

Learning to Learn: Research and Methods for Musicians for Effective Results

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MUSC 6115

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May 4, 2024

Abstract

This research paper focuses on how the mind learns and retains information and applies it to learning an instrument. Through various research drawn from other fields and real-life experiences, information is drawn from studies on habit development, mental strength and repetition as an hypothesis for how teachers in the field of music can better teach and how students can better learn and retain skills. Findings from research on the Pomodoro Technique, Zeigarnik Effect, Field Theory, and Flow State are central to the ideas in this paper which suggest modern ways in which musicians should be practicing given the research at hand. This paper challenges some norms in pedagogy and strives to create a new chapter in learning within the field of music. Afterall, “Learning to learn is arguably the most important factor for academic success.”¹ This paper aims to assist with that.

Keywords:

Plasticity - the ability of neural networks in the brain to change through growth and reorganization. It is when the brain is rewired to function in some way that differs from how it previously functioned.

Prefrontal Cortex - region of the brain responsible for high order of cognitive thoughts including speech, risk processing, and memory.

Habit - a settled or regular tendency or practice, especially one that is hard to give up.

¹ Stanislas Deheane, *How We Learn, The New Science of Education and the Brain* (New York: Penguin, 2020), xx.

Learning is about forming connections in the mind and repeating it the way we want it done until it becomes a habit. It is a process which is scientifically complicated yet fundamentally rather simple. “[O]ur brains are the result of a compromise -- we inherit, from our long evolutionary history, a great deal of innate circuitry ... but also,... some highly sophisticated learning algorithm that can refine those early skills according to our experience.”² No matter the task or skill the mind is trying to accomplish, the brain processes the information it is given in the same way. The brain simply takes the information we give it and treats it as “correct” whereby it begins to retain the skill and strengthen the bond around that particular skill.

The human brain is an incredibly malleable tool. Our brains have an enormous plasticity to them in order to adapt to whatever environment we are born into. Incredibly, this means we quite literally can do anything we set our minds to. At the root, learning can be primarily categorized into two types: habituation and association. Habituation refers to a process in which our mind continues to respond to a similar stimulus, adapt to it, and eventually no longer respond to it or need to think actively about it. Association happens to be somewhat more hypothetical where the brain can respond to familiar patterns and be able to complete an educated guess as to what will happen next. For musicians, this is common when a large V7 chord is struck and the well-trained brain automatically hears the resolution even before the resolution occurs. The trained and educated mind already knows what comes next due to a familiar pattern.

Patterns are one of the most useful tools for the mind to learn and engage. As repetition is the most essential element to learning a skill, the brain will draw the most from repeated patterns.

² Stanislas Deheane, *How We Learn, The New Science of Education and the Brain* (New York: Penguin, 2020), xviii

Habits are formed when new information is repeated several times and the brain forms a permanent connection with the information it was given. When one first learns a motor act, the cortex is used. As a skill is repeated and mastered, the skill becomes automatic - or habitual - and the responsibility for that skill shifts from the cortex to neurons in lower parts of the brain, freeing up neurons in the cortex which allows the brain to learn more new information.³ Further, what is happening in this process is the brain is building a high-speed network along nerve roads.

So how can one engrain these patterns deeper into the brain and how does one know which patterns to create in order to solidify the skills one is after? To address the second question first, these patterns must be patterns which focus on the exact skills one wishes to master. The brain is more efficient when it is allowed to focus on one specific task instead of several at once. Whether as a teacher or a student, the further simplified a task can become the higher the focus the brain will have on the task one wishes to imprint upon it.

To address the initial question posed above, there are multiple ways one can engrain material into the brain. For the purposes of this research article, two ways will be examined: active and passive learning. In the 1920's while a pupil of Kurt Lewin, the Soviet (now present-day Lithuanian) psychologist Bluma Zeigarnik conducted a study on memory in which she postulated and concluded that interrupted tasks are remembered better than completed ones. Her research stemmed from a lunch with Lewin in which they noticed a waiter had better recollection of orders which had yet to be paid. When a waiter was asked to recall what a table had ordered but they had already paid, the waiter was unable to remember the orders with much if any detail.

