
ACADEMY OF MUSIC AND DRAMA

# RANDOM PRACTICE AS A TOOL FOR ACHIEVING EXCELLENCE

## Can organized chaos in the practice room lead to improved consistency and confidence in performances?

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**Independent Project (Degree Project), 30 HEC, Master of Fine Arts in Music with specialisation in symphonic orchestral performance**

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## ABSTRACT

Key words: random practice, practice technique, motoric skills, contextual interference, retention of motoric skills, transfer of motoric skills, efficient practice.

Random practice is a method for practicing motoric skills that has shown to give much better results in terms of retention and transfer (how much of your practice that carries over to the next day), compared to “traditional” practice (blocked practice) and it is already seeing use in sports with great results. In this thesis I explore the possibilities on how to apply random practice concepts in my own, musical practice sessions, by creating three different practice-systems that follow random practice principles. This is followed by reflections on benefits and challenges these systems bring with them, as well as my own thought on what is required from the player to successfully gain the great benefits of random practice.

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# 1. Introduction

## 1.1 A desire to play the right notes, and to be able to trust my own playing during performances

First of all, why would I even want to try out new methods for practice? For starters, I have never really liked or been good at practicing. In my early teens, when I actually started trying to practice a bit, I would just unpack my trombone, start playing and pray I would get it right eventually. Of course, that usually led to playing something wrong so many times I essentially practiced my mistakes instead of fixing them. This would lead me to feel like practice made me worse at playing the trombone, which again would make practice less motivating.

Even as I got older and increased the number of hours, I still lacked very concrete tools to make my practice better. I got exercises, pieces and etudes from my teachers, but still lacked a system to put them into. The biggest change in my practicing came when I decided to start logging what I did in a practice session, with timestamps so I could see how I spent my time. After just one session, I could see how embarrassingly chaotic my practice was. This made me start practicing in blocks of 30 minutes, and keeping the log to keep myself accountable and motivated. At that time, the most important thing for me was to increase the number of hours in the practice room, but I had started to realize how much untapped potential I had in terms of how I did my work.

Eventually, I realized that nobody had actually taught me how to practice. Instead, I had mostly been told to practice this or that, or just to practice more. Even the times I was given concrete ways to practice something, I was never properly taught different ways of planning, scheduling and executing a practice session. Also, the tools I actually was given often lacked an explanation of why that way of working works, or what it worked for, which meant I had a tool I had no idea when to use. I imagine that the feeling I had would be similar to how it feels to be given the tools and parts for a big, complicated piece of IKEA furniture, but no instructions.

Since then, I have tried to experiment with my own practice, to make sure I never get stuck in a specific way of doing something. Both to keep improving and learning, and to avoid boredom and loss of challenges. I would switch methods and systems often, while bringing with me discoveries of what worked well and could be reused and adapted to other

systems. I have also attended many masterclasses and seminars, and whenever I had a chance, I would ask teachers or soloists about their systems and their reflections around their own practice. Then I would spend time experimenting with the tips I got, sometimes to great success, sometimes to lesser success. Nonetheless, I always tried to stick with the system or method long enough to get an understanding of why the originator deemed it worthwhile, and why it was working or not working for me. Often, I would find that some systems and methods required a technical and musical maturity I had yet to reach, and that it would be great for my playing in the future, just not at that specific moment.

During the time I have spent doing my bachelor and master educations, I have done many experiments, and solved many of the problems I thought would remain unsolved for the rest of my life. This is much thanks to my ever-expanding toolbox, and curiosity in the art of practicing. During the last couple of years, I have realized that my needs in the practice room have shifted. Up until this point, I was mainly working on creating structure and a framework for my practice day to ensure that every session offered quality practice, and that I got as close as possible to three hours a day. The last year of my bachelor's degree I started to realize that since my work ethic had improved, and I had created better habits around practice sessions, my goal of a certain number of hours per day would actually start to limit me. I would be content with a practice day if I reached my goal of three hours, even if I did not do everything I wanted or planned. On the other side, I would also feel bad about leaving early if I had done everything I wanted, and then stay extra and do practice of bad quality, just to fill my quota. After realizing that my needs had shifted, I started a new experiment where I stopped logging my hours, and started mentally making a "to-do" list for the day. Then I would practice until I was "done" instead of until "I got my hours in", no matter if it took two hours or eight hours.

