that are out of tune.
	Do squats make focusing more challenging?
	Remember: Your bow may move smoother after trying this exercise with squats first.
	Patience is key here.

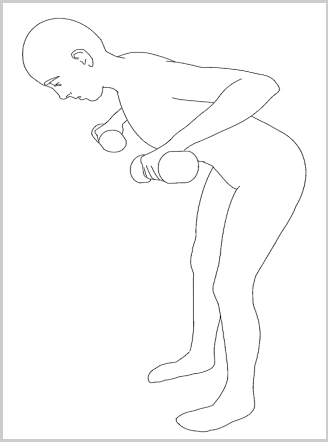
1 minute: Star Pose and Healthy Thought Exchange	Place instrument in case.
	
	While engaging in Star Pose, try reciting this affirmation:
	"From the power of the creating within me, From the essence of all that I am, I let go of all energies within and around me That are not of love and light, That do not bring me joy. I let go of them right now… So be it!"
5 minutes: Metronome Work	Pick a scale.
	Set a metronome to quarter note = 75 bpm.
	Focus on two different bowings to work on during this time frame: i.e. slurring two notes together at a time, slurring three notes together, slurring five notes together at a time, etc.
	No matter what bowing you do, each note is 75 bpm.
	This means that the bow speed will have to change with each bowing depending on how much bow you need to use.

1 minute: Revolved Forward Fold with Lifted Arm	Place instrument in case. 
	With a slightly bent knee, turn chest to the opposite direction and reach arm up.
	After about 30 seconds, switch sides.
	Enjoy the full body stretch!
5 minutes: Tuner Work	Choose a piece you are working on.
	Locate 10 hardest measures.
	Eliminate the rhythm and instead play each note like it is a slow half note (imagine quarter note equals 60 bpm).
	Remember that playing out of context increases your brain plasticity!
	Take an inventory of yourself (i.e. notice tendencies that you have, and common notes that are out of tune)
	Take mental pictures of what your left hand looks like.
	Are you moving past notes that aren't yet in tune?
	Patience is key here.
1 minute: Ragdoll Pose	Place instrument in case. 

	Fold forward with slightly bent (or very bent) knees and interlace arms.
	Enjoy the stretch along your entire spine from tail bone to head.
	[redacted]
5 minutes: Improvisation	Take 5 measures from a piece of music you are working on.
	Look at the notes and rhythms.
	Start to stack the notes from the lowest to highest throughout the five measures and notice them in a different form.
	Isolate a few notes at a time.
	Re-configure them in a different way.
	Explore longer and shorter strings of notes.
	Notice melodies that form.
	[redacted]
1 minute: In a Pinch	Using thumb and index finger, pinch the area where earlobes meet the side of the head and roll the skin back and forth or in small circles on both earlobes.
	[redacted]
10 minutes: Metronome Work	Pick a piece you are working on and determine whether it is intended to be in a faster or slower tempo.
	If tempo is fast and 4/4 or 6/8 (or some other time signature where the quarter note or eighth note has the beat), set metronome to a slow quarter note or eighth note tempo (between 60-70 bpm). If tempo is fast and 2/2 (or some other time signature wher ethe half note has the beat), set the eighth note to a moderately quick tempo (between 115-120 beats per minute).
	Choose the 20 hardest measures.
	Make sure to start in the correct bowing (if that measure begins in an up bow, for example, and you accidentally begin it as a down bow, you may learn this part incorrectly).
	Playing something out of context is good for your brain!
	Isolate specific notes that are incorrect.
	Enjoy the struggle.
	Intonation (the tuning of your fingers) is still important!
2 minutes: Boat Pose Alternated with Bridge Pose	Place instrument in case. Boat pose. 

	Bridge pose. 
	Hold each posture for about 10 seconds.
	[redacted]
10 minutes: Tuner Work	Take the same piece from earlier OR another piece you are working on.
	Flip to a page in the middle.
	Locate 8 difficult lines.
	Eliminate the rhythm and instead play each note like it is a slow half note (imagine quarter note equals 60 bpm).
	Remember that playing out of context increases your brain plasticity!
	Take an inventory of yourself (i.e. notice tendencies that you have, and common notes that are out of tune).
	Take mental pictures of what your left hand looks like.
	Are you moving past notes that aren't yet in tune?
	Patience is key here.
	[redacted]
2 minutes: Alternate Narrow Rows and Wide Rows	Place instrument in case. 5 repetitions: Narrow rows.  
	5 repetitions: Wide rows.





Alternate exercises every 5 repititions.

[redacted]

10 minutes: Practice Performance

Take a piece from earlier in the practice session.

Without a metronome or tuner, video record yourself playing through any part of the piece you practiced earlier.

Pick a tempo that works for you.

Don't stop until the end of the part you chose to play through.

Don't be worried about making mistakes.

Play back the performance.

Notice any issues/errors that occurred.

Repeat the process: Video record and watch back.

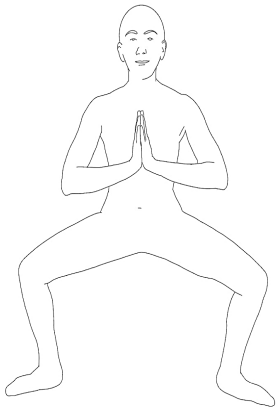
Notice any improvements.

[redacted]

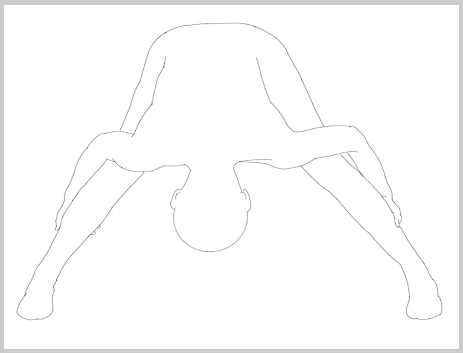
2 minutes: Alternate Horse Pose and Wide-Legged Forward Fold

Place instrument in case.

10 seconds: Horse pose.



20 seconds: Wide-legged forward fold.

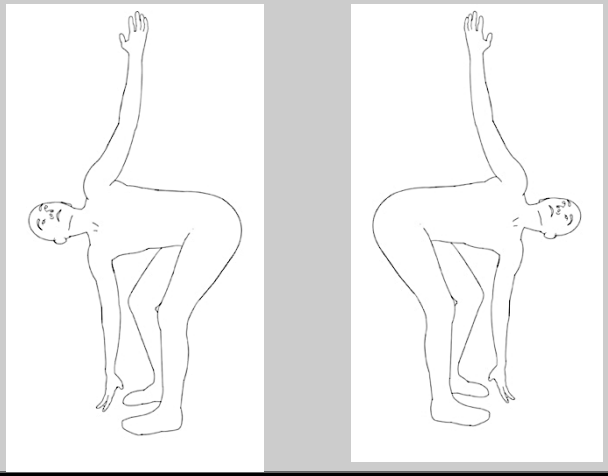


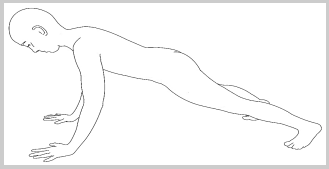
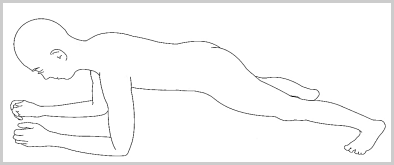
Alternate between these postures every 10 and 20 seconds.

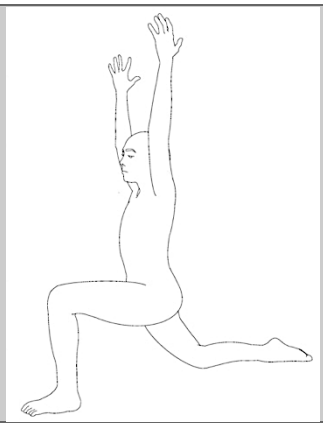
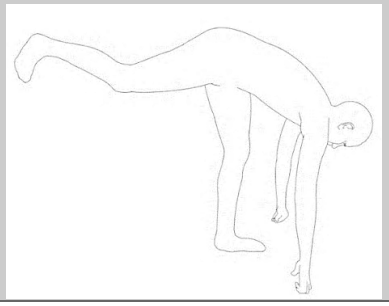
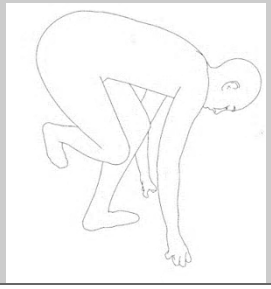
Practice Log

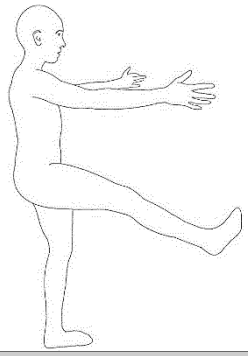
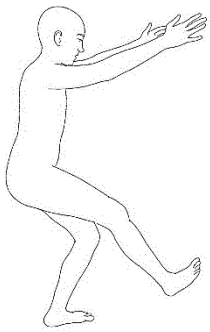
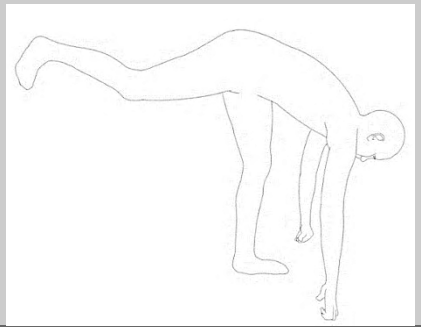
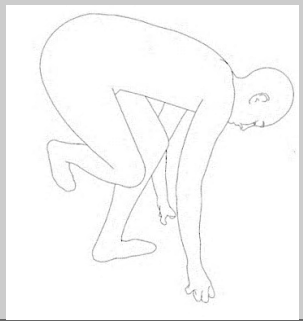
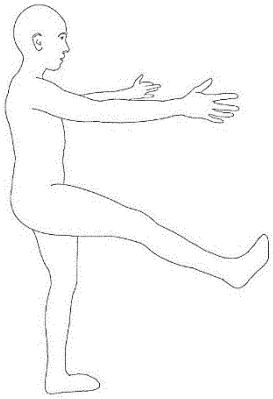
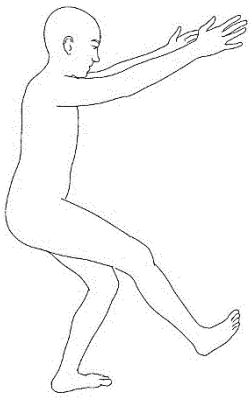
Write down anything that you believe will help you for your next music work-out.

