

On Focal Dystonia

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I

By now, a fair number of people are aware that I am enrolled in a Bachelor of Science (Advanced Mathematics) degree at the University of Sydney. This knowledge has invariably, and to my great relief, been greeted with enthusiasm and kind support, and I am immensely grateful for this. However, I have never really fleshed out the details behind the circumstances — which I intend to do now with this blogpost. Many of my friends and colleagues at the Sydney Conservatorium will know that my retreat from violin performance is due to onset of **focal dystonia** in my left hand, a neurological condition that severely compromises coordination in the affected area(s). It has occurred to me that it might be useful (and not only to musicians) to describe in detail the symptoms of this condition, how it affects instrumental playing, the treatment I received, and finally, the steps I am taking to recover.

The word [dystonia](#) can refer to a variety of movement disorders, so clearly the keyword here is *focal*. Generally speaking, focal dystonia is a *task-specific* loss of coordination, and it apparently afflicts musicians frequently enough such that it is often also called “musician’s cramp” (Altenmüller & Jabusch, 2009). The well-known condition **writer’s cramp** is indeed a type of focal dystonia (Frucht, 2009). An instrumentalist can execute hundreds of intricate movements – think about the many varied and highly-detailed tasks which an accomplished violinist, pianist, trombonist or percussionist (to name only a few) must perform! These tasks are often trained from an early age, and in practice, often subject to many hours of repetition on a daily basis. It is an intricate system that nonetheless must endure a tremendous amount of

physical *and* mental strain in the rehearsal room and ultimately on the concert platform. Hence there is a cruel irony in the fact that:

Focal dystonia ... presents itself as muscular incoordination or loss of voluntary motor control of extensively trained movements while a musician is playing the instrument.

... Typically, musician's dystonia occurs without pain, although muscle aching can present after prolonged spasms. Lack of pain distinguishes it from repetitive strain injury or occupational fatigue syndrome.

This definition, from a 2009 paper by Drs. Altenmüller and Jabusch, highlights the first important point I want to make about focal dystonia: the harder you try, the worse it gets.

To understand this, let's unpack the definition a bit more: 1) dystonia is a loss of *voluntary* motor control — i.e. the musician experiences uncontrollable spasms; 2) the movements affected are *extensively trained*; 3) the involuntary spasms occur only when trying to play the instrument (in my case, for example, my left hand coordination was not at all compromised in other daily tasks like picking up objects or typing on a computer keyboard). As you can imagine, this creates the agonising situation where the musician knows exactly how a specific movement must be done, but when he or she tries to execute the motion on the instrument, somehow the body “refuses” to do it, and instead involuntary spasms occur. Although it has quite debilitating physical symptoms, focal dystonia is neurological disorder, and represents a “corruption of complex motor programs” acquired through extensive training (Frucht, 2009, p. 137). There is a substantial body of research that demonstrates how the “mapping” of the affected areas (usually the hands in the case of musicians, and embouchure in the specific case of wind and brass players) in the brain is distorted. In hindsight, this is quite a natural explanation. String players and pianists, and to some extent woodwind players, require complex patterns of fingerings, and even in relatively simple pieces, the work done by the fingers is not trivial! (NB. I have deliberately avoided discussing wind, brass and percussion players, since I clearly don't have the expertise to make an informed comment in this area. No doubt, each of these instrumental groups has unique, respective problems). Furthermore, the *independence* of finger action when playing these instruments is extremely important even in the early stages. Thus the brain develops a highly delicate representation of each finger. A study conducted by Candia, Wienbruch et al. (2003) describes this neurophysiological aspect in great detail, and furthermore shows that successful treatment of focal hand dystonia does in fact reorganise digit representation in the somatosensory cortex.

I do not intend to turn this blogpost into a neuroscience paper (nor do I have the relevant qualifications), so I will leave it here as far as scientific details are

concerned. Hopefully I have provided a clear framework in which I may now discuss my own experience with focal hand dystonia.

