Working with Injury in Music Pedagogy: How Teaching, Dystonia, and the Feldenkrais Method Created a Base for Reexamining Pedagogy in the Performing Arts

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Abstract: *For nearly three centuries performing arts disorders have been cited in private accounts, pedagogical writings, and medical references. Yet, in 2017 we are just beginning to understand these injuries. As performance careers grow more competitive, many artists deal with complex issues but few find successful options for full recovery. In 2014 Lisa Burrell was diagnosed with a generalized dystonia, after several years of navigating the complexity of her own neurological maze that took over her career as a professional violinist. She now works as a teacher, lecturer, and string clinician, and as a certified Feldenkrais Practitioner, investigating the intricacies of musicians' disorders and difficulties. In this article she brings together elements of her personal experience, the most recent research into injury and performance, and its extension into her professional work with musicians and educators. This article illuminates new discoveries about the role of our unique neurology as artists, and to demonstrate her evolving Feldenkrais-based pedagogical strategies of variation, choice, initiation, and development of the self-image to impact the success and safety of our practice and teaching.*

Keywords: Injury, Music, Arts Pedagogy, Feldenkrais

Introduction

In 2014 I was diagnosed with a generalized dystonia after struggling with mysterious musculoskeletal and neurological difficulties that affected the way I played the violin, learned, and eventually even functioned on a daily basis. I faced perplexing symptoms for over nine years before receiving a diagnosis, although I now can trace some of the significant traits of this condition back to my late teens and early twenties in studying the violin, and even to how my learning developed more generally. For me, the diagnosis finally provided a concrete direction in which to channel my research, although both medically and pedagogically I found no proven options for rehabilitating, and, perhaps more significantly, preventing these kinds of injury among musicians. The unique challenges of injury in the performing arts have led me on a quest to research what is newly available in science, to investigate what has been present for years in anecdotal experience, and to understand what underlies our learning and development in arts pedagogy. With this information I hope to continue to develop considerations and adaptations in our pedagogy to impact both the short and long term health of our students.

In this article I will provide historical perspective on musicians' injuries with specific references to studies of the last few years. This research has finally begun to uncover clues to the nature of our neurological make up and how it is influenced by our pedagogy, detailing some of the ways traditional approaches to rehabilitation, and, indeed, prevention, have missed the mark. I will share details of my personal history with dystonia and the curious and ultimately informative interaction with my training to become a certified Feldenkrais practitioner. I will include individual case studies from my concurrent work with young musicians as a teacher alongside work with professional musicians as a practitioner. Based on the synthesis of this

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research, personal experience, and specific work using Feldenkrais as a model for a more differentiated approach to learning in the performing arts, I will provide examples of how traditional pedagogy can evolve to make learning in the arts safer, more efficient, more effective, and more integrated into artistic function for our students.

Research into Injury in the Performing Arts

In 1713 Bernardino Ramazzini was the first medical professional to cite occupational dysfunction in musicians: "There is no exercise, though never so healthful and innocent, but what may produce great disorders, if it is used with intemperance" (quoted in Bejiani 1996, 406). The diaries of Robert Schumann from the 1830s reference a neurological condition in his piano playing consistent with the characteristics of dystonia (Bogousslavsky et al. 2005). An analysis of the writings of Glenn Gould, from the late 1970s, by Joaquín Farias, one of the preeminent doctors to publicize and specifically address musicians' dystonia, indicate that the Canadian concert pianist developed a focal dystonia leading to the end of his stage career (Farias 2012).

Although musicians have been plagued with playing-related injury for centuries, scientific and medical studies on the topic have only emerged in the late twentieth century. The concept of task specific dystonia became a subject of research in the early 1980s with the work of Dr. Michael Merzenich at UCSF medical center (Blakeslee et al. 2007, 85). His research on this subject continued into the early 2000s. Most musicians' injury before 2000 was addressed in relation to sports injury and various forms of overuse, such as the development of carpal tunnel from repetitive strain. Only in the last few years, however, has research started to address musicians' injury as a product of specific kinds of learning and overdevelopment of the brain and nervous system. This research indicates that we reorganize to accommodate the kind of hyper-learning and hyper-function required to operate at a professional level in an increasingly competitive and limit-challenging artistic world. These recent studies have finally begun to reveal how these hyper-traits also undermine some of the normal self-regulatory functions of common overuse conditions. They suggest that due to the nature of accompanying neurological changes, the physical symptoms of overdevelopment are not effectively resolved by the traditional therapies, modalities, and even ways of learning, which rely on normal self-regulation for their success.