Presently, my biggest challenge as a trombone player is to increase my accuracy and hit-rate of correct notes. I still struggle with some inconsistency, especially when I am nervous, and with executing especially challenging parts at the highest level. I have started to realize that these issues probably are rooted in how I practice, which triggered my curiosity of different methods for motoric learning and retention. Then, during a lecture by Christian Steenstrup, professor of trumpet in Aarhus, I was first introduced to the concept of "random practice". This is a way of learning motoric movements effectively, that has been researched and used quite a bit in some sports already, with some trying to utilize it in music. I got very

fascinated by the concept and that such a chaotic way of practicing actually could have benefits that could make a difference in my own playing.

So, now that the opportunity presented itself, it was natural for me to write about random practice, and methods of implementing it into my own practice regime. This thesis will be a documentation and reflection of my process of incorporating random practice or random practice elements into my own daily practice, with the goal being that I can create very concrete systems and tools that can be easily used by both myself and others.

## 1.2 Question, material, method and structure

**The question** I will be working from, is "can organized chaos in the practice room lead to consistency and confidence in performance?" Random practice is at its core quite chaotic, as randomness and constant changes of tasks very quickly can become messy with no control and direction. However, my hope is that this chaos can be organized in a way that allows oversight and control, while still preserving the benefits of random practice.

**The material** I am using for this thesis is two studies published on the effects of random practice (also called contextual interference) and video recordings of my own practice sessions.[1] Especially important for my work was the study published by Shea and Morgan, which was one of the first studies published on the subject, and also the base of most of subsequent studies. The sheet music I used for my tests was a few books of etudes and studies, as well as my part of a chamber music piece I was playing at the time.[2]

**The method** I decided on, was to create three systems of random practice that could be used for different purposes, and then use them to practice whatever I needed work on at the time of documentation. Subsequently, I chose to separately analyse the three systems, and assess if I had been able to apply random practice concepts to those sessions through the use of my systems. After testing out all three systems, I did some reflections on their areas of use

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[1] John Shea and Robyn Morgan, "Contextual interference effects on the acquisition, retention, and transfer of a motor skill," *Journal of Experimental Psychology: Human Learning and Memory* 5 (1979): 179-187, Accessed 22. April 2020, DOI: 10.1037/0278-7393.5.2.179.
Sarah Merbah and Thierry Meulemans, "Learning a Motor Skill: Effects of Blocked Versus Random Practice a Review." *Psychologica Belgica* 51 (2011): 15-48. DOI: 10.5334/pb-51-1-15.

[2] Brad Edwards, *Lip slurs, progressive exercises for building tone & technique* (Ithaca, NY: Ensemble Publications, 2006).
Max Schlossberg, *Daily drills and technical studies for Trombone* (Corolla, NC: M. Baron Company, 1947).
Robert Müller, *Technische studien, heft 1* (Mainz: Musikverlag Zimmermann, 1901).
Jan Koetsier, *Concertino op. 115 for 4 trombones* (Crans-Montana, Switzerland: Editions Marc Reift, 1988).
André Lafosse, *Suites de J.S. Bach pour Violoncelle seul adaptées au trombone tenor*, (Rue Saint-Honoré, Paris: Alphonse Leduc, 1946).

and their usability, while comparing the benefits they offered. Finally, I made some conclusions about the use of random practice in music as a whole, as well as the requirements for this methods' success.

**The way I have structured this thesis**, I will first give an introduction to what random practice is, the terminology that is used to describe it, and also the effects it brings when used correctly. Then I will discuss the challenges and my reasoning behind the way I am attempting to implement random practice in a musical context. After that, I will present the different systems I have come up with, and discuss their areas of usage. Here I have some video material for reference. I will finish with a summarization of the systems, where they differ, and when to apply which, as well as some personal reflections and conclusions based on the experiences I made during this work.

# 2. What is random practice? Using high contextual interference during acquisition of a motor skill to improve retention and transfer

## 2.1 Terms used to describe random practice

In 1979, John Shea and Robyn Morgan published a study named “Contextual Interference Effects on the Acquisition, Retention, and Transfer of a Motor Skill”, which was one of the first important studies on the benefits of using high contextual interference during acquisition of a motor skill to affect the retention and transfer of that skill. For the sake of clarity, I am going to give a short explanation of the main terms used to describe random practice.

**Contextual interference** when performing a skill, is to interrupt the repetition of a task with another similar task and then changing the context of the performed skill. Put into simpler terms, having high contextual interference when performing a skill, is to change tasks often, avoiding consecutive repetitions. For example, if you are practicing shooting a basketball into the hoop, and want to do 18 shots from three different spots (total of six shots from each spot), a session with a high contextual interference would mean that you switch the spot you are shooting from after every shot. If you are doing a session with low contextual interference, you will do all six shots from a single spot before moving on to the next one. Practicing with high contextual interference is also known as (and will be referred to as such from here) “random practice”. Practice with low contextual interference is also known as “blocked practice” (and will be referred to as such from here), as the tasks are repeated multiple times, forming “blocks” of each task.