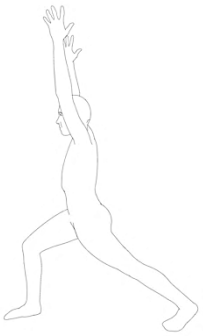
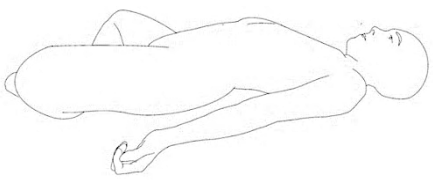
90 Minute Practice Template #1

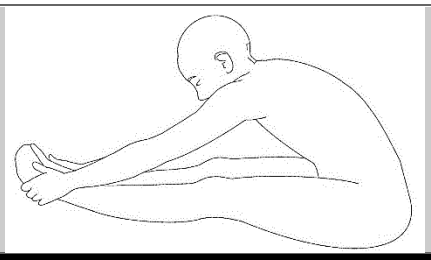
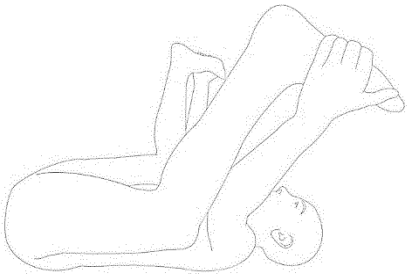
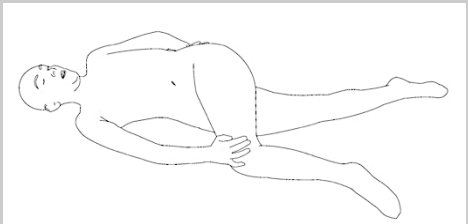
Time/Description	Actions
5 minutes: Cultivating Resonance	Place bow on string in between the bridge and the fingerboard a little closer to the bridge.
	Open string work from frog to tip, tip to frog (down bow, then up bow) and the reverse, tip to frog, frog to tip (up bow, then down bow).
	Practice the resonance on each string.
	Aim for 5 bows in each direction before moving on to the next string (10 bows per string, 40 total across the four strings).
	Imagine an Olympic swimmer who does a summersault at each end of the pool before starting a new lap.
	In this spirit, imagine each end of the bow has roughly 4 inches to prepare for the "turn around." This is when the bow glides seamlessly in the opposite direction.
	The sound should be uniform across all areas of the bow.
	The sound should be seamless through the bow change.
	When you reach your destination (either at the frog or at the tip), release from the string to allow the instrument to keep ringing.
	Listen to the vibrations.
	[redacted]
1 minute: Revolved Forward Fold with Lifted Arm on right and left	30 seconds right and 30 seconds left. 
	[redacted]
5 minutes: Tuner Work	Pick a scale.
	Start at the highest point of the scale and work your way back to the lowest point.
	Play notes slowly.
	Focus on the distance between notes and how they line up with the tuner.

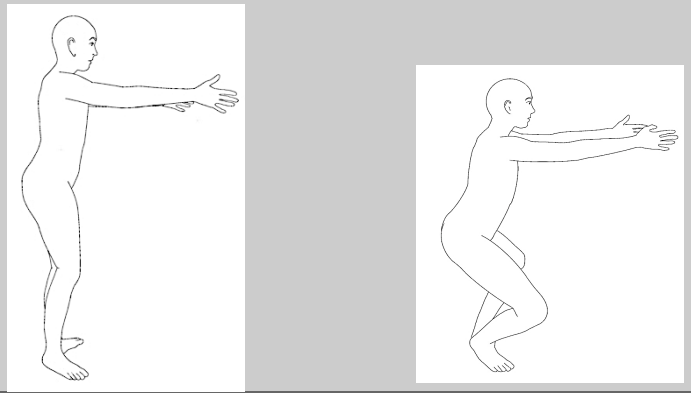
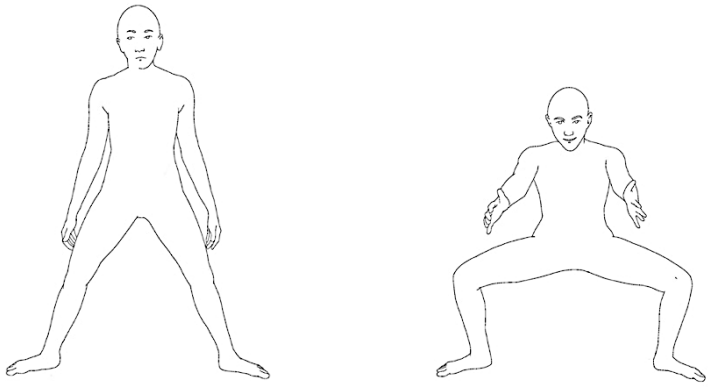
	[redacted]
1 minute: Alternate Between Half-Way Lift and Plank Pose	Place instrument in case. Halfway lift. 
	High plank or forearm plank.  
	Alternate postures every 10/20 seconds.
	[redacted]
5 minutes: Metronome Work	Pick a piece you are working on and determine whether it is intended to be in a faster or slower tempo.
	If tempo is fast and 4/4 or 6/8 (or some other time signature where the quarter note or eighth note has the beat), set metronome to a slow quarter note or eighth note tempo (between 60-70 beats per minute), If tempo is fast and 2/2 (or some other time signature where the half note has the beat), set the eighth note to a moderately quick tempo (between 115-120 beats per minute).
	Choose 10 hard measures near the beginning.
	Make sure to start with the correct bowing (if that measure begins in an up bow, for example, and you accidentally begin it as a down bow, you may learn this part incorrectly).
	Playing something out of context is good for your brain!
	Isolate specific notes that are incorrect.
	Enjoy the struggle!
	Intonation (the tuning of your fingers) is still important!
	[redacted]

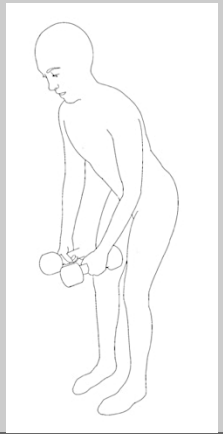
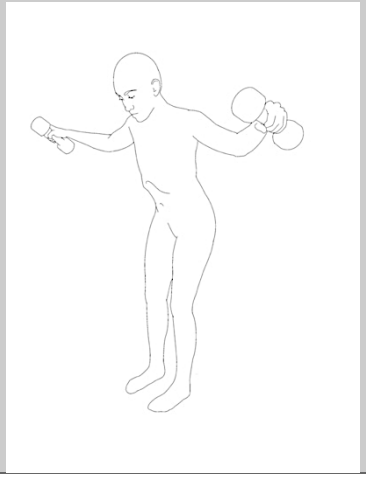
1 minute: Crescent Moon Pose	
	Feel the stretch along the stretched leg, up the spine and through the arms.
	30 seconds per side.
	[redacted]
10 minutes: Practice Performance	Take that same piece from earlier.
	Without a metronome or tuner, video record yourself playing through the 10 hard measures you identified earlier.
	Pick a tempo that works for you.
	Don't stop until the end of the 10 measures.
	Make lots of mistakes.
	Play back the performance.
	Notice any issues/errors that occurred.
	Repeat the process: Video record and watch.
	Note any improvements.
	[redacted]
2 minutes: Shiva Squats and One-Legged Squats	Place instrument in case. 30 seconds on right (standing on right leg): Shiva squats.
	 
	30 seconds on right (standing on right leg): One-legged squats.

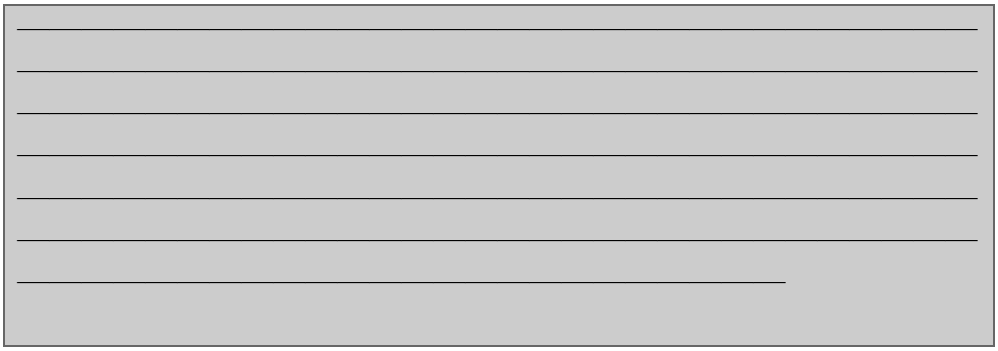
	 
	30 seconds on left (standing on left leg): Shiva squats.  
	30 seconds on left (standing on left leg): One-legged squats.  
10 minutes: Tuner Work	Take that same piece you just worked on.
	Locate 20 hardest measures.
	Eliminate the rhythm and instead play each note like it is a slow half note (imagine quarter note equals 60 bpm).
	Remember that playing out of context increases your brain plasticity!
	Take an inventory of yourself (i.e. notice tendencies that you have, and common notes that are out of tune).
	Take mental pictures of what your left hand looks like.

	Are you moving past notes that aren't yet in tune?
	Patience is key here.
	[redacted]
5 minutes: Metronome Work	Take that same piece from earlier.
	Flip to the end of the piece.
	Find a challenging 10 or so measures
	Make sure to start with the correct bowing (if that measure begins in an up bow, for example, and you accidentally begin it as a down bow, you may learn this part incorrectly).
	Playing something out of context is good for your brain!
	Isolate specific notes that are incorrect.
	Enjoy the struggle!
	Intonation (the tuning of your fingers) is still important!
	[redacted]
1 minute: Crescent lunge	
	[redacted]
5 minutes: Metronome Work	Pick another piece/etude/excerpt that you are working on.
	Identify 10 measures with fast rhythms.
	Play these measures slowly.
	Maybe learn them out of context.
	Maybe start at the last measure and work your way toward the beginning.
	[redacted]
1 minute:	Pick a special box or container that is nearby. Pay attention to the body and notice where there might be feelings of tension, pain, or other discomfort. Then imagine collecting these feelings and placing them in the chosen receptacle. This use of a grief box can make the mind-body connection feel lighter for the moment without suppressing or denying the emotion.
	[redacted]
2 minutes: Reclined Bound Angle Pose and Seated Forward Fold	1 minute: Reclined bound angle pose. 

	1 minute: Seated forward fold. 
10 minutes: Tuner Work	Work with this same piece (piece No. 2).
	Find a section (20 or so measures) somewhere in the middle.
	Eliminate the rhythm and instead play each note like it is a slow half note (imagine quarter note equals 60 bpm).
	Remember that playing out of context increases your brain plasticity!
	Take an inventory of yourself (i.e. notice tendencies that you have, and common notes that are out of tune).
	Take mental pictures of what your left hand looks like.
	Are you moving past notes that aren't yet in tune?
	Patience is the key here.
2 minutes: Happy Baby Pose and Supine Twist	1 minute: Happy baby pose. 
	Palce your instrument in case. 1 minute: Supine twist on both sides. 
10 minutes: Improvise	Take 10 measures from any piece of music you are working on.
	Look at the notes and rhythms.
	Start to stack the notes from lowest to highest with your instrument throughout the five measures and notice them in a different form.
	Isolate a few notes at a time.
	Re-configure them in different ways.