Recent studies from Australia (Ackermann et al. 2014), Denmark (Paarup et al. 2011), and Great Britain (Leaver et al. 2012), have shed light on the high injury rates among professional musicians. These studies found that a collective average of 86 percent of musicians in each country's full-time professional symphony orchestras were injured. Although the specific interests of each study varied, all involved some exploration of psychosocial factors, medical analysis, and personal interviews. The leading features of these injuries fell heavily into the categories of hyper-development, including increases in size, strength, and range of motion, among the physical characteristics associated with the injury patterns, making them difficult to evaluate using standards often applied in traditional medicine and physical therapy. The most commonly cited lifestyle and psycho-emotional characteristics shared by these musicians included long practice hours, averaging about 1300/year, training in highly competitive environments since early childhood, playing and pursuing a single instrument with disciplined focus since childhood, pressure to perform consistently on a daily basis to maintain job security, training based on tradition and sound above physical and neurological considerations, high levels of self-consciousness related to performance anxiety, and the fear of career-ending injury.

New approaches to the neurology of musicians' injuries address the changes that take place in the brains and even peripheral nervous systems of musicians who expose themselves to highly specific detailed tasks with heightened emotional, intellectual, and sensational requirements over the tens of thousands of hours of work required to reach a professional standard of playing (Zamorano et al. 2015). With the help of functional MRI, these new approaches have uncovered

startling changes in the way that the brain processes information over long periods of spatially specific training involving multi-sourced sensory and motor information. This kind of input creates changes in both the functional and structural organization of the entire nervous system. Increases in plasticity (the way in which we process and store new information) to states of hyper-plasticity create conditions in the brain and nervous system similar to those chronic pain patients (Zamorano et at. 2015). Hyper-plastic changes in the brain have been observed among musicians with orthopedic injuries, those with neurological problems like dystonia, and even among musicians who do not yet experience pain/injury. These changes in plasticity affect how we take in new information and how we learn. That learning over time becomes faster, more sensitive, and much more strongly networked to other parts of the brain, so that our habits become stronger, our synapses are less likely to weaken with less use, and our physical use and overuse is inextricably linked to the way we think, feel, hear, and process information tactilely. Furthermore, because of this restructuring of the entire system, the way we learn and respond to *all* kinds of sensory and motor input is changed and more likely subject to hyper-development (Zamorano et al. 2015).

Task-specific dystonia in musicians, which has become a leading cause for ending performance careers, is a neurological disorder characterized by abnormal muscle contractions and movement patterns (Altenmüller et al. 2010, 3-9). Recent research of the last few years has evolved to characterize musicians' dystonia by three main underlying traits: hyper-plastic functioning in the brain and nervous system, abnormal inhibition of motor signals, and dysfunction in sensory integration and/or proprioception (Quartarone et al. 2013, 958-967). Hyper-plasticity is characterized by changes in the brain that allow a person, on the positive side, to learn more rapidly over time; it involves faster synaptic formation, stronger and more developed networking to multiple parts of the brain in sensory-motor tasking, increased neurotransmitter activity (measured by chemical output of neurotransmitters of dopamine and acetylcholine) (Peterson et al. 2011, 558-573), and long term synaptic potentiation (synapses fail to weaken with lack of use over time). Abnormal inhibition means that there is no clear "off" switch for these strong, highly networked synapses once triggered. In normal function, when we initiate a new movement, inhibitory signals are fired to the peripheral motor receptors to stop initiating the previous movement. With abnormal inhibition, the signals are either too slow or too weak to keep up with the rate of the hyper-functioning excitation signals. This is complicated by spread of the excitation signals to the surrounding muscle groups, an idea known as improper surround inhibition (Quartarone 2013). When we receive sensory feedback from these areas, small amounts of stimulus seem to light up large portions of the sensory-motor cortex in functional MRI, which means that even small stimulation can cause a powerful excitation response. This is why brass players with embouchure dystonia can be triggered in later stages by simply touching a mouthpiece to their lips, or string players/pianists bringing a finger to the string of a violin or keys of the piano (Altenmüller et al. 2010, 3-9). In the following section I will share some details of my own experience with dystonia as they revealed themselves in relation to these characteristics.

A Personal Narrative

My personal relationship with dystonia unfolded in a narrative involving violin playing, teaching, and a perplexing experience within a four-year intensive Feldenkrais teacher-training program.[1]

[1] I first wrote about this personal narrative in 2015 for *The Feldenkrais Journal* (Burrell 2015), as a cautionary anecdote to other Feldenkrais practitioners working with musicians and dystonia, discussing contraindications for aspects of our work. Here I am reframing this narrative for the arts community to demonstrate the specific anecdotal factors that led to my current research into injury in the performing arts and to my ongoing pedagogical evolution.

Although I only consciously began to recognize the abnormal nature of what was unmasking itself in performance in my mid-30s, my research into the nature and progression of musicians' injury has allowed me to recognize a process that was in the making for many years in my growth and development as a musician. My symptoms, which began at an unconscious level of small challenges in learning over time, grew into patterns of intense contractions and postures—a progression which ultimately revealed a level of movement dysfunction in my training indicative of deep abnormalities in my processing of sensory motor stimulus.