II

As far back as November 2012, I was noticing a strange sensation in my left hand. During a recording session, I noticed that I could not control my vibrato, and especially when the middle finger was involved. However, I simply attributed this to occupational stress, since there was no pain at all. The holidays were coming up, and I would get a good break, so I was not worried. Near Christmas time, when I was already well rested, I decided to do some practice, which was when I noticed that I had trouble keeping the middle finger on the fingerboard. Any violinist can tell you that already this is a strange turn of events. Typically, the middle finger is one of the strongest, and as far as vibrato is concerned, often the easiest finger to use. Actually, what perplexed me the most was the *complete absence* of pain. (I'm glad to say that I've never experienced pain in my musical practice. Violin playing, or indeed, playing most orchestral instruments, is not inherently comfortable, but I think it's clear that it should never involve pain!). This made me suspect that there was more to it than the usual repetitive strain injury.

I had read the book [Musicophilia by Oliver Sacks](#) (highly recommended), so I was aware of some of the bizarre things that could happen in the brain. In particular, I recalled the famous case of the great American pianist [Leon Fleisher](#), who completely lost the use of his right hand due to focal dystonia (unaware to him and many of the doctors he consulted at the time), and performed left-handed for decades before experimental Botox treatments enabled him [gradually to return to playing with two hands](#). Obviously, this is a worst-case scenario — at its worst, his right hand was completely paralysed and clenched up — and unfortunately for Fleisher, the correct diagnosis and appropriate treatments were not even available to him until it was far too late. Anyway, I was at least aware of such a disorder. The two characteristics of my problem which stood out were the lack of pain, and the task-specific activation of the involuntary movements in the left hand. So what I could I do about it?

For better or for worse, when something goes wrong for a musician, we usually all have the same primary response: **practise more**. As I stated in part 1 of this post, and unbeknownst [*side note: perfect opportunity to use this hilariously archaic word*] to me at the time, this is one of the worst things someone with focal dystonia could do. The brain notices the “disobedient” fingers, then tries very hard to compensate by telling the fingers to do even weirder things, thus making the process more and more uncomfortable, creating a vicious cycle. And all this time, you are thinking, *what a terrible violinist I am, I can't even play scales in tune!* or some variation of that thought.

The harder you push, the more unwilling to cooperate the fingers become. Strangely enough, the worst thing about my situation was the fact that I was still “able” to perform — that is, the dystonic movements, although they were frustrating, were not severe enough to convince me to stop playing. Thus I had a false sense of security when I entered my fourth and final year at the Conservatorium of Sydney in 2013. Furthermore, I was working on an Honours performance project and thesis, and also had many important performances overseas, such as the European tour with the Australian Youth Orchestra, so I certainly wasn’t taking it easy! So far, I had not had the condition diagnosed or treated. I did consult Dr. Bronwen Ackerman, a physiotherapist with a wealth of experience treating musicians, who prescribed various stretches and finger exercises. She mentioned focal dystonia, but did not deem my case to be particularly serious (and she was not wrong). In hindsight, this would have been a good time to step back from violin playing and spend time recovering. But what use is hindsight, which tells you everything you *should have* done and not a single thing about overcoming the problems of the present? Seeing that it was my last year at the Conservatory, I decided to push on and finish my degree.

In June [*or early July? My memory of exact dates can be a bit fuzzy*] 2013, I happened to be in Europe. I had just played a recital in Oslo, at the Vigeland Summer Concert series run annually by my teacher Prof. Ole Bøhn. It was a good concert, and I was especially glad to have collaborated so well with the Norwegian pianist Geir Henning Braaten. I recall feeling particularly good about our performance of the Janacek *Sonata*. But, even though I played well enough to “fool” the audience (I hope the meaning of this is clear, as I do not intend to sound snobbish!), I knew my left hand was letting me down, and I realised that the problem would not simply sort itself out. This was not like a sore muscle after sleeping at an awkward angle. Consequently, making use of the opportunity of being in Europe, my teacher and I travelled to Hannover to visit Dr. Eckart Altenmüller, who is a leading expert in musician’s medicine. Dr. Altenmüller has published dozens of articles on focal dystonia, and works at the [Institute for Music Physiology and Musician’s Medicine](#). The existence of such an institute is sad (that there are so many medical problems associated with being a musician), fantastic (that there exists such a facility to treat, cure and research these musical maladies), and once again sad (that we do not have such a level of support and care for musicians here in Australia). Dr. Altenmüller was quick to reassure me that he had seen many patients with the exact same problems, and many have in fact recovered. The treatment he prescribed was controlled doses of the antidyskinetic drug [trihexyphenidyl](#) (pharmaceutical name [Artane](#)), starting with a tiny amount and then increasing the intake gradually and by small increments. Research has shown that this treatment can be effective (Jabusch, Zschucke et al., 2005, for example), since it inhibits spasmodic movements, but the side effects of this drug are problematic. In my case, although symptoms were somewhat alleviated, dryness of mouth and quick onset of fatigue made this treatment

unfeasible for the long term. After a few months, I stopped taking the medication in preparation for the final stretch of my Honours degree.

