

# All-State: What Musicians Can Learn About Practicing From Current Brain Research

presented by Molly Gebrian — reported by Faith Farr

*Molly Gebrian completed degrees in both viola performance and neuroscience. She has served as the Assistant Director for two interdisciplinary conferences on music and the brain, has published papers dealing with music and neuroscience, and currently teaches at the Fred Fox School of Music at the University of Arizona. Her background in neuroscience gives her unique insight into how the brain learns and how musicians can use this information in the practice room.*

When we play or practice, neural pathways are formed—for the wrong notes we play, as well as for the right notes. If two neural paths (right and wrong) to the same goal are equal, there is a 50/50 chance which path will be used next time. Most of us realize we need to play something right more often than we play it wrong. However, Molly explained that a neural path will be destroyed only if it is not used. That explains why the two most common ways of practicing are both bad: a) start at the beginning; play until you make a mistake; go on. Or b) start at the beginning; play until you make a mistake, and go back. The problem is that every time you make the mistake, your brain notices the path was used and does not destroy it. It's not enough to do it right more often than wrong; the goal is "never do it wrong"!

Molly pointed out that strategies such as "do it right 10 times" are not helpful, because there may be many wrong times in addition. She recommended "5 in a row" with a consequence for making a mistake. A simple consequence is to reset to zero if you make a mistake, and try again for 5 in a row. A better consequence is to reset to zero if you make a mistake, and now you have to do "6 in a row."

Because the purpose of correct practice is avoiding mistakes / avoiding reinforcing the wrong neural path, Molly recommends a run-through as a last step, not a first step. Most run throughs (play until you goof, then fix it) model bad practice. Instead, be aware of which neural pathway you are reinforcing. For instance, if you play out of tune and adjust, you will get good at adjusting. If you want to get good at precise intonation you must stop where you land, notice if you are sharp or flat, then go back and approach the note again with your revised plan.

With interesting pictures of brain cells, Molly explained that when a neural pathway is used a lot it gets "supercharged" by myelin which allows the electric signal to travel faster. The action feels automatic. Our goal in practice is to make the desired path feel automatic. Unfortunately, if the wrong path gets myelinated, it is really

hard to destroy that path. However, correct repetitions with subtle variations will build the right pathway more quickly. Subtle variations might include clicking up the metronome a notch; or standing on one foot; or facing a different direction.

## Blocked vs. Random Practice

Everyone has had the experience "it was better at home" than at the lesson, audition or performance. At least part of the reason is that home practice usually involves many repetitions of the same thing (blocked practice) whereas the lesson / audition / performance usually needs a single performance. We get good at what we repeat; if we want to be performers, we need to repeatedly practice that single performance, through random practice.

Molly gave an example of practicing for 90 minutes on three big orchestral excerpts in preparation for an audition. Long blocked practice, e.g. 30 minutes Don Juan, 30 minutes Mendelssohn Scherzo, 30 minutes Beethoven is good at the beginning to let you learn the passages, but gives you "the illusion of mastery." Long blocked practice won't help you perform. Serial blocked practice, e.g. rotating 5 or 10 minutes for each excerpt through your 90-minute practice is a better practice strategy because you get that "first performance" more often. This is a good strategy to check how solid things are. However, if the order is always the same, you may get used to playing Mendelssohn right after Don Juan. Randomly rotating each excerpt is the type of practice required for performance. This type of practice is also called "interleaved."

Molly had some brainwave charts that show doing blocked practice (the same thing over and over), is easy for the brain. Doing interleaved practice is harder for the brain. However, when the subjects were asked to perform their task once, after prior practice, the brain worked harder for those who had done block practice than for those who had done interleaved practice. The brain waves showed the subjects who had prepared with interleaved practice were more relaxed and less taxed by the

performance.