When I examine my early experience as a music student, several distinctions emerge as uncharacteristic of normal learning. I began playing the violin at the age of eleven in a school orchestra program. From the beginning I learned quickly and fell in love with the violin and the kind of ease at which I was able to progress. As my early inclination toward playing grew, I decided to seriously pursue performance in the first couple of years of my undergraduate study. It was then that I began practicing an average of five hours per day to "catch up" to many of my compatriots who had already been studying and practicing long hours for many years. It was always easy for me to learn new repertoire, develop new technique, and I prided myself on being able to learn and memorize large works in very short periods of time. However, when the time came for focusing or deepening a technique or working on a piece of music to maintain over an extended period of time, the problems began. While new learning was easy, repetition was not only ineffective, but often detrimental to my playing. Repetition produced increased tension in my playing to the point that I would have to relearn a passage from scratch with new technique in order to be able to play it. I sought advice from teachers with more and more diverse playing styles for new options to take me out of my growing tension. The longer I spent with a work or an idea, the more it would grow its own tangents of new ideas and new executions so that I would be overwhelmed by its weight and volume. I especially felt this with memorization, where a piece of music, once easy to memorize, grew to proportions too great to contain or organize in a performance, with each note containing thousands of footnotes of thoughts and sensations. I would often need to stare at music on a page to force myself to think of each note as just a note in order to focus to get through a performance. I can relate very much to the idea of Glenn Gould needing to turn on multiple radios and television while he practiced in order not to become overwhelmed by the material he was studying (Cott 1974).

In my mid-thirties I started experiencing increasingly troubling physical manifestations of these phenomena when I would work on a difficult passage over a long period of time, and especially in rehearsals where I could not control the amount of repetition to which I subjected myself. I encountered growing tension in my fingers and left arm with antagonistic contractions becoming so strong that I often could not move my fingers at the end of a rehearsal. Then, in 2008, I attended a small chamber music festival during which we rehearsed for a big concert within a concentrated time frame. At the end of a full day of rehearsal, as we were playing a highly repetitive passage from the last movement of the Dvorak Piano Quintet, my fingers started moving rhythmically, repeating a pattern I had just finished. Even as I tried to move on to the next several measures, my fingers continued reproducing the earlier pattern. Forced to stop playing, my fingers continued on their own in the air for several seconds until I was unable to move them. It was my first experience of outright loss of control.

Over the next several months incidents similar to this one occurred with increasing frequency. I grew concerned enough to seek help from a special teacher of the Taubman piano method in New York, known for her work with musicians with neurological difficulties. This teacher, Edna Golandsky, first introduced me to the concept of dystonia and diseased patterns of movement among musicians.[2] She showed me what movements in my playing had become taken

[2] Edna Golandsky is the primary teacher and trainer of the Taubman Method of piano pedagogy. She is the director of the Golandsky Institute in New York and the Princeton Summer

over by a kind of abnormal, unconscious reflex, and she explained to me that each time I employed anything related to these movements, I was strengthening a dysfunctional response that would, at some point, grow so strong that I might find it impossible to play around it. She showed me ways of retraining myself to play with stronger skeletal connections and better alignment, in order to avoid the particularly susceptible peripheral muscles that were already very entrenched in the "disease movements", as she called them. My compulsion to play using these peripheral muscles and my familiar misalignment was so strong that everything she showed me to be skeletally supported and healthy felt very wrong and uncomfortable.

At first I hated the new movements and thought it had been a waste of time to explore them, but as I continued to feel the increase of tension and bigger problems that grew from each tiny application of my old, familiar technique, I started to compare the differences side by side in front of a mirror. I was shocked at how much more fluid and organized her suggestions looked in relation to what I had been doing. For several months I practiced finding this skeletal organization and minimizing the isolated peripheral movements, and gradually the tension and problems started to fade, changing my overall posture and ease at the same time. I found that a single move towards the old patterns could bring back the tension almost immediately, so I worked hard at prioritizing the new connections. The astounding result was that my playing grew in efficiency and expression almost overnight once the old patterns were left behind, and I found a kind of new awakening in my career as performing musician.

As I began to feel better in my playing, I became fascinated with the idea that our propensity for injury as musicians might be the result of excessive emphasis on isolated, peripheral differentiation of movement and, in fact, reinforcing and prioritizing these kinds of movement through repetition. As I began working with my students to help restructure their playing to include better alignment, more skeletal connections, and less peripheral isolation, I noticed strong positive changes, but still found that this alone did not seem to account for enough of the picture of what was involved in playing-related injury.