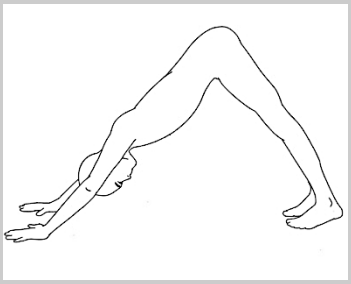
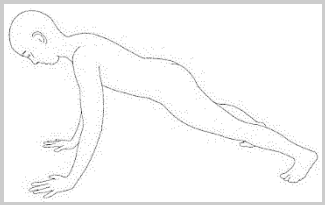
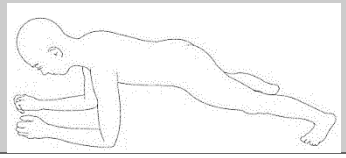
	Explore longer and shorter strings of notes.
	Notice melodies that form.
	[redacted]
2 minutes: Diamond Squats and Wide-Legged Squats	Place instrument in case. 1 minute: Diamond squats. 
	1 minute: Wide-legged squats. 
	Transition carefully between postures.
	[redacted]
5 minutes: Tuner Work	Choose an orchestral excerpt.
	Locate a section that is challenging to tune.
	Play each note as a slow half note (quarter note = 60).
	Align each note with 0 on the tuner.
	Focus on where you put each finger.
	When one finger is too high/low, fix that finger before moving on.
	Isolate two notes at a time and go back and forth between them.
	Focus on hand position.
	Notice how far each finger is from each other.
	The more accurate you are getting with the tuner, the better you are getting at intonation (the exact tuning of your fingers).

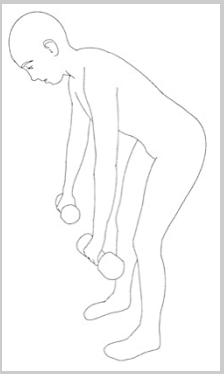
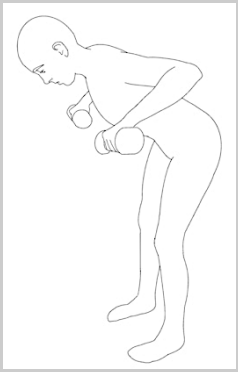
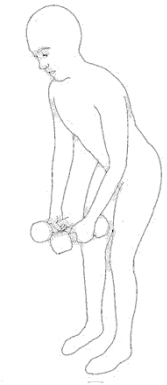
	The more you can repeat something accurately five times in a row time after time, the more this shows how your fingers are becoming trained.
	[redacted]
1 minute: Reverse Fly	Place instrument in case.  
	Extend the arms out in front of the body, and then open them out wide with elbows slightly bent.
	[redacted]
5 minutes: Left Hand Work	Choose that same orchestra excerpt or an etude.
	Eliminate the bow to focus just on left hand work.
	Think about hand frame and tapping lightly on the finger board. You will hear the pitches if you tap lightly. It is also a good reminder that one never needs to add an overabundance of pressure in general to the finger board.
	Choose a general tempo that works for the music—no need to use a metronome here. Identify where there are discrepancies in left hand function (i.e. where shifts or string changes are challenging).
	[redacted]
1 minute: Square Breathing	This technique involves finding a square or rectangular object (a sheet of music, tablet, wall hanging, door frame, etc.) and moving eyes from the top left corner of the object to the right side while inhaling, then down the right side while exhaling, then across the bottom while inhaling, then up the left side to the point and place of beginning while exhaling.
	[redacted]
Practice Log	Write down anything that you believe will help you for your next music workout.

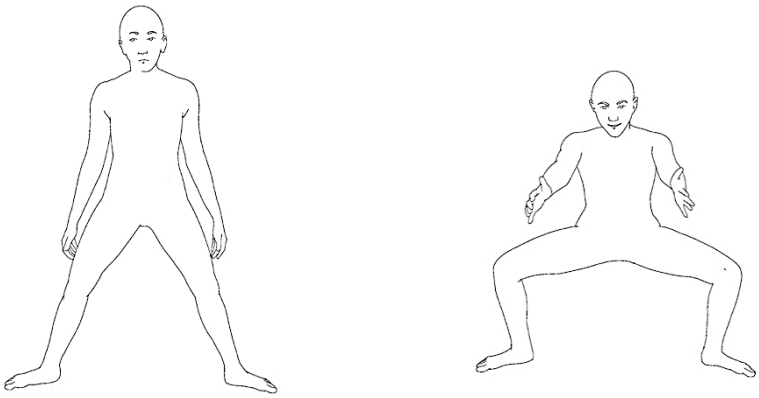


90 Minute Practice Template #2

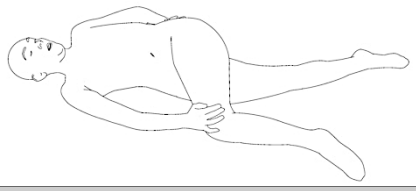
Time/Description	Actions
5 minutes: Cultivating Resonance and Hip-Width Distance Squats	Place bow on string between the bridge and the fingerboard a little closer to the bridge.
	Open string work from frog to tip, tip to frog, (down bow, then up bow) and the reverse, tip to frog, frog to tip (up bow, then down bow).
	Practice the resonance on each string.
	Aim for 5 bows movements in each direction before moving on to the next string (10 bows per string, 40 total across the four strings).
	Imagine an Olympic swimmer who does a summersault at each end of the pool before starting another lap.
	In this spirit, imagine each end of the bow has roughly 4 inches to prepare for the "turn around." This is when the bow glides seamlessly in the opposite direction
	The sound should be uniform across all areas of the bow.
	The sound should be seamless through the bow change.
	When you reach your destination (either at the frog or at the tip), lift your bow from the string to allow the instrument to keep ringing.
	While working on cultivating resonance, also practice hip-width distance squats.
	Separate your feet hip-width distance and sink down, bending at the knees, and rising back up with each half note.
	Keep the back upright and the spine straight the entire time.
	Take note of common tendencies: Is your bow shaky? Is it more challenging to stay in a good spot between the bridge and finger board? Is your bow moving seamlessly between down bow and up bow? etc.
	How does the addition of squats affect your focus?
	You may find your bow moves more smoothly after trying this exercise with squats first.
	[redacted]
1 minute: "Happy Point" Acupressure	Gently press the fleshy, muscular part of the hand between the thumb and index finger.
	Think happy thoughts!
	[redacted]
10 minutes: Vibrato Work	Choose a piece you are working on.
	Find a section with moving notes.
	Play this section slowly.
	Work on vibrating note to note.
	Play with a wide/slow vibrato.
	Focus on the vibrato hinge that must work in between notes.
	Make sure the left hand is soft.

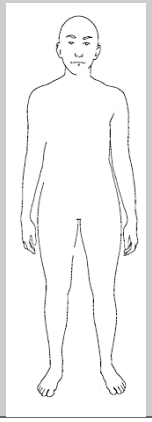
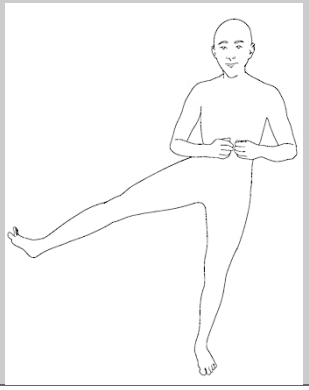
	This exercise SHOULD sound wobbly.
	Embrace the wobble!
	[redacted]
2 minutes: Downward Dog to Plank Pose	Place instrument in case.   
	1 minute: Downward dog.
	1 minute: Plank pose (either from hands, holding on to ergonomic grips, or from forearms. Ergonomic grips are pieces of equipment that allow you to do activities from your hands without resting weight on your palms (see appendix for details on where to find these).
	[redacted]
10 minutes: Tuner Work	Choose another piece you are working on.
	Turn to the middle of the piece.
	Work on the intonation, starting slowly at the beginning of a page until the timer goes off.
	Line up each note with 0 on the tuner.
	Focus on the relationship between notes.
	[redacted]
2 minutes: Ocean Sounding Breath	This exercise involves breathing more deeply and deliberately by gently tightening the back of the throat, engaging the whisper muscles. Without forcing the breath, slowly begin breathing in and out through the nose. This technique reduces the flow of air going in and out of the lungs. The sound produced is reminiscent of ocean waves.
	[redacted]
20 minutes: Metronome Work	Choose an entire movement of a piece.
	Divide each page of the movement into thirds.
	Start at the end of the movement and work backwards toward the beginning.
	Identify which section is the hardest.
	Take an inventory of the whole movement.
	[redacted]
4 minutes: Wide Rows and Reverse Fly	Place instrument in case. 2 minutes Wide rows.

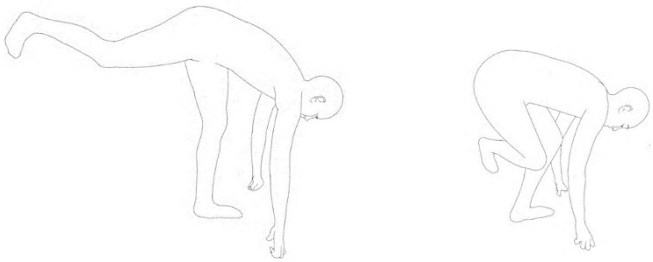
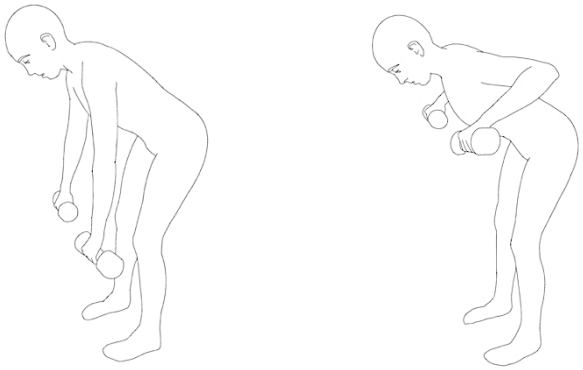
	 
	2 minutes: Reverse fly.  
	[redacted]
20 minutes: Tuner Work	Choose an entire movement of a piece (same one or another).
	Divide each page of the movement into thirds.
	Start at the middle of the movement and work toward both the beginning and end, alternating a section moving toward the beginning with one moving toward the end.
	Play the work slowly so that using the tuner is meaningful. If the music is too quick, the tuner will not respond accurately.
	Linger on notes that aren't lining up with 0 on the tuner.
	[redacted]
4 minutes: BodyTalk Cortices	The tapping motions with the right hand include tapping the forehead followed by tapping the chest bone. The first still position with the left hand is at the base of the head where the head meets the neck. The second still position with the left hand is centered on the back of the head. The third still position with the left hand is resting on the top of the head. The fourth still position with the left hand is pressing against the forehead (the right hand will tap on top of the left hand in this position). The fifth still position involves first placing both hands on either side of the head just above the ears for a cycle of breath, then taking turns tapping with the right and left hands while maintaining pressure against the side of the head with each still hand.