**Acquisition** is the first stage of learning a motor skill. This is the phase where you are introduced to and learn the new task you are going to practice. The acquisition stage can be seen as the phase when something is new, and you have to build a new memory of it in your brain. This can apply to both learning a new sequence and learning a new technique.

**Retention** describes how well the work you did during the acquisition carries over to the next session. If you were to repeat the task after some time, would you be able to perform it just as good as you did during the end of the acquisition phase? The grade of retention depicts how much of the improvements are still there after time has passed. For example, imagine having a passage you are able to do at 104 BPM. You spend an hour practicing it,

and are at the end of the session able to play it at a BPM of 142. If you the next day only are able to play it at 112 BPM, the hour you spent the day before would have resulted in low retention. However, if you the next day were able to play it at a BPM of 132, the hour you spent would have high retention.

**Transfer** is looking at how the skill you practiced and learned influence other, similar skills, or how the skill performs in a different context. For example, if a basketball player practices hitting the hoop from three metres away, and increases his accuracy during this practice session, would his accuracy and technique while hitting the hoop from one metre away also improve? Would it also improve his accuracy and technique when passing the ball? In this example, if the player's practice has high transfer, his practice will also improve the overall proficiency with the ball.

## 2.2 What is random practice, and how does it work?

As I mentioned previously, practicing a skill using random practice, would be practicing it with a high contextual interference. This means that when practicing a skill or a sequence, you should alternate between it and another skill or sequence, avoiding doing the same task twice consecutively before switching to another task.

So, for example: if you have to practice A, B and C five times each, instead of doing AAAAA, BBBBB, CCCCC, you would for example do ABC, CAB, BCA, ABA, and CBC.

At first glance, this seems like a very chaotic way of practicing a skill. In Shea and Morgan's study, they found that the random practice subjects performed poorer during the acquisition stage than the subjects who practiced blocked.[3] So why would we want to use a method that even has you performing worse when you are learning the skill?

The answer is superior retention and transfer. Shea and Morgan made a machine that gave the subjects several motoric sequences to execute, and recorded their completion time. For the acquisition phase, they divided the subjects into two groups. The "random" group would get the sequences in a random order, without sequences appearing more than twice in a row. The "blocked" group would get all repetitions of a sequence in a row. Both groups did the same sequences the same number of times, the only difference being the order they appeared in. They subsequently tested the retention of the sequences after 10 minutes and

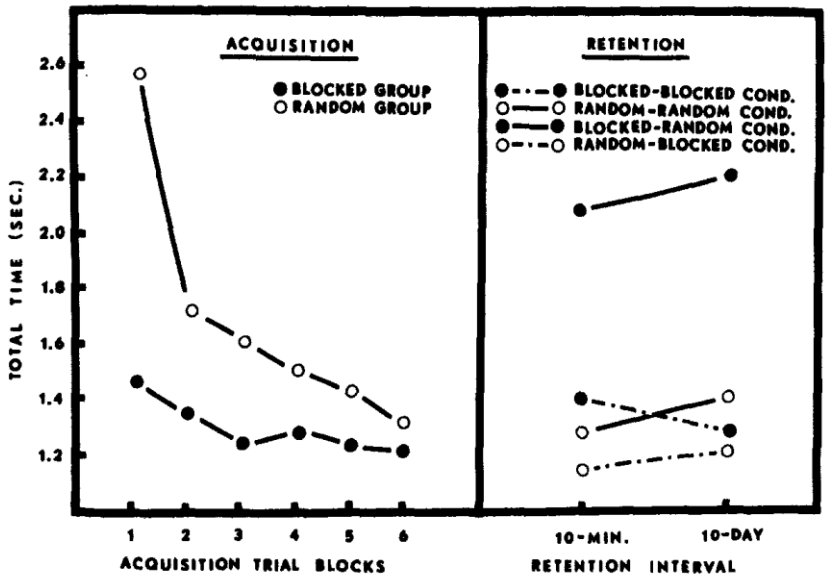
[3] Shea and Morgan, "Contextual interference," 183.

after 10 days. For this test, they split the groups in half again. Half of every group received the sequences the same way as during the acquisition phase, while the other half was tested in the other manner. This way they ended up with four groups:

- Acquired randomly – tested randomly
- Acquired randomly – tested blocked
- Acquired blocked – tested blocked
- Acquired blocked – tested randomly

What they found, was that the subjects who practiced the sequences randomly during the acquisition phase, had both better retention and considerably better transfer. To word it differently: those who practiced randomly performed worse when learning the skill, but did not only quickly improve (though never completely catching up to the blocked group) during the acquisition stage, they learned the skills better and they performed similar but harder tasks better.[4] Both the retention test and the transfer test clearly showed how much more flexible and adaptable the random groups skills were.