Uncovering the Foundations of My Own Injury in a Feldenkrais Training

Wanting more knowledge and a deeper understanding of the brain, the nervous system, and the role of movement and habit, in 2010 I entered a four-year, 800-hour training program to become a certified Feldenkrais practitioner. The Feldenkrais Method, the inadvertent brainchild of the Israeli physicist and mechanical engineer, Dr. Moshe Feldenkrais, uses movement as a tool to unveil the hinges of habit in the human nervous system (Feldenkrais 1977). It is a method of learning that allows people to recognize the unique integration of thought, emotion, and sensation in connections with the movements we compulsively choose, and which begin to define and limit us over time. Feldenkrais believed that by giving individuals the chance to discover habit through movement opened the doors to new choices of movement around and away from the old patterns, which could then be integrated into new ways of thinking, feeling, and sensing. The benefits of this kind of exploration of unique and complex patterns of movement, in the form of Awareness Through Movement (ATM) sequences, and the hands on work of Functional Integration (FI), draw from developing awareness of habitual patterns and then finding novel movement choices around overused patterns. Feldenkrais believed that having more movement options allowed people not only to avoid the problems of repetitive strain, but also to form new possibilities for thought and personal expression.

I anticipated that Feldenkrais training would deepen the exploration of my own patterns and would provide insight into what was happening both cognitively and physically with performing artists and injury. What I got was far more than I bargained for. At first the Feldenkrais training

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Symposium and International Piano Festival. Access to her work can be found at http://www.golandskyinstitute.org.

felt like magic to me. I experienced new changes in my movement, thinking, and sensation every day. Sequences that were difficult for me one day resolved themselves by then next. My learning felt fast, with new ideas for application to my students coming with each change I experienced in myself. I was experimenting in my teaching at every opportunity, and I was amazed at how new connections to my unconscious started emerging in spontaneous bursts of creativity. As in a state of flow, I felt I could watch a student perform, visualize the dysfunction, and come up with a recombination of movement sequences to help them around the difficulty, all without ever having to verbally or cognitively articulate the problem. It was easy for me to internalize the complex movement sequences and to break them down into patterns, memorize, and store them in my mind. I could read and memorize the details of an hour-long written lesson in a single sitting, something that was not as easy for most of my classmates. The rapid discovery and progress in my playing and teaching, alongside the powerful intellectual stimulation, gave me an incredible high, and made me feel like I was gaining super powers that I did not want to lose. In fact, I just wanted more, doing as many lessons as I could and reveling in the experience and subsequent tangents of thought and feeling in the hours and days afterward.

On the flip side, even within our very first fifteen-day training segment, I began to experience increased tension and eventually pain throughout my body, something that had not occurred at all during my previous two years of remission from my original focal dystonia symptoms. After a Functional Integration lesson in my second week of training, I developed tension and pain in my left hand and arm. This sensation spread in the coming weeks and months into my shoulder, my neck, my jaw muscles, along my whole spine, and even into my legs and feet. The feeling of high I initially felt turned into periods of confusion and even time I could not account for during and following lessons. Often I would feel a strong sense of ease and well-being, followed by a kind of drugged state, and ultimately pain and much fight or flight that sometimes continued for weeks. The changes I experienced grew from movement and sensation that seemed functional into postures and contractions warped far beyond their original form. At times I felt like my nervous system and brain would never stop replaying these patterns, which often contradicted each other so that much of my body became tied up in antagonistic contractions. I experienced tremor, increasing balance and proprioceptive issues, and a general loss of sense of self. Some mornings I awoke to find that the world had slanted to the right, and I would walk around as though I was in a fun house with floors and mirrors of deception. Other times, instead of choices to explore, I found that my brain was choosing all available options at the same time. All of this was quite a contrast to the experience of my classmates who were slowly uncovering old habits and finding newer, more elegant ways of moving and being in the world.

As my problems grew, I continued through the four years of my training struggling to understand what was happening to me, not finding a doctor to diagnose anything more than orthopedic observations such as tendonitis, nerve entrapment, inflammation, and tight, overused muscles. Neurologists and orthopedists prescribed steroid injections (which I avoided), months of strong anti-inflammatory drugs and physical therapy, which involved massage and stretching of the tight, painfully contracted muscles. None of these initial medical solutions had any effect on the internal force, which seemed to grow more and more powerful with each activity.

Many people have asked me why I did not give up the training when these difficulties became so disturbing. One answer is that the creative and intellectual stimulation kept increasing alongside the difficulties. In fact, during the times I felt the worst physically, I was also having the most successful periods of work and discovery with my students. Secondly, just about the only time I really felt good were those initial periods of exploration of new movement in lessons, before they became warped by my brain's own repetition of the ideas, and I felt release and calm. It was hard to believe that something that made me feel that good was also contributing to my dysfunction. Finally, because no doctor or therapist seemed able to uncover what was going on, I

felt that my continued exploration was the only chance I had to learn what was happening within me and to find a way to rehabilitate myself.