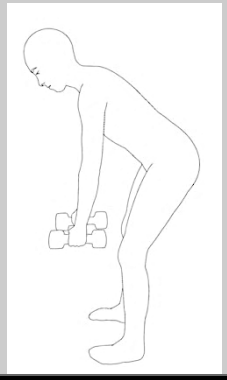
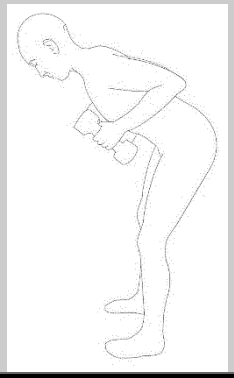
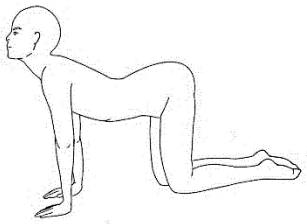
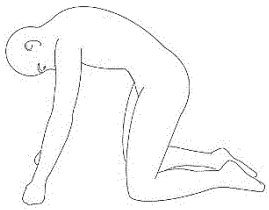
	[redacted]
10 minutes: Improvisation	Take a section of a piece.
	Focus on a few measures.
	Create a melody surrounding the measures.
	Think of the notes both in and out of order.
	Think about playing the beginning of one measure with the end of another measure.
	[redacted]
2 minutes: Wide-Legged Squats	Place instrument in case. 
	Hold the first for 2 seconds (breathe in), and the second for 4 seconds (breathe out).
	Repeat.
	[redacted]
Practice Log	Write down anything that you believe will help you for your next music work-out.

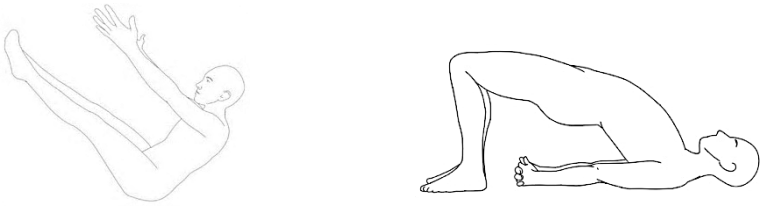
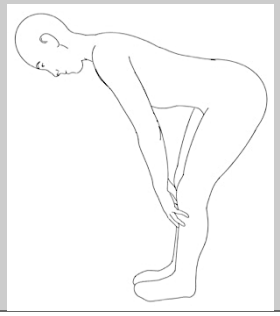
90 Minute Practice Template #3

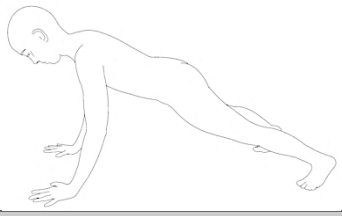
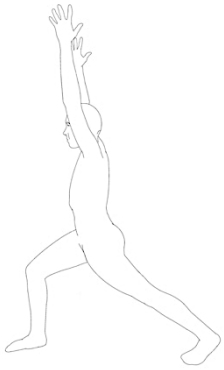
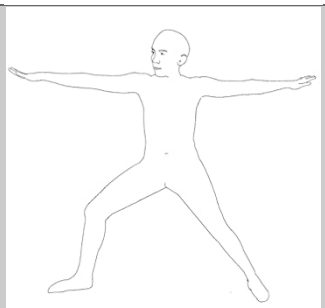
Time/Description	Actions
10 minutes: Cultivating Resonance and Diamond Squats	Place bow on string in between the bridge and the fingerboard a little closer to the bridge.
	Open string work from frog to tip, tip to frog, (down bow, then up bow) and the reverse, tip to frog, frog to tip (up bow, then down bow).
	Practice the resonance on each string.
	aim for 20 bows movements in each direction before moving on to the next string (40 bows per string, 80 total across the four strings).
	Imagine an Olympic swimmer who does a summersault at each end of the pool before starting the next lap.
	In this spirit, imagine each end of the bow has roughly 4 inches to prepare for the "turn around." This is when the bow glides seamlessly in the opposite direction.
	The sound should be uniform across all areas of the bow.
	The sound should be seamless through the bow change.
	When you reach your destination (either at the frog or at the tip), release from the string to allow the instrument to keep ringing.
	Aim for 20 open string strokes in each direction (one stroke is a down/up bow, or an up/down bow).
	At the same time, engage in diamond squats.
	Bring heels together, toes apart.
	Bend at the knees and sink on a down bow, and rise back up on an up bow (or vise versa).
	How does engaging in squats while cultivating your resonance affect your sound quality?
	You may find that your bow moves more smoothly after trying this exercise with squats first.
	[redacted]
2 minutes: Supine Twist	Place instrument in case. 
	1 minute per side.
	[redacted]
10 minutes: Metronome Work	Pick 5 lines of a piece of music you are working on.
	Set a slower-than-normal tempo.
	Work on two measures at a time.
	Think about your soft left hand.
	Think about your intonation.

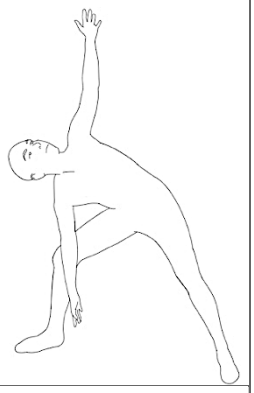
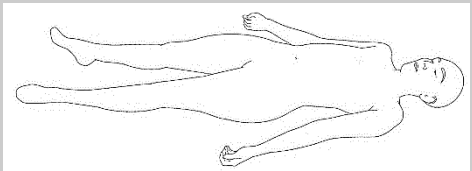
	Think about your bow use. Are you in the upper half when you should be in the lower half? Are you using too much bow on slurs or not enough bow? Etc.
	[redacted]
2 minutes: In a Pinch	Using the thumb and index finger, pinch the area where earlobes meet the side of the head and roll the skin back and forth or in small circles on both earlobes. Search for the "good ache" when massaging the area.
	[redacted]
10 minutes: Tuner Work	Pick another 5 lines from the same piece.
	Practice these notes without their intended rhythms so that each note is slow and steady.
	Consider starting at the end of the 5 lines and working toward the beginning.
	Focus carefully on making sure the intonation of each note, and the intervals between notes, are as accurate as possible.
	[redacted]
2 minutes: Standing Lateral Leg Lift	Place instrument in case.  
	One minute on each leg.
	Keep hips centered and back tall.
	Engage your core.
	[redacted]
20 minutes: Music Diagnostics	Isolate one whole page of music.
	Play from the beginning to the end of that page.
	After a first attempt, identify problem areas. Were there rhythms you weren't sure of? Were there notes that you found challenging? How about shifts, or fingerings?
	After identifying problem areas, start at the end of the page and work your way back to the beginning.
	Using a tuner/metronome is not necessary here, unless you would like to, of course.
	[redacted]

4 minutes: Healthy Thought Exchange and Shiva Squats	Place instrument in case. 
	2 minutes per leg.
	While engaging in shiva squats, think positive, healthy thoughts.
	Try reciting this mantra: "From the power of the creating within me, From the essence of all that I am, I let go of all energies within and around me That are not of love and light, That do not bring me joy. I let go of them right now… So be it!"
20 minutes: Music Diagnostics	Locate another page, from the same piece or another piece.
	Play from the beginning to the end of that page.
	After a first attempt, identify problem areas. Were there rhythms you weren't sure of? Were there notes that you found challenging? Were you too close to the fingerboard, or too close to the bridge? Etc.
	After identifying problem areas, start in the middle of the piece and work toward both the end and back to the beginning, piecing ideas together out of context.
	Using a tuner/metronome is not necessary here—but you can.
	[redacted]
4 minutes: Wide Rows and Narrow Rows	2 minutes: Wide rows. 
	2 minutes: Narrow rows.

	 
	[redacted]
10 minutes: Tuner Work	Go back to the page of music you isolated in the first 20-minute practice segment.
	Identify 3 challenging measures for intonation from each line of that page.
	Work on these notes slowly out of context.
	Don't rush through notes that are not in tune yet.
	[redacted]
2 minutes: Cat/Cow Pose and the Grief Box	Place instrument in case.  
	While stretching your spine and your abdomen through engaging in cat/cow, also practice the grief box.
	First, pay attention to the body, and notice where there might be feelings of tension, pain, or other discomfort.
	Placing these feelings in a grief box can make the mind-body connection feel lighter for the moment without suppressing or denying the emotion.
	Consider setting a box or container on the floor while you do cat/cow and place your thoughts in this container.
	[redacted]
10 minutes: Metronome Work	Return to the page of music you isolated in the second 20-minute practice segment.
	Identify three rhythmically challenging measures from each line of that page.
	Work on these measures—slowly if you need to—to assure the rhythms are correct.
	Speed up the metronome if you find that playing these measures slowly is beginning to be easy.

	Notice where there are similar rhythms throughout the page so you don't have to practice the same thing twice (unless you want to!)
	[redacted]
2 minutes: Bridge Pose and Boat Pose	Place instrument in case. 
	For 2 minutes, alternate bridge pose and boat pose.
	[redacted]
10 minutes: Improvisation	Isolate a section of a piece that you like.
	Change around rhythms/notes.
	Add or eliminate slurs.
	Create something new out of something that already exists.
	[redacted]
2 minutes: Square Breathing	Find an object with four sides (this could a page of sheet music or a tablet).
	Breathe in and out as you follow the sides of the object.
	Breathe in as you scan across the top, breathe out as you scan down a side, breathe in as you scan across the bottom, breathe out as you scan up side. Repeat.
	[redacted]
20 minutes: Orchestral Excerpt Practice	Locate an orchestral excerpt that you are unfamiliar with.
	Begin to explore the excerpt.
	Take an inventory of your process. Might you need to sing something through first? Do you need to listen to it? How might you problem-solve?
	Notice the key and time signatures.
	Notice pesky accidentals.
	Start to dissect the excerpt.
	[redacted]
4 minutes: Alternate between Half-Way Lift Pose and High Plank/Forearm Plank Pose	Place instrument in case. 

	
	Hold each pose for a few seconds before moving to the next one.
	You can either hold plank pose or forearm pose depending on how your wrists feel.
	[redacted]
20 minutes: Vibrato Work	Locate an entire movement of a piece you are working on.
	Find all the sections that have slurs and moving notes.
	Practice vibrating every note, making sure that you are vibrating across slurs and the space through the walking notes.
	It is easy to stop doing vibrato when you change notes.
	This practice segment is meant to target these kinds of moments.
	[redacted]
4 minutes: Sun Salutations Sequence (on right and left)	Place instrument in case. 30 seconds: Crescent lunge. 
	30 seconds: Warrior two. 

	30 seconds: Extended-side angle. 
	30 seconds: Reverse warrior. 
	Spend 2 minutes on each side before switching sides.
	[redacted]
5 minutes: Metronome Work WITHOUT Instrument	Locate the same orchestral except from earlier, or a different one.
	Find a section that looks like it may be challenging.
	Set a metronome to a doable tempo.
	Practice speaking this section.
	[redacted]
1 minute: Corpse Pose	Place instrument in case. 
	Relax into the ground. Relieve muscles from toes all the way to head.
	[redacted]

Practice Log

Write down anything that you believe will help you for your next music work-out.

Appendix

Barrett (2019). An examination of two-timed practice conditions: Measuring performance outcomes of pitch and rhythm.