The last semester of my study was particularly hectic. I toured with the Australian Youth Orchestra for 4 weeks, submitted my thesis on the solo violin music of Elliott Carter, and presented my final recital, featuring music by Carter, Ives and Stravinsky. The difficulty of the repertoire I performed in my Honours recital reflects a stupid amount of determination on my part, but also shows the intriguing phenomenon of being simultaneously “able” and “unable” to play. Without any scientific framework, I speculate that this is possible because of the muscle memory developed by many years of rigorous training. I probably would not have succeeded if I had bad technique. Then again, if I had not trained at such a high level and instead played the violin merely as a hobby, I would not be at risk of developing dystonia — recall that it only seems to affect those with extensive training! Such is the irony of this disorder. In any case, I did well enough to graduate with First Class Honours. I was not happy for long though, because now the problem of what to do next suddenly became serious. With my condition, my initial plans of doing postgraduate study in Germany were out of the question. I was clearly not fit for auditions.

The year 2014 turned out to be a difficult and generally unhappy one, but it didn't start that way. In January, I was performing at the Santa Catarina Music Festival in Brazil, which was a fantastic experience. Once again, I was somehow able to muster the ability to play “through” the dystonia, but of course I knew by now that I needed a proper solution. Knowing that I would be in Europe the following month, I contacted Dr. Altenmüller to arrange another appointment. In February, at the invitation of Ole Bøhn, I travelled to Oslo, where I performed the wonderful *Sonata for violin and cello* by Ravel with American cellist Chris Gross. This time, everything I played felt uncomfortable. Something had changed, and I was no longer able to push through. According to Chris, I played well enough to convince most people that there was nothing wrong, but in reality I felt horrible. After this concert in Oslo, I travelled to Berlin, where I stayed for 9 [or was it 10?] days. I had always intended this period to be a real holiday, but fortunately I also had the foresight to arrange my appointment in Hannover during this time. I showed him what continued to be problematic — namely, the involuntary flexion of the ring and pinky fingers whenever the middle finger was on the fingerboard. (Incidentally, this is a typical dystonic posture; see Altenmüller & Jabusch, 2010. If there was any doubt before, this cleared it up). After discussion, I decided to accept his recommendation for treatment with botulinum toxin (Botox). The dosage was carefully calculated, and the doctor injected the drug at a specific location in my arm, such that only the muscles controlling the dystonic fingers were affected. His expertise was impressive.

Apart from the inevitable shock and pain of having your arm muscles poked by an ominously long needle, there were virtually no side effects — I merely had to avoid picking up heavy objects with my left arm for a week or so. The tension in the muscles was alleviated, and for the first time in a while, I felt able to control my fingers again. By the end of March, I started to ease back in to playing the violin. At this point, I had accepted a position at the Sydney Con as a research student, but looking back, this seems to have been a mistake. Being associated with a music institution again, I was far too eager, and also felt a certain pressure, to get back into performing, and this most likely delayed my recovery. I realised that the treatment I received could only set up the desired physical circumstances for recovery (i.e. symptomatic relief), but it seems it did not address the neurological root of the dystonia. (See Frucht, 2009, pp. 139-141; Altenmüller & Jabusch, 2010, pp. 6-8). The brain map of my fingers, it seems, was still scrambled. Nevertheless, on certain occasions, I was (somehow!) well enough to perform: in May, I was concertmaster at the inauguration concert of a newly-founded orchestra, then called the Bruckner Orchestra Sydney, now officially known as [The Musician Project](#); in July, I played with the Australian Youth Orchestra in Brisbane, under the baton of world-renowned Australian conductor Simone Young. I really know how to pick my concerts, don't I?