³ John Ratey, *A User's Guide to the Brain*, (New York: Vintage, 2002), 149.

Upon this realization, Zeigarnik designed a series of experiments in which she would uncover the processes underlying this phenomenon. In her research, she worked with students and focussed on whether students would remember the material they were focused on better with or without a break/interruption in order to perform unrelated tasks. Upon conclusion of her studies, she found compelling evidence that the students who interrupted their learning process with a break were not only more likely to remember the material they were focussed on but remembered the material better than those students who did not take a break.⁴ Zeigarnik's research stems from Lewin's study of Field Theory which states "a task that has already been started establishes a task-specific tension, which improves cognitive accessibility of the relevant contents."⁵ Through this idea of task-specific tension, the mind continues to focus on the original task in the background like an open tab in a web browser, strengthening the development of that task when it is returned to.

Musicians can utilize this research in practice sessions. With ideas such as the Pomodoro Technique⁶ which suggest a 25-minute period of focus followed by a 5-minute period of rest up to 4 times before a longer break is required, it can be helpful to use this idea to plan multiple sessions. Already, one can begin to see the similarities with Zeigarnik's research through the Pomodoro Technique as it relies on interruption in order to build its basis.

The concept of willpower may also be a useful tool to musicians when they practice and hone key skills. In the book *Willpower* by Roy F. Baumeister and John Tierney, the concept of willpower, or the ability to make decisions based on mental strength, is examined through

⁴ Bluma Zeigarnik, *A Source Book of Gestalt Psychology*, (Internet Archive, 1970), 300-14.

⁵ *Zeigarnik Effect*, (Wikipedia)

⁶ Laura Scroggs, *The Pomodoro Technique - Why It Works & How to Do It*, (Todoist, accessed April 3, 2024)

several different lenses. In *Willpower*, the authors explain the mind literally is required to make thousands of decisions every single day from something as simple as what to wear to something more complex such as what to say in a meeting with a boss.⁷

Within a chapter on decision fatigue, they describe a study on four men serving in Israeli prisons with similar sentences who had recently asked to be released on parole. Their cases were heard by a judge and a board to determine their outcome. These 4 prisoner's cases for parole were heard over the course of a single day. Case 1 was heard at 8:50am, Case 2 was heard at 1:27pm, Case 3 was heard at 3:10pm, and Case 4 was heard at 4:25pm. A pattern emerged from the board's decision separate from the facts that they were presented. Again, each of these prisoners were rather similar in the fact they were repeat offenders of mild crimes. The pattern that was discovered boils down to the "you are what you eat" phenomenon. The two prisoners whose cases were heard based on whether or not the cases were heard when the board's glucose levels were higher - in other words, the prisoners had a better chance of getting a favorable outcome (parole granted) when the board had more recently eaten.

These outcomes may seem directly related to glucose levels in the bloodstream because food is required to nourish the mind. No matter how honorable a judge may be, judging is hard mental work. As a judge begins to make one decision after another, their brains become tired and decision fatigue begins to set in. Noticing that, and with an abundance of caution, they choose to deny parole to prisoners with highly similar cases not because those prisoners didn't show they were worthy of being granted parole, but simply because their willpower was already exhausted from previous work.

⁷ Roy F. Baumeister and John Tierney, *Willpower* (New York. Penguin, 2011), 96-102.

As musicians, this idea of willpower can be critical in our development. Taking this study and applying it to practice, many parallels can be drawn. For one, perhaps those late-night sessions may not be the best idea after all. Applying the information about the prisoner's parole cases, the mind may not be able to best make decisions later in the evening. Due to thousands of other minor decisions the mind has made during the day, this is now understandable. So, instead of burning the midnight oil which is essentially fumes, why not structure a day in a way in which allows the mind to be as present and fresh as possible for the tasks at hand?

Tackling high-level priorities earlier in the day has been cited by several research articles as a way to accomplish more, better. Unless someone is an extreme night owl, the earlier in a day someone works on and completes a task, the better the quality and result will be due to the mind having a greater ability to focus on and make the best decisions on how to complete a task.