Diagnosis

In early 2014, two months after I graduated from my training, I finally was referred to a neurologist in Houston, Texas, Dr. Mya Schiess, who specializes in unusual movement disorder cases.[3] My very first appointment with Dr. Schiess lasted two hours, involving a discussion of my history with many questions asked about the details of my experience, references to the very newest dystonia research, and a diagnosis of generalized dystonia. She was the first doctor to look at my dysfunction in the context of my cognitive experience, and she ordered extensive testing and medication experimentation to begin to help down-regulate some of the strongest processes at work. Since my first meeting with Dr. Schiess, our relationship has been one of sharing resources of the latest research, going over anecdotal evidence, her general deepening of my understanding of the factors at play in these complex conditions, and her huge support of my own research with musicians. I subsequently spent two years in physical therapy with a therapist similar in her understanding of the latest research into learning and neurology. Like my neurologist, my therapist has been willing to join with me in my own experimentation, referring clients of interest to my Feldenkrais practice of working specifically with musicians, and valuing my anecdotal evidence and ideas. Our partnership has helped me learn to manage some of the most difficult aspects of my disorder and to understand how certain kinds of learning could actually trigger dystonic episodes.

My discoveries both with Dr. Schiess and in the last two years of physical therapy have been consistent with the latest research cited above: that our brains and nervous systems function differently, even change in their structural and chemical nature over long periods of time with exposure to strong, highly specific stimulus. The way we learn is changed by our art; the way we develop and keep habits is changed and strengthened by increasingly broad and complex networking throughout the brain. The key to effectively dealing with injury produced by such stimulus lies in our understanding of the cognitive processes that contribute to this kind of change.

Anecdotal Evidence Through Teaching and Practice of the Feldenkrais Method

In my first years of practicing Feldenkrais with musicians, I began to notice that the musicians I worked with seemed to change much more rapidly in response to movement stimulus than the "lay people" we most often worked with in our training. Even after my classmates had gained many hours of new movement and stimulus in our training, I still noticed far more dramatic changes in most of the musicians, particularly the adult professionals who volunteered as practice candidates for my work. Some of the changes were overwhelmingly positive. A jazz musician colleague who had suffered a stroke came to me with severe back pain. Due to some speech difficulties resulting from the stroke, he tried with difficulty to describe his symptoms. I worked with him to find comfort in lying, sitting, and standing, finding alternatives to some well-used patterns of favoring on side, one leg, and some habitual connections in his arms and spine related to his playing. Although my intention was to ease in his back pain, when the lesson ended the most remarkable change was in the fluidity of his speech; he began speaking immediately in complete sentences. He described everything he felt that was new in his posture and comfort, reveling in the changes in sensation, and describing them in articulate detail. This convinced me

[3] Dr. Mya Schiess is on the neurology faculty of the University of Texas Medical Center and specializes in movement disorders.

to delve more into the relationship between movement and cognitive growth. I worked with colleagues who had explored difficulty with pain for many years and who found ease from small changes that incorporated the use of the whole self, such as wind players who discovered ease in breathing by finding new movement in their hip joints and pelvic floor, brass players who explored movement in the feet, ankles, and lower legs which led to ease in their static shoulder-loading problems, and string players who benefitted from work with the tongue, lips, and jaw, to ease excess tension in the neck. I had many small successes with rapid change with my own students as well—students who struggled with physical, aural, and cognitive difficulties who are now playing with ease and expression. But there were contrasting results which made me feel that this was a powerful way of working that needed great care, particularly with performers--clients finding confusion and even agitation with too much stimulus, clients who experienced fast release in large and long-held tension patterns and who were at a loss to know how to compensate for the changes, and performers who developed subsequent new patterns of tension and difficulty in order to find ways to stabilize to play and survive.

All of this began to contribute to my emerging theories about how we learn and what we can do to prepare for and possibly offset the kind of evolution we may undergo as a result of the input to our systems over many years as artists. These theories prompted new questions about our practices as teachers and performers. Is it possible to rethink our teaching in a way that promotes enough variability in our stimulus that we have new compensations available to us when one way of working is less functional? Is it possible to minimize the kinds of repetitive stimulus which narrow our focus and begin to overdevelop parts of our nervous systems and parts of our brains and cause habits and patterns from which it becomes next to impossible retreat? Is it possible to teach in a way that we are regarding the whole self-image of the person in the process—helping them to explore unique characteristics of the whole self which will lead to future exploration and change, rather than regimented paths toward singular solutions to difficulties? Is it possible to begin to understand when one kind of learning becomes too much and begins to compromise the timing and regulation in a person? When musicians do experience injury, can we broaden our understanding of recovery to include not only the injury itself, but the other hyper-processes that compound that injury?

Pedagogical Evolution

My pedagogy is largely derived from these questions, based on my research, personal experience, and the evidence from daily work with my students and clients. Much of current education in the performing arts still centers on schools of technique, based on traditional teaching of pedagogues sometimes centuries earlier. In the violin world I can think of several examples of teaching particular techniques that originate from individual habits of famous violinists—we do it that way because Heifetz or Ysäye did it and that person was a great violinist. My concern is that tradition-based pedagogy often fails to recognize the widely varying styles, focuses, and physical contributions to individual learning, and due to a kind of forced reproduction strategy, actually tends to promote hyper-learning, and hyper-stimulation tendencies by requiring students to work on narrowing focus toward singular pre-molded and modeled results.