## Serial Practice

Molly gave several examples of "serial practice" to reveal how solid practice spots are.

a) Choose 4–7 spots that are learned well enough that you expect to play them well. Put a post-it by each spot. Play the first spot once and put a tick on the post-it if the performance was "perfect." Play the next spot once and put a tick if "perfect." When you have gone through all the spots, return to the first one and perform it. If perfect, add a tick to the post-it; if you goofed erase a tick mark! The goal is 5-10 tick marks for each spot. Erasing on a goof quickly reveals which of the spots are in fact solid.

b) Set an interval timer (on your phone, or download a free Interval Timer app) for say 5 minutes. Practice your normal routine – scales, etudes, pieces etc. When the timer goes off, perform your spot once. Reset the timer and continue with your normal practice until your timer goes off again. This teaches you to play "out of the blue" and shows you what is solid and what really needs more woodshed practice.

This timer practice can be used by directors in orchestra rehearsal, for instance if there is a problem at [C]. Rehearse your orchestra as usual. When the timer goes off, have the orchestra play the spot once.

## Use your biorhythms

Molly made the new-to-me suggestion of doing a practice recording your program or audition material at your *worst* time of day. At bed time, when you feel just too tired to play. Or get up early if you are always groggy before noon, and play your program without that first cup of coffee. If you can perform to your satisfaction in those physically difficult circumstances you have a good chance at the actual audition.

## Creative Use of the Metronome

Learning to play with a metronome on each beat is a skill all students need to learn. However, Molly said that the brain functions differently when it has the external stimulation of the click than when we are

trying to continue the steady beat internally without the metronome. She had several interesting suggestions.

a) Have your metronome beat steadily as it usually does, but have the click be the “and” (off-beat) instead of the beat.

b) Set the metronome for half the tempo; the metronome clicks every other beat.

c) Have the metronome click on the down-beat only; or every second or third down-beat. You’ll find out if you are steady between the clicks! The Tempo app by Frozen Ape (\$2.99) allows you to set it to for instance  $\frac{12}{4}$  with a click on beat 1 only to get the effect of one click every three measures of  $\frac{4}{4}$ . Tempo app also has irregular meter e.g.  $\frac{5}{8}$  as 3+2 or as 2+3.

d) The Time Guru Metronome app (\$1.99) comes with a variety of dings and clicks, but also with voices (man, woman, robot) that count out loud (“One, Two, Three, Four”). Students who habitually add a beat in  $\frac{3}{4}$  or habitually shave a beat off a dotted half are able to fit with a click metronome, but will discover the added or missing beats when the Talking Voice says “One” and they are not at the beginning of a measure.

Time Guru also has a “random” setting

where the voice or click drops out, continuing silently, and then resumes. E.g. “One, Two, Three, ..., | ..., ..., Three, Four |.” You can set how much drop out you want as a percentage. Zero is no drop out / continuous click or voice as we are used to. I have found intermediate students who can play with the metronome are challenged by 20% drop out. 60% drop out challenges me. Molly explained the benefit of this practice is you are practicing playing without the metronome during the drop out, while maintaining the discipline that the metronome provides.

### Sleep and Learning

Molly cited a number of studies that show that when learning a task that required a quick and accurate sequence of button presses, precision went up and errors went down after people had a good night’s sleep. She explained that there are various kinds of sleep (light sleep, deep sleep, REM sleep, non-REM sleep) and the type of sleep that comes in the fourth quarter of a 8-hour night’s sleep gives the most improvement in activity the next day. So if you are only getting 6 hours of sleep a night, you are never getting to that beneficial sleep! Here’s the sci-

entific proof that cramming does not work. If a student does 10 minutes of practice a day for 7 days and gets 7 good nights of sleep, they’ve had 7 useful reinforcements of their work. But if a student practices 70 minutes the day before the big test, they have only 1 night of useful sleep reinforcement.

### Mental Practice

Molly cited intriguing studies that compared physical practice of a skill (such as playing a 5-finger ascending and descending pattern on a piano) with mental practice of the same skill without actually doing it. Test subjects had no previous piano or musical training. Brain scans and tests for the skill showed that after 5 days the mental practice subjects were about the same place as the physical practice subjects had been after 3 days. The neural paths are created not only by physical practice, but also by mental practice only. You can change your brain by thinking about doing a task!

*Faith Farr is editor of this magazine. For more information on practicing and brain research, visit <https://mollygebrian.com/writing/> ♪*