Musicians - especially student musicians - would be best suited to begin their days with 1 very specific focus on a fundamental aspect of their playing which they begin working on immediately. The idea of a long warmup is an old idea which focuses on a variety of skills which are repeated daily. As tasks are repeated, they become a habit. When tasks become habitual, the brain no longer works actively to produce the desired results but becomes more passive in its approach as we discussed earlier in this article.

From another angle, there is an evolutionary biological tool which all of us as humans possess - the boldness of a first taste⁸. Long ago, ancestors didn't have grocery stores they could simply drive to and pick up a pint of organic blueberries. They had to forage for their food, often traveling a dozen or so miles per day in search of it, crossing different regions, and finding things

⁸ John Ratey, *A User's Guide to the Brain*, (New York: Vintage, 2002), 72-76.

which looked like food but they had never seen before. One day, an ancestor stumbles across what looks to be a blueberry. Weary of it, they try just one to be sure it's safe. When our ancestor puts it in his mouth, much to their surprise, it's not sweet like a blueberry is supposed to be but sour and intensely bitter. This ancestor immediately spits it out and moves onto another bush to find a berry which tastes better for they believe what they just ate to be toxic. As they find the actual blueberries, the first bite of them tastes incredibly good - sweet, juicy, like summer time. After a few bites however, the taste becomes less intense - almost bland. This is because the mind now feels the food is safe and no longer has to focus intensely on what they are putting into the mouth as there is no longer fear of death from the food.

From another angle, one can examine an initial journey from home to school. On the first day, one wakes up early and is sure to leave enough time in order for a commute. Additional time is accounted for in case a wrong turn is made or one gets lost because the route was new. At every intersection the mind notices a stop sign, crosswalk, and an interesting tree. A week later and something fascinating happens in the mind. Now, there is an awareness based on habituation as to how long this route takes and what potential traffic one might encounter. The mind stopped observing the stop signs, crosswalks, the "Better Call Saul" sign. Why? Because the mind has developed a habit and is now comfortable with this route in order to get from home to school. The mind no longer needs to be sharp and aware of its surroundings for fear of the unknown because now the surroundings are familiar.

When the mind learns any skill, especially an instrument, these same principles apply. First, we have to focus on how to move from one note to another. Every step needs to be thought through in order to accomplish what we as the operators of an instrument are trying to do from

the wind, embouchure, holding the instrument, bow position, etc. to ensure things are being done correctly at the fundamental level in order to instill what is correct and what skills are desired to become habits into the deeper regions of the brain.

Returning to the idea of a warmup, similarities can be drawn from what is stated above due to how the mind works. Newer information requires a sharper mind. Older information does not. If the desire is to improve and grow, the focus must be on the most important skill desired when the mind is at its most optimal state. This focus must also be changed regularly for two reasons. 1) The mind must stay active and see the new material as new material in order to activate this biological response of alertness. 2) As discussed earlier, when the mind is interrupted of a task it wishes to complete, it retains information at a higher rate as discovered in Zeigarnik and Lewin's studies.

Conversely to these ideas of shorter periods of focus which become interrupted, it would be remiss for this article to not include the research of Mihaly Robert Csikszentmihalyi. Noted for his work on happiness and creativity, Csikszentmihalyi is best known for his research on an idea which is called the *flow state*. In the flow state, the mind enters a deeply concentrated state with complete absorption of the task at hand. In this state, Csikszentmihalyi suggests the mind is at its happiest. Colloquially known as "being in the zone," the feeling is characterized by feelings of engagement and fulfillment during which periods of temporal concerns such as hunger are often completely ignored.⁹

Incredibly enough, Csikszentmihalyi's research stemmed from his fascination with artists who seemed to get lost in their work. In order to find flow, a certain level of difficulty must be

⁹ Wikipedia, *Flow (psychology)*, 2024.

reached. Should the skill be too simple, the mind becomes bored. In other words, the more habitual the task at hand is, the less engaged the prefrontal cortex will be leading to less interest and a lower threshold of learning. On the other hand, should the task at hand be too difficult, the mind will enter a heightened state of anxiety, causing distress and uneasiness.