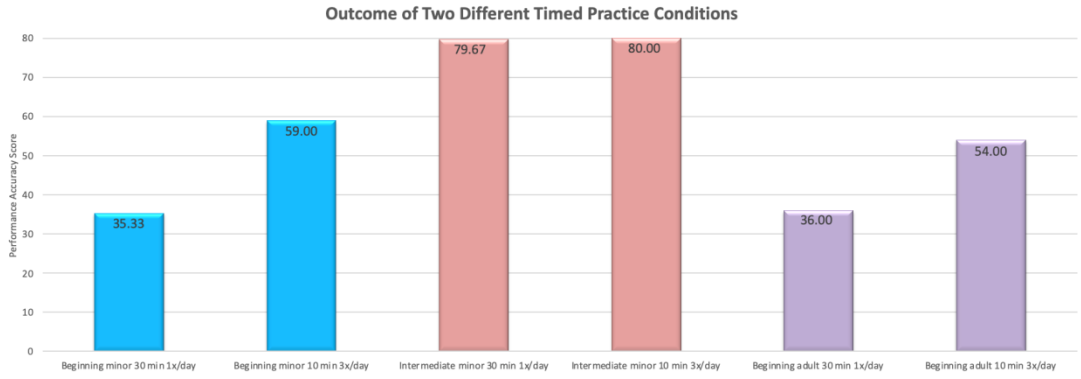
Methodology

The subjects were six violin and viola students, ranging in ages from 13-57 years. Subjects were divided into two groups. Group A (n = 3) and Group B (n = 3) were comprised of one beginning student under the age of 18, one intermediate student under the age of 18, and one beginning student over the age of 18. Students knew that each practice condition was some form of 30 minutes, but they only knew the guidelines of their own group. Data were collected over a two-week period of time, on a new piece written for them, specifically for the current study, culminating with a performance test at the end of the study. Students in Groups A and B were given a different timed 30-minute practice condition (30 minutes was established as the maximum amount of time that several of these students had in their schedules to devote to music on a daily basis). Group A was instructed to practice in one 30-minute segment, five days a week, not skipping more than two days in a row. Group B was instructed to practice three 10-minute segments, spaced out at least one hour between segments, five days a week, not skipping more than two days in a row. Each student had three private 30-minute lessons in addition to their practice condition. Lessons did not count as practice sessions.

The study commenced at the first lesson for each student where they were given their practice condition and specific guidelines to follow. Each student also was provided a practice log (optional) to record their practice sessions. Lesson number two occurred half-way through

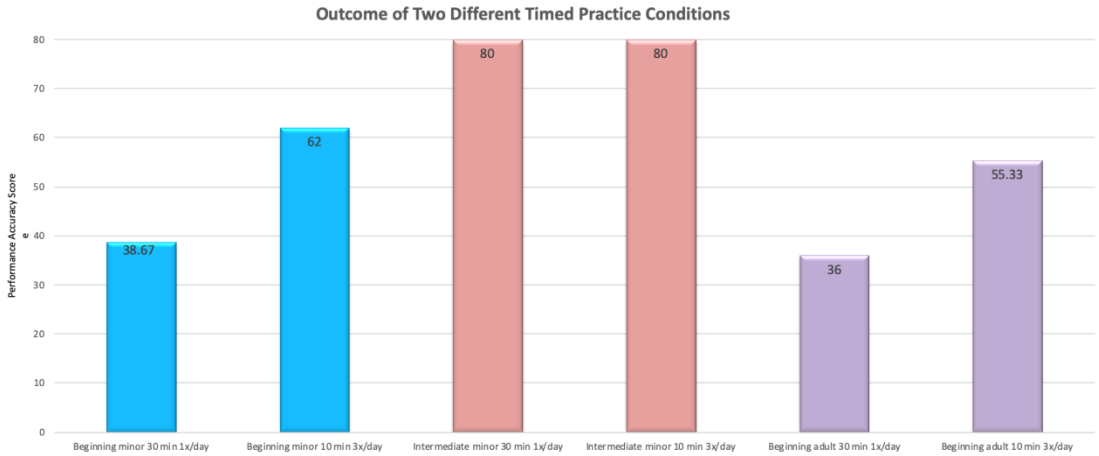
the study after week 1, and the third and final lesson occurred after week 2, at which point each student performed the piece three times in a row (18 total samples). Means for the students' three performances were then calculated to determine and evaluate consistency. The final performance test was measured based on a rubric worth 80 points (40 total bars, with each bar worth 2 points: 1 point for accurate note, and 1 point for accurate rhythm). This data was analyzed by two observers. Observer 1 is the author of the current study, and private instructor of the students who participated in the study. Observer 2 was an anonymous peer reviewer. Lessons were recorded using the Macbook Pro-Photo Booth application. Students' practice sessions were recorded with either a video/audio or audio-only device. The final performance was recorded on the iPhone voice recorder application, without video for anonymity. The peer reviewer did not know which sample belonged to which student, and which student was in which practice condition.

Results



Results from observer (top)

Results from observer 2 (bottom)



Performances were analyzed using an 80-point rubric, measuring outcomes of pitch and rhythm (2 points per bar—1 point for correct notes for the entire bar, 1 point for correct rhythm for the entire bar—for a 40-bar piece). Each student performed the piece three times. Means for the students' three performances were then calculated to determine and evaluate consistency. Observers 1 and 2 both found a higher mean score for Group B (10-min/3x day) than for Group A (30-min/1x day). Observer 1 found a Group A mean score of 50.33 and a Group B mean score of 64.33, while Observer 2 found a Group A mean score of 51.56 and a Group B mean score of 65.78. Observer 1 found a higher score for each student in Group B (beg/min = 59; int/min = 80; beg/adult = 54) than in Group A (beg/min = 35.33; int/min = 79.67; beg/adult = 36). Observer 2 found a higher score for each beginning student in Group B (beg/min = 62; beg/adult = 55.33) than in Group A (beg/min = 38.67; beg/adult = 36), but no difference in scores between the two intermediate students (Groups A and B int/min = 80). Another observation was that all three students in the 10 minutes/3x day group attempted to learn the entire piece, while two out of three students in the 30 minutes/1x day group attempted to learn only half of the piece. Observer

2 found generally higher performance outcome scores for the students than Observer 1. Both observers, however, found the exact same scores for Groups A and B for the int/min student and the beg/adult student.

Discussion

Observer 1 is the private instructor of the students in the current study, and a DMA Candidate at the University of Washington. Observer 2 is a colleague at the University of Washington. Observers 1 and 2 had very similar performance outcome scores. Observer 2 was provided with a set of guidelines to evaluate the students' performance outcome scores. The guidelines stated if the students got a note wrong in a measure, the whole measure could not receive a point for note, and if the student got a rhythm wrong in a measure, the whole measure could not receive a point for rhythm. In addition, the guidelines also stated that if a student backtracked and started over a portion of the measure, the measure would not receive either a point for note or rhythm. The guidelines also said to not evaluate the students for slight tempo changes, wrong bowings or a lack of musicality. The findings indicate that Observer 2 found higher performance outcome scores for the students (except for the int/min student and the beg/adult student in Groups A and B). It is possible that Observer 1 evaluated the students slightly more critically than Observer 2 because of the familiar relationship between the students and Observer 1.

It is noteworthy that every student in Group B attempted to learn the entire piece, while only the int/min student in Group A attempted this endeavor. Both the beg/min and beg/adult students attempted to learn only half the piece. Anecdotally, both of these students informed Observer 1 that because they only had 30 minutes, they felt unable to learn the whole piece.

After evaluating students' practice sessions, it became evident that the students in Group B engaged in more deliberate practice and self-regulation behaviors than the students in Group A. Each student in Group B utilized each of their three 10 minute segments to work on a third of the piece. These are possible reasons that the students in Group B attempted the whole piece, and received higher performance outcome scores.

The two int/min students essentially did not differ from one another. The int/min student in Group A, who received a mean of 79.67 from Observer 1, received 80/80 on two out of the three performance attempts, and a 79/80 for one missed rhythm in the third performance attempt. Both of the int/min students in Groups A and B are active violinists/violists in the Seattle Youth Symphony Orchestra program and members of their school orchestras. These findings are in alignment with Sloboda et al. (1996), whose results indicated a higher skill level was more highly correlated with formal practice.

Many of these findings are similar to those of Nielsen (1999) and Nielsen (2001) who indicated that students engaging in deliberate practice learn to organize information and integrate it with existing knowledge to optimize their learning. This is evident from all three students in Group B who chose to organize their time a certain way, and of the int/min student in Group A. Results are also similar to those of Stambaugh (2011), who found that the random group retained more information than the blocked group. In the current study, Group A resembles the blocked practice schedule while Group B resembles the random schedule. In looking at the results of the two beg/adult students, findings are similar to those of Logan and Balota (2008) who indicated that adults benefit from spaced retrieval. This was more evident of the beg/int student in Group B than in Group A.

There were several ancillary issues of interest in the current study. The int/min student in Group B missed one or more of their 10-minute segments, while the beg/min and the beg/adult students in Group A missed one or more of their 30-minute segments. Future research should continue to examine how self-regulation and deliberate practice contribute to musical achievement. A replication of this study should be done with a larger sample size so students can be randomly placed into groups. With only six students in the current study, students could not be randomly placed into groups. Also with such a limited sample size only vague correlations can be made. Another area to consider is age. For this study, age wasn't a factor other than below or above the age of 18. Experience was the sole factor for how the students were divided into the two groups. Future studies could specifically look at age as a factor.

The current study could have significant impact on the practice of educating instrumental musicians. The continuing examination of efficient utilization of time in conjunction with deliberate practice and self-regulation could potentially inform researchers about how the next generations of students gain instrumental competence.

All performance outcome scores from Observer 1:

Group A (30 min/1x day)

beg/min:
1. 39/80
2. 40/80
3. 37/80

int/min:
1. 80/80
2. 80/80
3. 79/80

beg/adult:
1. 36/80

2. 36/80
3. 36/80

Group B (10 min/3x day)

beg/min:
1. 57/80
2. 62/80
3. 58/80

int/min:
1. 80/80
2. 80/80
3. 80/80

beg/adult:
1. 53/80
2. 56/80
3. 53/80

All performance outcome scores from Observer 2:

Group A:

beg/min:
1. 39/80
2. 40/80
3. 37/80

int/min:
1. 80/80
2. 80/80
3. 80/80

beg/adult:
1. 36/80
2. 36/80
3. 36/80

Group B:

beg/min:

1. 63/80
2. 62/80
3. 61/80

int/min:
1. 80/80
2. 80/80
3. 80/80

min/adult:
1. 52/80
2. 57/80
3. 57/80

Ergonomic grips for comfortable pushup position

Amazon: Perfect Fitness, Yoga-Grip, Bear Blocks

References

Ackermann, B., & Adams, R. (2003). Physical characterisics and pain patterns of skilled violinists. *Medical Problems of Performing Artists, 18*(2), 65-71.

Ackermann, B., Adams, R., & Marshall, E. (2002). Strength or endurance training for undergraduate music majors at a university? *Medical Problems of Performing Artists, 17,* 33-41.