The AYO concert in Brisbane was to be my last public performance in a long time. After returning to Sydney, I made the very difficult decision to cancel all remaining performance engagements that year. In retrospect, my circumstances in 2014 were not all that different from 2013. The dystonia had not worsened, but it had certainly persisted. For the first time, my condition was taking a psychological toll, and I found myself in the unusual position of having lost all motivation. I think I speak for many performing musicians in saying that our self-worth is correlated highly with our ability to perform well, and when we lose this ability, we are devastated. It is no wonder that musicians are often unwilling to discuss injuries. As Oliver Sacks wrote, there is a strong belief that admitting to an occupational disorder or injury would amount to “professional suicide”, and hence we have this “veil of secrecy” (pp. 292-293). Fortunately, this is changing rapidly. In the last and final part of this series, I will write about psychological aspects of dystonia, and also outline some techniques I have been using to recover.

III. 1

In the previous part, I recounted my experience with focal dystonia. In these subsequent instalments, I would like to address more general issues, including the prevalence of dystonia in classical musicians and the psychology of dystonia. Finally, I will conclude by describing some possible steps towards overcoming the disorder. Originally, I had intended this to be a

single post, but it appears that there are many details worth discussing, and hence, just like the *Hobbit* movies, I will expand it into three parts.

Who gets focal dystonia?

Although I have only browsed just over a dozen articles on focal dystonia in musicians, there is already significant variation in the estimate of musicians afflicted by this condition [*I will provide a full reference list at the very end of this series of posts*]. Several articles have stated that FD affects ~1% of professional musicians — I assume they mean classical musicians, but more about that later. However, Jabusch et al. (2005) claim that FD affects ~1% of “all musicians”, whatever that means. Given that a defining characteristic of FD is that it mostly affects extensively trained movements, perhaps they left out the word “professional”? To complicate things further, Butler & Rosenkranz (2006) report the prevalence of FD among professional musicians as 2-10% (citing three other papers), which is surely a non-trivial variation! However, this paper is also one of the very few to acknowledge that FD might be more common than is often reported, so it is worth keeping these figures in mind.

Some other interesting details:

- It is generally recognised that classical musicians are at the highest risk of developing FD. In Butler & Rosenkranz's article, the researchers estimate that 95% of cases are attributed to classical musicians, implying that the remaining 5% accounts for jazz and pop musicians. This is an extremely significant number, and strongly suggests that there are specific occupational “hazards” in the training and development of a career in classical music.
- Consistently, it is shown that there is a much higher incidence of FD among males than females. I have yet to find a detailed explanation for this. Lim et al. (2001) speculate that this may be due to inherent gender biases in the classical music industry (“An explanation might be that males are represented at higher levels of music performance and that the gender bias may result from the type of instruments played”). However, the gender divide is slowly disappearing in classical music, so this argument is perhaps not so strong.
- Some researchers have acknowledged that genetics may influence one's susceptibility to dystonia (e.g. family history of movement disorders). However, my siblings and I are the first generation in my family to have studied *any* musical instrument in a rigorous manner, and there are undoubtedly many others in the same situation, so this perspective is not particularly useful in my case. A brief review of the literature in the article by Lim et al. shows that the research in this area is inconclusive. The proportion of FD patients who also had family history of some type of dystonia or other movement disorders ranged from 0% at one end, to 25% at the other extreme.

“Classical conditioning”

(My apologies to Pavlov for misappropriating this term. And if this reference doesn't ring a bell for you, then... oh, I think I just ruined the joke).

It is fair to say that classical musicians spend most of their lives practising. Many start their training early: for pianists and violinists especially, starting at the age of 4 or 5 is not uncommon. Furthermore, those who are particularly talented acquire new skills and techniques, learn repertoire, and in general ‘absorb’ music rapidly. Steven Frucht, in his 2009 article which gives diagnostic advice to the clinician, notes astutely that for accomplished musicians, “the idea that instrumental performance can be challenging is often foreign. Many are unaware of the mechanics involved in their own playing and may have never analysed their physical approach to the instrument.” We can observe the remarkable abilities of young violinists in, for instance, international competitions, where 12-year-olds effortlessly perform technically demanding works by Paganini and Wieniawski and more. Regardless of natural talent however, the common denominator is that to make *any* progress at all on a musical instrument, there must be a consistent **and** persistent investment of time and effort — that is, regular, even daily practice over many years. Furthermore, the *way* we practise is also a distinctive aspect of classical music training. In order to excel, disciplined study and practice is necessary. When a student is young, this discipline may often be imposed by parents and teachers, but later may well develop into an internal motivation to develop and succeed. Indeed, this seems to characterise the best musicians: for them, practice does not come as a chore, but becomes a necessary part of their artistry, as they continually refine their techniques and expand their palette of musical expression.