Many teachers use repetition to reproduce a particular success and to carbon copy a successful result. I have witnessed notable teachers requiring students to repeat a passage one hundred times in a row with a singular goal in mind for the repetition, such as landing a particular shift or creating a particular articulation with the bow. Much of current pedagogy champions isolated movement at the periphery with an emphasis on challenging the body to perform extraordinary finger differentiation, isolated movement, stretching, and strength as essential to developing the exceptional physical postures of playing, rather than integrating the peripheral movements into a more efficient use of the whole body. Teaching in the arts often

focuses on the product and the perfection of an outcome rather than diversification within the process to produce an array of successful possibilities. Because of this, the emphasis turns toward categorical and often regimented skill acquisition and achievement based learning, where students are rewarded for reproducing a particular set of skills in a particular way, decided upon by traditional models. Finally, these skill sets are most often taught from a snapshot perspective—method books are full of model students demonstrating postures, positions, bow "holds", and measurements. Students are evaluated on static versions of technique and not on attention to how they move and feel. As a result, the static versions of technical ideas become internalized over smoothness, ease, freedom, and reversibility of movement.

Similarly, current therapy and rehabilitation models for addressing injury among performing arts patients, often adopted by teachers as preventative and healing strategies, place an emphasis on stretching, strengthening, massage, periods of rest, and various anti-inflammatory agents. In most cases, however, injuries return with a return to performance, because the therapy does not include functional application and the critical need for movement re-education and most often the need for movement variation and reintegration. Even when therapy involves an educational component, the emphasis is often on posture as a static feature, involving weekly evaluation of angles of flexion or extension and range of motion to assess how far and how high, rather than the quality and effectiveness of the movement itself for the functions required. Furthermore, this reeducation often fails to integrate the self as a whole into the necessary changes to avoid injury—the emotional connections, the intellectual connections, the sense of the whole organism as networked into the current patterns of habit and overdevelopment/overuse.

How I Teach My Own Students: Pedagogical ideas for injury prevention and successful performance

Much of my current teaching derives from the Feldenkrais Method, my personal experience, and my experimentation with willing participants in my process of discovery. I use movement as a primary tool for learning, and I use the idea of how we learn as artists as an ever-present guide to its application. I am fortunate to have access to students and clients at many stages of development with a range of experience. I serve as a clinician in the public schools in Houston, Texas, giving an average of sixty half-day and full-day clinics to young musicians every year during which I have been encouraged to include my Feldenkrais influenced pedagogy to aid in preparation for performance, develop technique, and to encourage healthy practice strategies. Each year I present several clinics with college music majors on injury prevention, helping to fulfill the National Association of Schools of Music wellness requirement for accreditation in the United States. I teach middle school, high school, and college music majors in a private studio setting weekly. I work with professional musicians on audition preparation, injury, and performance issues as individual clients. Because I choose movement over static models, I am providing links to You Tube examples in the following section of various exercises I employ working with my own students to illustrate some of the concepts that I find most important.

Evolving away from traditional models in recent years, I have found the most successful change in my approach has been to gradually replace my old product-oriented approach, which also largely defined my own early study and learning, with a process-oriented one, using movement as an impetus for discovery. As an experiment when I first began my Feldenkrais training, I chose a group of new young students and intentionally shifted my primary focus in lessons toward each student's experience and awareness, setting aside my usual sense of a structured curriculum for learning to play the violin. I began asking questions about the ways they moved and felt, following their lead and interests, and I allowed the work we did to progress in a unique curriculum set by their individual curiosity. It was difficult at first to forgo my sense of how teaching needed to be organized toward a particular goal, but within months I began to learn increasingly about the differences in the ways each of these students related physically,

emotionally, and developmentally to their instruments. I found that it was much easier to work with their difficulties because our work was mostly focused on giving them the tools to communicate what they needed from me. They were able to share how they were feeling and experiencing much of what was not so visible to me or even familiar in my own experience. I learned that some of what was most important in teaching was uncovering the things I did not know I did not know.

I was initially concerned that when it came time to perform, audition, or test that they would not have acquired enough of the skills they needed. However, the encouraging result was that they more quickly gained the tools they needed, when compared to students I had taught according to a predetermined plan. Furthermore, their ability to change and modify on the spot, due to heightened awareness of what they were doing, made them more confident and more successful. Lessons with these students often involved starting with something that the student had discovered during the previous week and continued with a Feldenkrais exploration in balance, reversibility, breathing, timing, etc. Most often the student would then take over, commenting on or simply playing to look for new ways into a problem or interest. What I found in a short time was that students actually progressed much faster and developed new skills with ease and fluidity because the stimulus for learning came from the formation of an internal organization that inherently made sense to them; it was derived from the nuts and bolts of their experience.