Ackermann, B., Adams, R., & Marshall, E. (2002). The effect of scapula taping on electromyographic activity and musical performance in professional violinists. *Australian Jornal of Physiotherapy, 48*(3), 197-203. Doi: 10.1016/S0004-9514(14)60224-5

Ackermann, B., & Driscoll, T. (2013). Attitudes and practices of parents of teenage musicians to health issues related to playing an instrument. *Medical Problems of Performing Artists, 28*(1), 24-27.

Ackermann, B., & Miller, C. (2018). Essentials of performing arts medicine course. *Performing Arts Medicine Association.*

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5.* (5th ed.). American Psychiatric Association.

Araujo, N. C. K., Cardia, M. C. G., Masculo, F. S., & Lucena, N. M. G. (2009). Analysis of the frequency of postural flaws during violin performance. *Medical Problems of Performing Artists, 24*(4), 181-184.

Armbrecht, K. (2011). *Negative conditions and psychological effects of performance anxiety between musicians and athletes* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3462956)

Ator, J. (2012). Yoga for everyday athletes. *Women's health, 9*(6), 134.

Baader, A. P., Kazennikov, O., & Wiesendanger, M. (2005). Coordination of bowing and fingering in violin playing. *Cognitive Brain Research, 23,* 436-443.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.

Barbar, A., Crippa, J., & Osório, F. (2014). Performance anxiety in Brazilian musicians: Prevalence and association with psychopathology indicators. *Journal of Affective Disorders*, *152-154*, 381-386.

Barczyk-Pawelec, K., Sipko, T., Demczuk-Wlodarczyk, E., & Boczar, A. (2012). Anterioposterior spinal curvatures and magnitude of asymmetry in the trunk in musicians playing the violin compared with non-musicians. *Journal of Manipulative and Physiological Therapeutics, 35*(4), 319-326.

Barry, N. H. (1990). The effects of different practice techniques on technical accuracy and musicality in student instrumental music performance. *Research Perspectives in Music Education, 44*(1), 4-8.

Bartolome, S. J. (2009). Naturally emerging self-regulated practice behaviors among highly successful beginning recorder students. *Research Studies in Music Education, 31*(1), 37-51.

Bauman, J. N. (2016). The stigma of mental health in athletes: Are mental thoughness and mental health seen as contradictory in elite sport? *British Journal of Sports Medicine, 50*(3), 135-136.

Berque, P., & Gray, H. (2002). The influence of neck-shoulder pain on trapezus muscle activity among professional violin and viola players: An electromyographic study. *Medical Problems of Performing Artists, 17*, 68-75.

Biasutti, M., & Concina, E. (2014). The role of coping strategy and experience in predicting music performance anxiety. *Musicae Scientiae, 18*(2), 189-202. Doi: 10.1177/1029864914523282

Bloom, B. S. (1985b). Generalizations about talent development. In B. S. Bloom (Ed.), *Developing talent in young people.* Ballantine Books.

Bonneville-Roussy, A., & Bouffard, T. (2015). When quantity is not enough: Disentangling the roles of practice time, self-regulation and deliberate practice in musical achievement. *Psychology of Music, 43*(5), 686-704.

Boudenot, A., Maurel, D. B., Pallu, S., Ingrand, I., Boissaeu, N., Jaffré, C., & Portier, H. (2016). Quick benefits of interval training *versus* continuous training on bone: A dual-energy X-ray absorptiometry comparative study. *International Journal of Experimental Pathology, 96*, 370-377. Doi: 10.1111/iep.12155

Bouffard, Thérèse & Parent, Sophie & Larivée, Serge. (1993). Self-regulation on a concept-formation task among average and gifted students. *Journal of Experimental Child Psychology, 56*(1), 115-134. Doi: 10.1006/jecp.1993.1028

Boyle, C., Sayers, S., Jensen, B., Headley, S., & Manos, T. (2004). The effects of yoga training and a single bout of yoga and delayed onset muscle soreness in the lower extremity. *Journal of Strength and Conditioning Research, 18*(4), 723-729.

Bryan, W. L., & Harter, N. (1897). Studies in the physiology and psychology of the telegraphic language. *Psychological Review, 4,* 27-53.

Bryan, W. L., & Hartrer, N. (1899). Studies on the telegraphic language: The acquisition of a hierarchy of habits. *Psychological Review, 6,* 345-375.

Burin, A. B., & Osório, F. d. L. (2016). Interventions for music performance anxiety: Results from a systematic literature review. *Archives of Clinical Psychiatry, 43*(5), 116-131. Doi: 10.1590/0101-60830000000097

Burrell, L. (2017, September 20). 101 ways to differentiate a scale. Navigating the Maze: Perspectives on music, teaching, Dystonia, and Feldenkrais. https://lisaburrellviolin.com/2017/09/20/101-ways-to-differentiate-a-scale/

Burrell, L. (2019, October 15). 101 ways to practice anything: Variations for individual practice, classroom teaching, and ensemble rehearsals. Navigating the the Maze: Perspectives on music, teaching, Dystonia, and Feldenkrais. https://lisaburrellviolin.com/2019/10/15/101-ways-to-practice-anything-variations-for-individual-practice-classroom-teaching-and-ensemble-rehearsals/

Butzer, B., & Ahmed, K., & Khalsa, S. B. S. (2016). Yoga enhances positive psychological states in young adult musicians. *Applied Psycophysiol Biofeedback, 41,* 191-202. Doi: 10.1007/s10484-051-9321-x

Calais-Germain, B. (2007). *Anatomy of movement*. Seattle, WA: Eastland Press.

Cantwell, R. H., & Millard, Y. (1994). The relationship between approach to learning and learning strategies in learning music. *British Journal of Eduction Psychology, 64*, 45-63.

Carter, C. E., & Grahn, J. A. (2016). Optimizing music learning: Exploring how blocked and interleaved practice schedule affect advanced performance. *Frontiers in Psychology, 7*(1251), 2-10. Doi.org.offcampus.lib.washington.edu/10.3389/fpsyg.2016.01251

Chan, C., Driscoll, T., & Ackermann, B. (2014). Effect of a musicians' exercise intervention on performance-related musculoskeletal disorders. *Medical Problems of Performing Artists, 29*(4), 181-188.

Chang, J. C., & Midlarsky, E., & Lin, P. (2003). Effects of meditation on music performance anxiety. *Medical Problems of Performing Artists, 18,* 126-130.

Cirakoglu, O., & Senturk, G. (2013). Development of a performance anxiety scale for music students. *Medical Problems of Performing Artists, 28*(4), 199-206.

Cirillo, F. (2006). *The pomodoro technique*. San Francisco, CA: Creative Commons.

Coles, M. E., & Heimberg, R. G. (2000). Patterns of anxious arousal during exposure to feared situations in individuals with social phobia. *Behavior Research and Therapy,* 38, 405-424.

Comyns, T. M., Harrison, A. J., Hennessy, L. K., & Jensen, R. L. (2006). The optimal complex training rest interval for athletes from anaerobic sport. *Journal of Strength and Conditioning Research, 20*(3), 471-476.

Coon, B. U. (2007). The effect of asymmetric positioning in student violinists result in focal upper quadrant pain and weakness. *Journal of Hand Therapy, 30,* 1.

CorePower Yoga. (2016). *Power yoga teacher training.* Denver, CO; Seattle, WA.

Cox, W., & Kenardy, J. (1993). Performance anxiety, social phobia, and setting effects in instrumental music. *Journal of Anxiety Disorders, 7*, 49-60.

Csikszentmihalyi, M. (1975/2000). Beyond boredom and anxiety: Experiencing flow in work and play (2nd ed.). San Francisco, CA: Jossey-Bass.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience.* New York: Harper & Row.

Csikszentmihalyi, M., & Csikszentmihalyi, I. S. (1988). Introduction to Part IV. In M. Csikszentmihalyi & I.S. Csikszentmihalyi (Eds.), *Optimal experience: Psychological studies of flow in consciousness* (pp. 251-265). New York: Cambridge University Press.

Dawson, W. J. (2008). *Fit as a fiddle.* Lanham, MD: Rowman & Littlefield Education.

Defares, P.B., Grossman, P., & Kok, J. (1986). Differential effects of trait anxiety levels on hyperventilatory breathing during performance under stressful conditions. *Biological Psychology, 22*(2), 196-197. https://doi.org/10.1016/0301-0511(86)90067-0

Diaz, F. M. (2018). Relationships among meditation, perfectionism, mindfulness, and performance anxiety among collegiate music studies. *Journal of Research in Music Education, 66*(2), 150-167. doi: 10.1177/0022429418765447

Dick, R. W., Berning, J, R., Dawson, W., Ginsburg, R. D., Miller, C., & Shybut, G. T. (2013). Athletes and the Arts: The role of sports medicine in the performing arts. *Current Sports Medicine Reports, 12*(6), 397-403.

Drake, C., & Palmer, C. (1999). Skill acquisition in music performance: Relations between planning and temporal control. *Cognition, 74*(2000), 1-32.

Ericsson, K. A., Krampe, R. T., Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review, 100*(3), 363-406.

Ericsson, A. & Pool, R. (2016). *Peak: Secrets from the new science of expertise.* Boston, MA: Mariner books.

Feldman, L. (2010) Keeping your body in tune. *Canadian Musician*, 32(5), 38-39.

Foxman, I., & Burgel, B. J. (2006). Musician health and safety. *Aaohn Journal, 54*(7), 309-316.

Fredrikson, M., & Gunnarsson, R. (1992). Psychobiology of stage fright: The effect of public performance on neuroendocrine, cardiovascular and subjective reactions. *Biological Psychology, 33*, 51-61.

Fullagar, C., Knight, P., & Sovern, H. (2013). Challenge/skill balance, flow, and performance anxiety. *Applied Psychology, 62*(2), 236-259. doi:10.1111/j.1464-0597.2012.00494.x

Groth, T. G. (2016). *Musician's maintenance: A scientific approach to healthy practice techniques for optimal performance* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 10107851)

Gruson, L. M. (2001). Rehearsal skill and musical competence: Does practice make perfect? In J. A. Sloboda (Eds.), Generative processes in music: The psychology of performance, improvisation, and composition (pp. 1-28). Oxford University Press.

Hallam, S. (2001). The development of expertise in young musicians: Strategy use, knowledge acquisition and individual diversity. *Music Education Research, 3*(1), 7-23. doi: 10.1080/14613800020029914

Havas, K. (1974). *Stage fright: Its causes and cures, with special reference to violin playing.* London: Bosworth.

Herzog (2017). Eccentric vs. concentric muscle contraction: That is the question. *Journal of Sport and Health Science, 6*, 128-129.

Hoge, E. A., Guidos, B. M., Mete, M., Bui, E., & Pollack, M. H., Simon, N. M., & Dutton, M. A. (2017). Effects of mindfulness meditation on occupational functioning and health care utilization in individuals with anxiety. *Journal of Psychosomatic Research, 95*, 7-11.

Hyllegard, R., & Bories, T. (2008). Deliberate practice theory: Relevance, effort, and inherent enjoyment of music practice. *Perceptual and Motor Skills, 107*(2), 439-448.