What defines mastery of a musical instrument, at least in my opinion, is the illusion of *ease*. This is not a difficult concept to grasp. After all, we admire top tennis players like Roger Federer or Serena Williams, for whom nothing seems to be impossible as they move effortlessly from one incredible shot to another. Similarly, who has not thought to themselves, after a performance from the likes of Martha Argerich, Frank Peter Zimmerman, Christian Lindberg, or John Coltrane, or [insert your favourite artist here], “how does it look so easy for them?” Admittedly, Coltrane is a bit of an anomaly. As I wrote above, FD affects classical musicians disproportionately. Altenmüller & Jabusch (2010) have also noted: “in contrast to pop or jazz music with improvised structures and great freedom of interpretation, musical constraints are most severe in classical music.” The ideal of perfection in classical music has often been considered an important factor contributing to FD. This is where we tread the fine line between pushing ourselves to develop our craft to its highest potential, or simply becoming harmfully fixated and obsessing over the most intricate details. On the one hand, playing any instrument at a high level requires a tremendous amount of

Careful, disciplined practice, simply in order to learn the hundreds of complex tasks necessary to performance. On the other hand, there is a limit to how much we can take before we feel the physical and emotional/mental consequences. A catchy phrase that has become popular in education is “work smarter, not harder.” Unfortunately, musicians (and I suppose athletes too) do not have that luxury. We must work very hard **and** very smart. I also think that recording technology has not helped in this regard. These days we are far too accustomed to “perfect” recordings of classical works, where it is possible to edit virtually every note, and not a scratch to be heard. This creates some unrealistic expectations for both performer and listener of what a performance should sound like, and perhaps unrealistic ideals of what is physically possible in performance. I say “perhaps”, because it is undeniable that the technical abilities of the top performers are extraordinary, but without the power of multiple takes and state-of-the-art audio editing, we are nonetheless all human.

Researchers of musician’s focal dystonia have certainly understood these unique features of classical music training, and many suggest that there are specific psychological pressures associated with this kind of learning environment which contribute to the onset of the disorder. However, the good news is that a solid understanding of these psychological factors may prove to be one of the most helpful ways of overcoming focal dystonia.

III. 2

Psychological Aspects of FD

Many recent studies on musician’s dystonia now acknowledge the role of psychological and emotional factors contributing to the emergence or persistence of the disorder. In the previous section, I have already alluded to one of these psychological pressures: the need or expectation for perfection in classical music training. Indeed, this point has been emphasised many times across many research papers, including several by Altenmüller and his colleagues. For example, Altenmüller & Jabusch (2009) is a noteworthy paper, as it compares psychological profiles (“personality structures” is one of the terms used in the paper) of patients with FD and those without. Interestingly, a group of patients suffering from chronic pain was also examined, with the aim of “detect[ing] unspecific secondary psychological reactions in diseased musicians.” I object slightly to the use of the term “diseased”, but you get the idea!

The results of the study are quite clear: anxiety disorders and social phobias were more prevalent in patients with FD than in healthy musicians (hereafter HM). Although patients suffering from chronic pain also showed different psychological patterns from HM, in general they recorded scores between

those of the other two groups. In particular, and most significantly, FD patients showed a pattern of “exaggerated perfectionism” not seen in patients with chronic pain, nor in HM. This raises the important question — whether pre-existing anxiety and perfectionism contributes to FD, or whether these characteristics are “psychoreactive symptoms” of the playing disorder. Based on their data, the authors of the paper suggest that it is the former condition. Actually, this model of the development of FD reflects my own experience quite accurately. Let’s not forget that *all* performing musicians deal with stressful situations, the most obvious being performing on stage in front of an audience, and playing in an audition. For music students, there are also masterclasses, and necessary evils such as technical exams, jury recitals and competitions. Depending on your teacher’s personality, even studio classes and lessons can be stressful. Hence, it makes a lot of sense that musicians with elevated levels of anxiety and perfectionism are more at risk of developing FD. The emotional or affective component of music making cannot be ignored either. Performing a piece of music requires significant physical and emotional effort. Add perfectionism and anxiety into the mix, and you will have a very stressful experience indeed. Whether or not someone *appears* to be anxious or nervous is irrelevant. Those of you reading who are classical musicians (or actors, for that matter), I wonder how many of you have received comments such as “you didn’t look nervous at all!” I am always grateful for these comments, since they are invariably well intended, but it is really a meaningless statement. *Of course* we don’t look nervous — either we are genuinely not nervous (if you fall into this category, then I don’t believe you), or we are simply very good at managing our nerves. If we do our job properly, then we will have at least created the illusion of being in control and mastered our art! Unfortunately, we must accept that while the audience will (hopefully!) appreciate our brief time on stage, rarely will they stop to think of the hundreds of hours of painstaking preparation.