One can find similarities within musicians. Continue doing the same thing every single day when a practice session begins and the mind becomes disinterested, disengaged. Attempt a work or etude which is too far ahead of the current skill set and feelings of distress begin to appear. This is why it is important to lead all practice sessions not with something routine, but with something newer which requires a higher focus and is achievable.

When teaching, a teacher must be able to steer their pupil in the right direction at a pace where the mind is continually focussed and never becomes complacent. A teacher needs to be able to distill the most fundamental aspects of playing an instrument into the most expensive sound possible by looking at the fundamentals of a student. From there, and depending on the level of a student, 1-2 fundamental tasks such as striving for a more pure sound or creating an articulation with a ping on the front of it should be assigned as overarching goals for 1-2 weeks (more if they are a beginning student). Having a clear goal which can be applied to all aspects of playing is important due to two important factors. 1) A clear goal provides direction for the student. Without a clear goal, no destination will be reached. 2) A clear goal determines when success is reached for the student. All humans are motivated by reward.

With positive associations present upon the completion of a task, the mind associates a reward with the positive behavior. This is no different than positive reinforcement training in our best friends, the humble dog. The more positive association, the happier the mind is. The happier

the mind is, the more desire the mind has to continue working on such tasks.

Another rather interesting concept in the way in which one learns stems from self-awareness. Often, musicians are told to practice in front of a mirror in order to be able to view their posture and correct their form based on the information provided to them by their teacher. A mirror is a phenomenal tool for this because it gives instantaneous feedback to the person staring into it. With regard to much of what needs to be addressed in a practice room, the mirror may seem like a minor accessory only to be utilized when absolutely needed. Personally, I have worked with several students who don't regularly use a mirror in their practice. Unfortunately, not practicing with a mirror is depriving musicians of one crucial element they could benefit from: a healthy dose of self-awareness.

Amazingly enough, mirrors cause profound differences to those who are placed in front of them. In a study by psychologists Charles Carver and Michael Scheier in which participants were placed in a seat at a desk where there happened to be a mirror, they came upon some revelatory findings: the mirror prompted them to keep working harder at their task.¹⁰ Why? Because of the link between self-awareness and self-regulation. When one sees themselves in the mirror, that person is challenged to committedly uphold their values and meet their own standards. Nothing is worse than letting oneself down.

Musicians would be apt to consistently utilize a mirror in their practice sessions. Learning an instrument is a particularly self-taught discipline. Aside from 1 hour a week of guidance the student receives from their teacher, musicians are mostly left to their own vices to learn their instruments. So why not utilize a mirror to prompt self-regulation if it has been shown to change

¹⁰ Roy F. Baumeister and John Tierney, *Willpower* (New York. Penguin, 2011), 113.

the way people interact and cause them to uphold their highest values?

Throughout this paper, several larger topics have been discussed yet the question as to how to utilize all of this information still remains. In short, this information can be utilized in a variety of different ways, applied by the user in order to best suit their particular learning style. Some students respond best to shorter periods of learning as the Pomodoro Technique suggests. Some students operate better with distractions thrown in in order to keep the mind active and not stuck on a single task such as the Zeigarnik Effect explores. Others may find Mihaly Csikszentmihalyi's idea of the flow state to be more productive should they be learners who prefer to focus for extended periods of time and enjoy what they do.

Each one of these techniques has its own place and can be used in tandem with other techniques. In many ways, utilizing more than just one of these techniques will have a larger impact on the way one is able to focus in their practice sessions as opposed to utilizing just one of them. Overall, these concepts aim to start a conversation in order to address common shortfalls within the pedagogical center of teaching music to students. In a world where the answer is often simply "you just need to practice more," perhaps it is due time teachers and students challenge the notion of "more" and replace it with a different word such as "better" or add the words "effectively" or "efficiently" after it. To conclude, Stanislas Dehaene states best at the end of "How We Learn:" [j]ust as medicine is based on biology, the field of education must be grounded in a systematic and rigorous research ecosystem that brings together teachers, patients, and researchers, in a ceaseless search for more effective, evidence-based learning strategies."¹¹

¹¹ Stanislas Dehaene, *How We Learn, The New Science of Education and the Brain* (New York: Penguin, 2020), 245.

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