Iqbal, N., Singh, A., & Bano, S. (2014). Effects of dynamic meditation on anxiety. *Indian Journal of Health and Wellbeing, 5*(8), 909-912.

Janzen, T. B., Thompson, W. F., Ammirante, P., & Ranvaud, R. (2014). Timing skills and expertise: Discrete and continuous timed movements among musicians and athletes. *Frontiers in Psychology, 5*(1482), 1-11. Doi: 10.3389/fpsyg.2014.01482

Kabat-Zinn, J. (2015) *Mindfulness*. *Mindfulness, 6*(6), 1481-1483. https://doi.org/10.1007/s12671-015-0456-x

Kazennikov, O., & Wiesendanger, M. (2009). Bimanual coordination of bowing and fingering in violinists effects of position changes and string changes. *Mottor Control, 13*(3), 297-309. Doi: 10.1123/mcj.13.3.297

Kempter, S. (2003). *How muscles learn: Teaching the violin with the body in mind.* Van Nuys, CA: Alfred Music.

Kenny, D. T., & Osborne, M. S. (2006). Music performance anxiety: New insights from young musicians. *Advances in Cognitive Psychology, 2*(2-3), 103-112.

Kenny, D. (2011). Phenomenology of music performance anxiety. In D. Kenny (Ed.), *The psychology of music performance anxiety* (pp. 1-19). Oxford: Oxford University Press. doi:10.1093/acprof:oso/9780199586141.003.0014

Kenny, D. (2011). Comorbidity and music performance anxiety. In D. Kenny (Ed.), *The psychology of music performance anxity* (pp. 64-66). Oxford: Oxford University Prss.

Kesselring, J. (2012). Music performance anxiety. In E. Altenmüller, M. Wiesendanger, & J. Kesselring (Ed.), *Music, motor control and the brain* (pp.1-12). Oxford University Press. doi:10.1093/acprof:oso/9780199298723.003/0020

Khalsa, S. B. S., Shorter, S. M, Cope, S., Wyshak, G., & Sklar, E. (2009). *Applied Psychophysiol Biofeedback, 34*, 279-289.

Khalsa, S., Butzer, B., Shorter, S., Reinhardt, K., & Cope, S. (2013). Yoga reduces performance anxiety in adolescent musicians. *Alternative Therapies in Health and Medicine*, 19(2), 34-45.

Khng, K. H. (2017). A better state of mind: Deep breathing reduces state anxiety and enhances test performance through regulating test cognitions in children. *Cognition and Emotion,* 31(7), 1502-1510. Doi: 10.1080/02699931.2016.1233095

Killough, C. M., Thompson, L. A., & Morgan, G. (2015) Self-regulation and working memory in musical performers. *Psychology of Music, 43*(1), 86-102. doi: 10.1177/0305735613498917

Kim, S. J. (2008). *A collective case study of self-regulated learning in instrumental practice of college music majors.* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database (UMI No. 3327057)

Kinoshita, H., & Obata, S. (2009). Left hand finger force in violin playing: Tempo, loudness, and finger differences. *Acoustical Society of America, 126*(1), 388-395. Doi: 10.1121/1.3139908

Kobori, O., Yoshie, M., Kudo, K., & Ohtsuki, T. (2011). Traits and cognitions of perfectionism and their relation with coping style, effort, achievement, and performance anxiety in Japanese musicians. *Journal of Anxiety Disorders, 25*(5), 674-679. doi:10.1016/j.janxdis. 2011.03.001

Krampe, R. T., & Ericsson, A. K. (1996). Maintaining Excellence: Deliberate practice and elite performance in young and older pianists. *Journal of Experimental Psychology, 125*(4), 331-359.

Krampen, G. (2010). Improvement of orthography test performance relaxation exercises: Results of a controlled field experiment in basic secondary education. *Educational Psychology, 30*(5), 533-546.

Krause, P. (2009). The benefits of cross-training. *AAMA Journal, 22*(2), 15-16.

Lacaille, N., Whipple, N., & Koestner, R. (2005). Reevaluating the benefits of performance goals. *Medical Problems of Performing Artists, 20*, 11-16.

Larsen, Ch., Larsen, C., Hartlelt, O. (2008). *Köperhaltungen: Analyserien und verbessern*. Germany: *Trias Verlag.*

LeBlanc, A., Jin, Y. C., Obert, M., & Siivola, C. (1997). Effect of audience on music performance anxiety. *Journal of Research in Music Education, 45*(3), 480-496.

Leon-Guerrero, A. (2008). Self-regulation strategies used by student musicians during music practice. *Music Education Research, 10*(1), 91-106.

Leska, M. (2010). *Violin and yoga* (Doctoral dissertation). Available from UMI dissertation publishing and ProQuest dissertation and Theses database. (UMI No. 3439820)

Lima, L. C. R., & Denadai, B. S. (2015). Attenuation of eccentric exercise-induced muscle damage conferred by maximal isometric contractions: A mini review. *Frontiers in Physiology, 6*, 1-7.

Lin, P., Chang, J., Zemon, V., & Midlarsky, E. (2008). Silent illumination: A study on Chan (Zen) meditation, anxiety, and musical performance quality. *Psychology of Music, 36*(2), 139-155.

Litscher, G., Yannacopoulos, T., & Kreisl, P. (2018). Nogier reflex: Physiological and experimental results in Auricular medicine—a new hypothesis. *Medicines (Basel, Switzerland), 5*(4), 132. Doi: 10.3390/medicines5040132

Liu, S., & Hayden, G. F. (2002). Maladies in musicians. *Southern Medical Journal, 95*(7), 727-734.

Llobet J. R. I., & Odam, G. (2007). *The musician's body: A maintenance manual for peak performance.* London, England: The Guildhall School of Music and Drama and Ashgate Publishing Limited.

Logan, J. M., & Balota, D. A. (2008). Expanded vs. equal interval spaced retrieval practice: Exploring different schedules of spacing and retention interval in younger and older adults. *Aging, Neuropsychology, and Cognition, 15*, 257-280. doi: 10.1080/13825580701322171.

López-Íñiquez, G., & Pozo, J. I. (2016). Analysis of constructive practice in instrumental music education: Case study with an expert cello teacher. *Teaching and Teacher Education, 60*, 97-107. doi: 10.1016/j.tate.2016.08.002

Lordo, J. (2015). *Expertise development in musicians: The roles of deliberate play and deliberate practice.* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 101807609).

Manchester, R. A. (2008). Periodization for perfomring artists? *Medical Problems of Performing Artists, 23*(2), 25-46.

Maran, A. G. (1998). Performing arts medicine. *British journal of sports medicine, 32*(1), 5.

McCormick, J., & McPherson, G. E. (2003). The role of self-efficacy in a musical performance examination: An exploratory structural equation analysis. *Psychology of Music, 31*(1), 37-51.

McPherson, G. E. (2000/2001). Commitment and practice: Key ingredients for achievement during the early stages of learning a musical instrument. *Bulletin of the Council for Research in Music Education,* 147, 122-127.

McPherson, G. E., & McCormick, J. (1999). Motivational and self-regulated learning components of musical practice. *Bulletin of the Council for Research in Music Education, 17*(141), 98-102.

McPherson G. E., & McCormick (2000). The contribution of motivational factors to instrumental performance in a music examination. *Research Studies in Music Education, 15*, 31-39.

McPherson, G. E., & Renwick, J. M. (2001). A longitudinal study of self-regulation in Children's musical practice. *Music Education Research, 3*(2), 169-186. doi: 10.1080/14613800120089232

McPherson, G. E., & Zimmerman, B. J. (2002) Self-regulation of musical learning: A social cognitive perspective. In R. Colwell & C. Richardson (Eds.), *The new handbook of research on music teaching and learning* (pp. 327-347). New York, NY: Oxford University Press.

Menuhin, Y. (1977). *Unfinished journey.* New York: Alfred A. Knopf.

Miksza, P. (2006). Relationships among impulsiveness, locus of control, sex, and music practice. *Journal of Research in Music Education, 54*(4), 308-323.

Miksza, P., & Tan, L. (2015). Predicting collegiate wind players' practice efficiency, flow, and self-efficacy for self-regulation: An exploratory study of teachers' instruction and students' practicing. *Journal of Research in Music Education, 63*(2), 162-179.

Miksza, P., Tan, L., & Dye, C. (2016). Achievement motivation for band: A cross-cultural examination of the 2 x 2 achievement goal motivation framework. *Psychology of Music, 44*(6), 1372-1388. Doi: 10.1177/0305735616628659

Moraes, G. F. d. S., Antunes, A. P. (2012). Musculoskeletal disorders in professional violinists and violists: A systematic review. *Acta Ortop Bras, 20*(1), 43-47.

Nadler, S. F., Chou, L. H., Toledo, S. D., Akuthota, V., & Drake, D. F. (2004). Sports and performing arts medicine: general considerations for sports and performing arts medicine. *Sports and Performing Arts Medicine, 85*(3), S48-51.

Nawawi, U. (2014). The effect of low impact and mixed impact aerobic exercise on percentage of body fat. *Asian Social Science, 10*(5), 163-167.

Nielsen, S. G. (1999). Learning strategies in instrumental music practice. *Music Ed., 16*(3), 275-291.

Nielsen, S. G. (2001). Self-regulating learning strategies in instrumental music practice. *Music Education Research, 3*(2), 155-167. doi: 10.1080/14613800120089223

Nyman, T., Wiktorin, C., Mulder, M., & Johansson, Y. L. (2007). Work postures and neck-shoulder pain among orchestra musicians. *American Journal of Industrial Medicine, 50*(5), 370-376. Doi: 10.1002/ajim.20454

Oare, S. R. (2007). *Goals and self-assessment in the middle school learner: A study of music practice habits.* (Doctoral dissertation). Available from ProQuest Dissertations and Thesis database (UMI No. 3282174).

Osborne, M.S., & Franklin, J. (2002). Cognitive processes in music performance anxiety. *Australian Journal of Psychology, 54*(2), 86-93.

Osório, F. L., Burin, A. B., Nirenberg, I. S., & Barbar, A. E. M. (2017). Music performance anxiety: Perceived causes and coping strategies. *European Psychiatry, 41S,* S106-S169. doi: 10.1016/j.eurpsy.2017.01.1882

Ostwald, P. F., Baron, B. C., Byl, N. M., & Wilson, F. R. (1994). Performing arts medicine. *The Western Journal of Medicine, 160,* 48-52.

Paarup, H. M., Baelum, J., & Manniche, C. (2012). Occurrence and coexistence of localized musculoskeletal symptoms and findings in work-attending orchestra musicians: An exploratory cross-sectional study. *BMC Research Notes, 5*, 541.

Park, K. N., Kwon, O. Y., & Ha, S. M. (2012). Comparison of electromyographic activity and range of neck motion in violin students with and without neck pain during playing. *Medical Problems of Preforming Artists, 27*(4), 188-192.

Patston, T. (2014). Teaching stage fright? Implications for music educators. *B. J. Music Education, 31*(1), 85-98. doi: 10.1017/S0265051713000144

Pike, P. (2017). Exploring self-regulation through a reflective practicum: A case study of improvement through mindful piano practice. *Music Education Research, 19*(4), 398-409.