Perfectionism and FD are the ideal ‘frenemies’, so to speak. Classical musical training, with its emphasis on perfection, does nothing to alleviate this, and in fact feeds the vicious cycle. Sometimes, the demands can be absurd to an outsider. Take, for example, the violinist who proudly proclaims (well, roughly speaking) “I spent 3 hours on the first page of the Mendelssohn Violin Concerto today!” Or just point out a split note to a horn player — which I imagine is a great way to never make any horn-playing friends. A perfectionist will fixate on the smallest of details, overthinking everything, but most importantly, be very irritated at any slight perturbation or deviation from the idealised ‘perfect’ performance. So imagine the hypothetical situation in which you are a very accomplished violinist working on the Sibelius Violin Concerto, one of the most demanding pieces in the entire repertoire. (If you *are* a violinist, then unfortunately for you, this may not be hypothetical!) There is a particular passage you are struggling with, but your perfectionist tendencies motivate you to practise this isolated passage obsessively, sometimes repeating it over the course of a full hour, breaking it

up into little segments and practising all the individual changes of position and tricky bowing patterns. Altenmüller and Jabusch suggest that “musicians with an inclination toward anxiety and extreme perfectionism may emphasise the disturbing and threatening element in the occurred wrong movement.” In our hypothetical case, it is possible that the problem is quite simple (perhaps a change of fingering? conceptualising the shift differently?), but the poor violinist has exaggerated the significance of his lack of fluency in one particular passage, and reprimands him/herself for the ‘failure’ to execute this passage ‘perfectly’.

A newer study by Ioannou & Altenmüller (2014) builds up an even more detailed psychological profile of musicians with FD. In addition to the well-known traits of anxiety and perfectionism, the study investigates more specific factors including (but not limited to) the following:

- Self-doubt & personal standards
- Parental expectation & criticism
- Mental [perseveration](#) (*not a variation of “perseverance”, see the linked Wikipedia article for a quick definition*)
- Self-incrimination

I believe this study shows that there is a complex interaction between pre-existing personality traits and environmental or occupational pressures. Among the patients with FD, the majority tended to score higher than healthy musicians for the parameters listed above, but there was also a minority who did *not*. The authors of this paper thus came up with the two classifications *HPE* (high psychological effects) and *LPE* (low psychological effects) to describe the two distinct ‘clusters’ of data, and furthermore postulated that the lack of a consistently effective treatment for FD may be due to the highly individualistic nature of the disorder. This is not exactly the good news a musician with FD would like to hear. For those with perfectionist tendencies, the situation plays all too directly to our main weakness: our usual self-doubts about our abilities become real, and we deteriorate from just thinking “I can’t do this” to being literally, physically unable to play. Worse still, the more we push ourselves to practice, the worse the dystonic movements become. As classical musicians, who are accustomed to solving problems through disciplined practice, we feel suddenly faced with what seems to be an insurmountable obstacle.

Although it seems we are still a long way from any definitive cure — if such a thing is even possible — fortunately there is now more information and help available for musicians with FD than ever before. Many have realised that the key to overcoming the disorder lies within a biological organ so remarkably complex it can hardly understand itself: our own brain.