The following example demonstrates the use of movement to illuminate connections across the body with a student struggling to find clear articulation with the bow, but along the way changing much in posture, organization, and ultimate ease in playing: https://youtu.be/qa-khHFAF1U

In continuing to incorporate concepts of the Feldenkrais Method in my work with musicians, cautioned by my own experience, I have learned to use stimulus and movement to change focus and attention, rather than the blanket use of exploration of all movement patterns. Feldenkrais training has helped me as a teacher to spot where a student seems to be over-focusing attention and to uncover the places and perspectives they have not yet explored. I often tell my students that the trick is not to keep using the same door to enter a locked room—rather, to explore the problem from as many angles as possible. Real learning only occurs with new information. We have to introduce something novel each time we practice, a new stimulus, a new focus of attention, a new environment, or a new way of moving, in order to avoid being stuck in rote repetition. Many students come to me wanting to show that they are good students and can accomplish a particular task by the next lesson. I often downplay the importance of accomplishment of singular goals, found often in traditional pedagogy, and increase the emphasis on exploration and change. If we look at how to play in tune by imagining the pitch or tonic of a key after each note, the next week we might turn attention to something completely different in sensation and thought, such as how to initiate a bow stroke for a complex pattern. In this way the student is never focusing on a single goal and becoming pigeon-holed in the processes of achievement, but rather developing a sense of the multi-faceted nature of learning, and the need for change and ever growing sources of knowledge from within—a growth-oriented model replacing the outside-in models of traditional teaching.

In the following example an advanced student and one of my first process-oriented candidates discovers through varying perspectives how to produce a clear articulation on a new violin she is trying out, one with a response very different from her own. In each of the frames we involve a new element/stimulus for exploring the relationship of the bow to the violin. We listen to how the bow articulates at the initiation of each stroke by changing the feeling in the fingers on the bow; then shifting the attention from her hand to her sternum and ribs, we look for a more proximal relationship to her hand and fingers; while deepening this relationship to her center, we look at differences between side-bending and rotation, working with movements both in the same direction as the bow and in opposition to it: https://youtu.be/jxbigRDo3Qc

A friend and longtime violinist with the Houston Symphony told me recently how fortunate he felt to have a teacher in his graduate school years who taught him the importance of adaptability. He said that he has noticed how often his colleagues find themselves in pain from playing, but have become so entrenched in their methods of playing that they would have to dig themselves out of very deep holes in order to really get to the root of their difficulties. Because just one teacher gave him the foundation for variation and change, he has constantly made little adjustments as needed over the years to avoid becoming limited by a single method of practice and self-use.

Variation in practice is an invaluable substitute for repetition when it comes to developing skill, and particularly when it comes to the performance of that skill under varying conditions. Students who find themselves constantly surprised by their lack of success in performance after repeated success in the practice room are usually missing a key component in their practice: variation. According to Dr. Michael Merzenich of Posit Science, this is because our movements become "stereotyped" with repetition. At the moment carbon copy repetition begins, not only does learning cease, but it actually weakens and becomes a mere summary of the original learning, fading like a mimeograph of a copy of an original (Merzenich 2012).

I often find that it requires more effort and creativity to teach variation in place of repetition, but the success of this kind of practice usually sparks new connections in students that allow them to build on this concept, creating variations of their own, and following their own interests over time. The following is an example of a student beginning work on a difficult passage in Bach involving multiple string crossings in an unfamiliar pattern. Most students struggle through weeks of repetition to find the coordination necessary to play this passage comfortably, and even then they often find that the newly acquired comfort in the practice room eludes them in performance. Using variation on the elements of movements involved alongside an exploration of this particular student's habitual tendencies unlocks some significant changes in ease and fluidity within about ten minutes of experimentation: https://youtu.be/MI9GptjyxuU

One of the most detrimental habits in pedagogy and in individual practice, especially when it comes to the long-term health of performers, is the inclination for teachers and performers to universalize technique, declaring, for example, this is the secret to staying relaxed, this is the set-up checklist we need to look for in each student, this is the way to play octaves in tune, etc. I am equally guilty of this infraction, discovering an idea that applies beautifully to both myself and/or a handful of students, and thinking that I have found the keys to the kingdom, wanting it to work for everyone. One of my colleagues calls it being "overly impressed by the shock-value of your own discoveries," a description I often employ to check myself.