Pitts, S., & Davidson, J. (2000). Developing effective practice strategies: Case studies of three young instrumentalists. *Music Education Research, 2*(1), 45-56.

Pitts, S.E., Davison, J.W. & McPherson, G. (2000). Models of success and failure in instrumental learning: Case studies of young players in the first 20 months of learning. Bulletin of the Council for Research in Music Education. 51-69.

Powell, D. (2004). Treating individuals with debilitating performance anxiety: An introduction. *JCLP/In Session, 60*(8), 801-808. doi:10.1002/jclp.20038

Powers, T. A., Koestner, R., Lacaille, N., Kwan, L., & Zuroff, D. C. (2009). Self-criticism, motivation, and goal progress of athletes and musicians: A prospective study. *Personality and Individual Differences, 47*, 279-283. Doi: 10.1016/j.paid.2009.03.012

Rabuffetti, M., Converti, R. M., Boccardi, S., & Ferrarin, M. (2007). Tuning of the violin-performer interface: An experimental study about th effcts of shoulder rest variations on playing kinematics. *Medical Problems of Performing Artists, 22*(2), 58-66.

Rahl, H. A., Lindsey, E. K., Pacilio, L. E., Brown, K. W., & Creswell, J. D. (2017). Brief mindfulness meditation training reduces mind wandering: The critical role of acceptance. *Emotion, 17*(2), 224-230. doi: 10.1037/emo0000250

Rainero, R. (2012). Practicing vocal music efficiently and effectively: Applying "deliberate practice" to a new piece of music. *Journal of Singing, 69*(2), 203-214.

Rensing, N., Schemmann, H., & Zalpour, C. (2018). Musculoskeletal demands in violin and viola playing. *Medical Problems of Performing Artists, 33*(4), 265-274.

Renwick, J. M., & McPherson, G. E. (2002). Interest and choice: Student-selected repertoire and its effect on practicing behaviour. *Music Education, 19*(2), 173-188.

Ross, S. L. (1985). The effectiveness of mental practice in improving the performance of college trombonists. *Journal of Research in Music Education, 33*(4), 221-230.

Rumsey, H. E., Aggarwal, S., Hobson, E. M., Park, J., & Pidcoe, P. (2015). Anxiety's effect on muscle activation and fatigue in trumpet players: A pilot study. *Medical Problems of Performing Artists, 30*(4), 203.

Ryba, T. V. (2006). The benefits of yoga for athletes: The body. *Athletic therapy today, 11*(2), 32-34.

Sadler, M., & Miller, C. (2010). Performance Anxiety. *Social Psychological and Personality Science, 1*(3), 280-287. doi: 10.1177/1948550610370492

Salmon, P. G. (1992). *Notes from the green room: Coping with stress and anxiety in musical performance.* San Francisco, CA: Jossey-Bass.

Santana, E. L. (1978). *Time-efficient skill acquisition in instrumental music study* (PhD doctoral dissertation). Florida State University, Tallahassee, Florida.

Schmidt, C. P. (2005). Relations among motivation, performance achievement, and music experience vartiables in secondary instrumental music students. *Journal of Research in Music Education, 53*(2), 134-147. Doi: 10.1177/002242940505300204

Schneider, E., & Chesky, K. (2011). Social support and performance anxiety of college music students. *Medical Problems of Performing Artists, 26*(3), 157-163.

Schubert, K. (2016). *Relieve Stress: 20 quick techniques.* Center City, MN: Hazelden Publishing.

Schunk, D. H., & DiBenedetto, M. K. (2016). Self-efficacy theory in education. In *Handbook of Motivation at School: Second Edition* (pp. 34-54). Taylor and Francis.

Shan, G., & Visentin, P. (2003). A quantitative three-dimensional analysis of arm kinematics in violin performance. *Medical Problems of Performing Artists, 18*, 3-10.

Shan, G., Visentin, P., & Schultz, A. (2004). Multidimensional signal analysis as a means of better understanding factors associated with repetitive use in violin performance. *Medical Problems of Performing Artists, 19*(3), 129-139. Doi: 10.21091/mppa.2004.3022

Sieger, C. (2017). Music performance anxiety in instrumental music students: A multiple case study of teacher perspectives. *Contributions to Music Education, 42*, 35-52.

Sloboda, J. A., Davidson, J. W., Howe, M. J. A., & Moore, D. G. (1996). The role of practice in the development of performing musicians. *British Journal of Psychology, 87*, 287-309.

Spahn, C., Wasmr, C., Eickhoff, F., & Nusseck, M. (2014). Comparing violinists' body movements while standing, sitting, and in sitting orientations to the right or left of a music stand. *Medical Problems of Performing Artists, 29*(2), 86-93.

Spielberger, C. D. (1979). *Understanding stress and anxiety.* New York: Harper & Row.

Stambaugh, L. A. (2011). When repetition isn't the best practice strategy: Effects of blocked and random practice schedules. *Journal of Research in Music Education, 58*(4), 369-383.

Stanhope, J. (2015). Physical performance and musculoskeletal disorders: Are musicians and sportspeople on a level playing field? *Performance Enhancement and Health (Oxford), 4*(1), 18-26. Doi: 10.1016/j.peh.2015.11.004

Steinmetz, A., & Jull, G. A. (2013). Sensory and sensorimotor features in violinists and violists with neck pain. *Archives of Physical Medicine and Rehabilitation, 94*(12), 2523-2528. Doi: 10.1016/j.apmr.2013.04.019

Steinmetz, A., Seidel, W., & Muche, B. (2010). Impairment of postural stabilization systems in musicians with playing-related musculoskeletal disorders. *Journal of Manipulative & Physiological Therapeutics, 33*(8), 603-611. Doi: 10.1016/j.jmpt.2010.08.006

Steinmetz, A., Seidel, W., & Niemier, K. (2008). Shoulder pain and holding position of the violin: A case report. *Medical Problems of Performing Artists, 23*(2), 79-81. Doi: 10.21091/mppa.2008.2015

Steinmetz, A., Möller, H., Seidel, W., & Rigotti, T. (2012). Playing-related musculoskeletal disorders in music students-associated musculoskeletal signs. *European Journal of Physical and Rehabilitation Medicine, 48*(4), 625-633.

Stern, J., Khalsa, S., & Hofmann, S. (2012). A yoga intervention for performance anxiety in conservatory students. *Medical Problems of Performing Artists, 27*(3), 123-128.

Studer, R., Danuser, B., Hildebrandt, H., Arial, M., & Gomez, P. (2010). Hyperventilation companies in music performance anxiety among classical music students. *Journal of Psychosomatic Research, 70*, 557-564. doi: 10.1016/j.jpsychores.2010.11.004

Studer, R. K., Danuser, B., Hildebrandt, H., Arial, M., Wild, P., & Gomez, P. (2012). Hyperventilation in anticipatory music performance anxiety. *Psychosomatic Medicine, 74*, 773-782.

StGeorge, J. M., Holbrook, A. P., Cantwell, R. H. (2012). Learning patterns in music practice: Links between disposition, practice strategies and outcomes. *Music Education Research, 14*(2), 243-263. doi: 10.1080/14613808.2012.685454

Su, Y., Luh, J., Chen, H., Lin, C., Liao, M., & Chen, H. (2010). Effets of using relaxation breathing training to reduce music performance anxiety in 3rd to 6th graders. *Medical Problems of Performing Artists, 25*, 82-86.

Sugawara, E. (1999). The study of wrist postures of musicians using the WristSystem (Greenleaf Medical System). *Work (Reading, Mass.), 13*(3), 217-228.

Tan, L., & Miksza, P. (2019). Motivational orientations of college band students: A cross-cultural examination of a collective 2 x 2 achievement goal model. *Psychology of Music, 47*(1), 33-50. Doi: 10.1177/0305735617734628

Thomas J., & Nettelbeck, T. (2014). Performance anxiety in adolescent musicians. *Psychology of Music, 42*(4), 624-634. doi:10.1177/0305735613485151

Turner-Stokes, L., & Reid, K. (1999). Three-dimensional motion analysis of upper limb movement in the bowing arm of string-playing musicians. *Clinical Biomechanics, 14*, 426-433. Doi: 10.1016/S0268-0033(98)00110-7

Van Dam, N. T., Hobkirk, A. L., Sheppard, S. C., Aviles-Andrews, R., & Earleywine, M. (2014). *Mindfulness*i, 5, 574-588. doi: 10.1007/s12671-013-0229-3

Visentin, P., Li, S., Tardiff, G., & Shan, G. (2015). Unraveling mysteries of personal performance style: Biomechanics of left-hand position changes (shifting) in violin performance. *PeerJ (San Francisco, CA), 3,* e1299-e1299. Doi: 10.7717/peerj.1299

Wan, B., & Shan, G. (2016). Biomechanical modeling as a practical tool for predicting injury risk related to repetitive muscle lengthening during learning and training of human complex motor skills. *SpringerPlus, 5*(1), 1-13. Doi: 10.1186/s40064-016-2067-y

Watson, A. H. D. (2009). *The biology of musical performance.* Lanham, MD: The Scarecrow Press.

Wells, R., Outhred, T., Heathers. J. A. J., Quintana, D. S., & Kemp, A. H. (2012). Matter over mind: A randomized-controlled trial of single-session biofeedback training on performance anxiety and heart rate variability in musicians. *PLos ONE, 7*(10), 1-11. doi: 10.1371/journal.pone.0046597

Westney, W. (2003). *The perfect wrong note: Learning to trust your musical self.* Prompton Plains, NJ: Amadeus Press.

Wiklund, A. F., Grip, H., Andersson, H., & Karlsson, J. S. (2004). EMG trapezius muscle activity pattern in string players: Part II—infleunces of basic body awareness therapy on

the violin playing technique. *International Journal of Industrial Ergonomics, 33*(4), 357-367. Doi: 10.1016/j.ergon.2003.10.008

Yerkes, R. M., & Dodson, J. D. (1908). The relation of strengths of stimulus to rapidity of habit formation. *Journal of Comparative Neurology and Psychology, 18*(5), 459-482.

Yondem, Z. (2007). Performance anxiety, dysfunctional attitudes and gender in university music students. Social Behavior and Personality, 35(10), 1415-1426.

Zaza, C., & Farewell, V. T. (1997). Musicians' playing-related musculoskeletal disorders: An examination of risk factors. *American Journal of Industrial Medicine, 32*, 292-300.

Zhukov, K. (2019). Current approaches for management of music performance anxiety. *Medical Problems of Performing Artists, 34*(1), 53-60. doi: 10.21091/mppa.2019.1008

Zimmerman, B. J. (1990). Self-Regulated Learning and Academic Achievement: An Overview. Educational Psychologist - EDUC PSYCHOL. 25. 3-17. 10.1207/s15326985ep2501_2.

Zimmerman, B. J. (2000). Attaining Self-regulation a social cognitive perspective. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds.), *Handbook of Self-Regulation* (pp. 13-39). New York, NY: Academic Press.