III. 3

There are some words which (bad) writers of popular science like to throw around in order to sound impressive. *Quantum* is perhaps among the most frequently abused terms, for instance. Another would be *statistically speaking*. (Did you really analyse the sample distributions, and compute the variance and correlation coefficients? Didn't think so). Another buzzword, and the one pertinent to our discussion here, is [neuroplasticity](#). Fortunately, unlike quantum field theory and statistics, we don't have to pretend to understand neuroplasticity, since there are many cases where it is clearly visible, and I believe its core concepts are readily grasped by the general public. In addition, popular science titles like *The Brain That Changes Itself* by the neuroscientist [Norman Doidge](#) certainly increase public awareness and understanding of this issue. We can observe directly that the brain is capable of remarkable change and adaptation. One of the most dramatic and convincing examples of this is the phenomenon of "phantom limbs" — the ability to feel pain or itching or other sensations in missing limbs. If you are interested, I will save you from googling for unreliable sources, and link [this journal article](#) by Ramachandran & Ramachandran (2000). The important and (at the time) revolutionary idea is that the brain is not a static organ. The *brain map* can be reorganised — new neural networks can be created, and the physical *topography* of the brain is susceptible to change. This is reassuring for those with dystonia. It means that there is a possibility of "unlearning" the dystonic movements, and creating new neural pathways to replace the old, misbehaving ones. Many dystonia researchers now recognise re-training as a viable treatment option, and from a musician's point of view, I believe it is also the most useful and least harmful. Medical treatments can work very well for some individuals — and depending on the severity of the symptoms, may even be essential — but the prospect of taking botox injections several times a year, for example, is not exactly pretty. However, re-training requires considerable time investment and dedication... then again, isn't this exactly like learning a musical instrument!

The first and arguably most difficult step is simply to recognise a need for re-training, if one desires to play the instrument again. Of course, this involves getting through the denial phase, in which one tries to practise "through" the dystonia (as I, and likely many others, have done), and inevitably to no avail. If you recall the main points I raised in the preceding section on the psychological aspects of focal dystonia, you'll see that getting through this initial stage is in itself a challenge. One must learn to accept the circumstances imposed by the disorder, and resolve to find a new way. In my experience, I have felt the need to redevelop my left-hand technique from "first principles", to borrow an important scientific term. This means that I return to the most basic aspects of violin playing, and derive more advanced concepts and techniques from these foundations. In the early stages, my "practice" would

often involve simply holding the violin, and I would ask myself questions such as these:

- 1) When playing, where does the instrument “sit”? (Generally speaking, on the collarbone)
- 2) How is the violin supported? (In my view, it’s not as simple as you might think!)
- 3) What is the most natural position for the left hand *for me*? (Everyone has a different hand)
- 4) Where does the thumb sit in relation to the other fingers? What is the best set-up for me?
- 5) What are the most natural ways of shifting (moving around the fingerboard)?

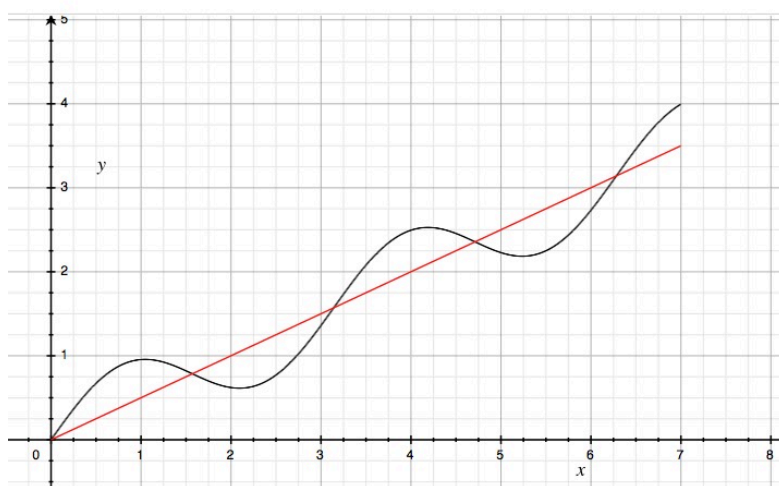
These are of course specific to violin playing. But it is necessary to consider some important questions from the neurological perspective too:

- 6) Where is the dystonia localised? — There is more to this question than meets the eye. When I first realised I had the condition, I noticed that I could not control the middle finger. However, when I visited Dr. Altenmüller in February 2014, he showed that the behaviour of my middle finger was explained by involuntary flexion of the muscle controlling the ring finger, and hence that was where he administered the botox treatment.
- 7) What is the *trigger* for the dystonic movements — i.e. what are the specific circumstances under which the dystonia manifests? In my case, when the condition was at its worst, simply placing the fingers of the left hand onto the fingerboard would trigger the incoordination. I later managed to narrow the trigger down to the specific sensation of pressing onto the *strings* themselves.
- 8) Having now identified the trigger(s), can I remove myself from the specific circumstances to re-train the movements anew? — Yes, absolutely. In my case, I found it beneficial to stop playing the violin entirely for a while. After a period of complete rest, I started to practise violinistic movements away from the violin, then transitioning onto the instrument. I also practised various general finger coordination exercises which I collected from a mix of consultations with a physiotherapist, reading articles about dystonia, and talking with other musicians who have had similar issues.