My Feldenkrais training pushed me away from this universalizing notion in my pedagogical thinking. After all, even the blanket, generally "harmless," application of Feldenkrais lessons was not for everyone, especially me. In the course of my training and subsequent work, I also spent much time exposed to structural variations in anatomy, which hugely affect our functional movement. Our training employed multiple visual resources to demonstrate the functional use of the most applicable elements of anatomic structure using real human cadavers. One of the most defining images from this series included multiple cadaver examples of human collarbones, shoulder blades, pelvises and hip joints, which varied so widely in shape and dimension that it was obvious that no two could function identically in movement or support (Grilley 2013).[4] A similar recent study of the extensor tendons of the hand demonstrates that the variations in the way that muscles are connected to the fingers is almost as distinct from one person to the next as a fingerprint (Palatty et al. 2015).

Perhaps the most life-changing work I have done in recent years has been with a student who came to me with a brachial plexus injury from birth. She has been playing the violin since the age

[4] I encourage a visit to Paul Grilley's website at http://paulgrilley.com/bone-photo-gallery to view their slideshow comparing bones of many sizes and shapes taken from human cadavers.

of eleven, now twenty years old, and has virtually no nerve enervation to her right shoulder. She is unable to lift her right arm with the muscles of her brachial plexus, meaning that she cannot suspend her arm lifted more than a couple of inches. Also, due to significant tissue degeneration and contracture formation, she needs to avoid any internal rotation of her right shoulder in order to avoid dislocation (which occurs with ease).

Where physical challenges have often met dead ends in the realm of traditional technique, this student's intelligence, creativity, and necessary exploration of variation has taught me about how the whole body can function to create every evolving possibility in movement. Our lessons have become a multifaceted exploration of self-image. We have brought into play every viable resource for new movement and expression. As seen sequentially in the video below, we explore stability and support to protect her shoulder, variations in rotation, flexion, extension, and side-bending, connections of the small movements of violin playing to the larger muscles of her legs, pelvis, abdomen, and back, and later incorporate glossed-over developmental steps such as cross body patterns and crawling, due to the lack of available stability in her early years. What has impressed me most in our work on these physical elements of her playing is the powerful emergence of emotion and expression. You can see her artistry strengthen as her movements become more supported, fluid, and diversified. Work with this student has taught me that the quest for what we do not yet know and do not yet have access to is the most critical material in all of our learning and artistic expression: https://youtu.be/sX-FZoXyS8k

In addition to work with older students, I have recently begun working with younger children (ages 3-7) in Suzuki workshops. A concern among teachers of elementary age children has been a noticeable lack of rhythmic coordination, now thought to be a product of lack of balance challenging playground equipment and a general de-emphasis on unstructured play. We now know that balance and rhythm are connected in the vestibular system and also closely linked to cross-body movements. Working on strengthening developmental movements, clapping, marching, exercises on all fours (hands and knees or hands and feet), and variations of these with instruments often helps boost timing connections and provides additional stability for physical challenges. I have observed that even the ability to sight-read can be strengthened by uncovering gaps in aural-kinesthetic connections. Likewise, coordination issues during adolescent development include challenges with changing instrument size and/or adapting with growth and changes in the body and mind to an instrument. Working with middle school age and younger high school age students provides opportunities for continuing to articulate the importance of variation and change alongside the awareness of the changes within us. I have had students use this time to experiment with new techniques, such as the use of baroque principles, even incorporating a baroque bow and tuning, and exploring new repertoire and techniques that stimulate an interest in experimentation and new sensory motor experience.

Further Questions to Explore

My hope in sharing these theories, anecdotes, research, and my own strategies to explore the problem of injury among performing artists is that we can work as a community of teachers, scientists, academics, and artists to grow in a direction of increased options in our practice and pedagogy. I would like to see science, medicine/therapy, teaching, and practice evolve towards an appreciation of the unique features of our neurology and biology, resulting from the fascinating processes we undergo to become artists, leading to a decrease in the prevalence and seriousness of the injuries that plague us. As students gradually grow towards self-sufficiency, I find that they become great contributors as well to the myriad of processes we might explore to bring performing arts pedagogy into a new state of healthy exploration. The element I value most in my work with these students and clients is that of surprise, especially when it replaces a concept that has grown tired or overused even in my own thinking.

Inviting future contribution and continued exploration toward this goal of exponentially growing surprises and novel approaches to teaching, I would like to conclude with my own unanswered questions: How can anecdotal information in cases like mine and others play a role in the research of dystonia and other musicians' injuries? Can we as educators and researchers encourage injured performing artists to participate and share their experiences, making injury less stigmatized and more open to understanding? How can we begin to involve more modalities like the Feldenkrais Method, among others, not prescriptively, but for continued investigation of their assets and challenges in performing arts teaching at all levels? Can evaluating various applications of our traditional approaches to pedagogy provide alternative ways of working with musicians and provide insight into more ways of preventing or recovering from injury? How can we improve our communication with clients/students to create options/language/openness for sharing serious concerns and difficulties? Finally, can we begin to incorporate more movement based and experience based learning in the classroom, in private teaching, in clinics, and even in academic settings as an alternative to some of the outdated static models, achievement oriented, and product oriented approaches to teaching and practice in the performing arts?

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