I will mention briefly here a technique which has been described as *sensory trick* in various articles (for instance, see Butler & Rosencrantz, 2006a, pp79-80). Essentially, it plays on the specificity of the medium which sets off the incoordination. String players with FD will find that it may be possible to play “normally” while wearing a latex glove. A logical extension of this exercise is to cut off the tip for one of the digits of the glove, thus exposing a

particular finger to the string. In this way, one can very gradually "teach" the hand, one finger at a time, not to react negatively to the sensation of the strings. Such a strange result demonstrates once again that the brain is a highly complex and sensitive organ!

Unfortunately, this final part of the blog series must necessarily be incomplete. My recovery from focal dystonia is still very much a work in progress, and no doubt I will continue to learn and discover new things. In between the homework and studying for my new Science degree at USyd, I try to allocate some time every day to violin practice, or failing that, I will then devote a significant part of the weekend to "catch-up". Progress is slow, and I have had to learn to be very patient in all that I do concerning violin practice. There is a lot to think about, much to experiment with, and there are many hurdles to overcome. There will be days when you feel that everything has improved, and other days when you feel that nothing is working. In short, the recovery process is not so much a straight line, as it is better described by a function such as $y = A(\sin nx + x)$, where $x \geq 0$, and A and n are arbitrary constants chosen such that your graph looks pretty. Sorry, I couldn't resist.



(In the graph above, $A = \frac{1}{2}$ and $n = 2$, if you were curious). Throughout all the ups and downs, it is important to keep in mind the *overall* progress. While there is still a long way to go, I have certainly made significant improvements since last year.

To conclude, I'd like to share some key pieces of information with respect to recovery from focal dystonia. Hopefully it will be useful to those afflicted by dystonia, and possibly also to musicians affected by any other occupational disorder or injury:

- Being incapacitated as a performing musician will take an emotional or psychological toll. Be prepared and unafraid to deal with these consequences, and most importantly, do not feel ashamed to seek help!

- Understand the condition — read about it, do research, consult professionals. Decide whether medical intervention is the right approach for you.
- Share your experience with friends and colleagues. You never know where you might obtain valuable advice, and even important contacts.
- In the beginning stages of recovery, practise little but often — for example, enforce a maximum of 15-20 minutes for each practice session, and even less if the dystonic movements are particularly troublesome. However, try to maintain regular practice nonetheless (hence, “little but often”).
- Think about playing more than you actually play. Analyse the mechanics of playing your instrument. Recovering from musicians’ dystonia involves understanding the subtleties of how mind and body work together when playing. Mindless practice is simply wasted time. This probably applies to all musicians, with or without injury!
- Be content with small victories. This is not the same as accepting defeat, or being complacent; rather it is a reminder to be realistic with your practice goals! If you’ve just suffered an injury, you cannot expect yourself to be playing Paganini caprices after a few days. Focus first on what you can do, and use that as a foundation to develop gradually.
- Continuing on from the point above, make very specific practice goals, and make *comparative* goals. The opposite of this is a blanket statement like “get left hand back to normal”, which is worse than useless for someone with focal dystonia. In my case, a realistic, specific goal might simply be: “to gain a level of control over the middle finger on the D string that was better than the situation on Thursday.” Another good one would be: “to reproduce the relaxed hand position attained yesterday and apply it to Sevcik finger-action exercises.”

My final bit of advice is to recognize that positive realistic thinking is of utmost importance. When combined with flexible problem-solving skills, I believe one can make excellent progress. It is no exaggeration to say that focal dystonia has been life-changing for me, and certainly not in the cheesy motivational documentary sort of way. Having spent most of my life up to now being heavily involved in classical music, suddenly enrolling in a Science degree is quite a dramatic, but definitely a welcome change in direction. In fact, these new experiences have only further enriched my thinking, expanded my knowledge and understanding of the world, and increased my curiosity and love of learning. I have also managed to maintain some presence in the musical community through teaching students and writing music, both of which I find immensely rewarding. It is tempting to think what might have happened, if I had never contracted focal dystonia. But I’m fairly convinced that the Me in *that* alternate universe is travelling a path far less interesting than the one I am experiencing right now.

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