The figure below graphically shows the results of Shea and Morgan's tests.[5]




In the study, they also offer their own thoughts on why the random group had superior retention and transfer. The authors' explanation is that due to the high contextual interference,

[4] Shea and Morgan, "Contextual interference," 183-185.
[5] Shea and Morgan, "Contextual interference," 183-185.

the difficulty was in reality higher for the random group, which forced them to use multiple processing strategies to be able to perform the task.[6] A great way of depicting this is the way Trevor Ragan, who made a video about the benefits of random practice[7], puts it. He names the process that happens before executing a skill "read, plan, do".[8] Both groups had to read the situation, plan how to execute the task, then perform (do) the task as planned. The difference is that the blocked group only had to read and plan once, and then they could just keep doing the same solution, while the random group had to complete the whole process every time.

This is why the random group performs worse during start of the acquisition stage. Not only do they have to redo the full process to properly remember and perform the skill every time they do a repetition, they only get one attempt before they have to shift their attention to another task that need just as much focus. This is of course much more cognitively demanding and force the mind to be active through the whole process of recreating the memory and the skill.

## 2.3 How can we apply random practice in a musical context?

After some experimentation I quickly realized that applying random practice in my own practice was harder than I anticipated. Because of the difficulties of exactly measuring musical progress in the practice room, I have found that the best way to review the effects of the different methods, is simply to rely on my own sense of security during performance, and my own experience of retention between practice sessions. In addition, I decided to document my own thoughts, reflections and experiences during all points of the process. If a random practice system is successful, I should experience that the retention of the things I practice improves, and that my overall security when performing this material improves.

The most important aspect of random practice is switching the task as often as possible, and avoid doing the same thing more than two times in a row. This is much easier implemented in sports, as practicing those techniques is a bit more streamlined. The challenge is to define "one repetition." If we are to stay very true to the definition of random practice, then "one repetition" would be exactly that, one repetition of one instance. When doing the

[6] Shea and Morgan, "Contextual interference," 186-187.
[7] Trevor Ragan, "Motor Learning: Block vs random practice," uploaded to YouTube by the user Trevor Ragan, accessed April 23, 2020.
[8] Trevor Ragan, "Motor learning," 3:28.

pilot project, I was curious to test out the boundaries of the term “one repetition”, as its definition also controls what situations the system fits into.

This led me to create three systems for random practice. The systems are named after how or where the contextual interference is based, and I have also made a distinction on the amount of effort needed to use the system. This is based on the amount of time needed to prepare and execute the system, as well as how rigid it is. The result was two high effort systems, and one low effort system.

- **The task-based system, high effort**, originates from an attempt to use random practice for daily routines and series of exercises. The main purpose of it was to apply random practice to my exercises and daily routines that mainly worked on fundamental and basic playing technique.
- **The time-based system, high effort**, stems from my own good experiences with using time-limited sessions for practice, and a friend of mine who once talked about how she had very short sessions and breaks in her practice sessions.
- **The problem-based system, low effort**, was made as a kind of counterweight to the two high effort systems, by being adaptable and easy to make use of, as well as require little to no preparation or planning. The goal of this system, is to be a tool that can be brought out for specific problems that arise when working on a piece of music, rather than being a full practice session like the other two systems.

# 3. Three systems that apply random practice into a musical practice session

## 3.1 The task-based system, high effort

The task-based random practice session had one main goal. I wanted to attempt taking daily routines found in books and practice them with high contextual interference. The challenge was that almost all daily routines have been designed for blocked practice. They are usually built progressively with an exercise being introduced, then repeated while moving up or down in semitones. It will then be followed by either an exercise expanding upon the previous exercise, or an exercise addressing a different part of the basic playing technique. These daily routines all have in common that they address all basic techniques in the span of a session.

This meant that if I were to do the same routines randomly, I would have to redesign them in some way. The first design I attempted was to follow the progression that already had been made and do the first step or repetition of each exercise, then go back to the first exercise again and do the next step of that exercise, usually in another key. This meant I effectively would be doing the whole routine several times, just down semitone every time. A way of depicting this would be ABCDEFGH, ABCDEFGH (down a semitone), and so on.

Even though this is an interesting idea, there are two problems with this system in my eyes. The first one is that the sheer number of tasks will require a lot of time to get through, especially if the goal is to get several repetitions of each task. The second problem would be organizing it. If I follow the already made progression, I will end up with one long, linear block that is repeated a semitone down. If I were to mix up the instances, that would require a very large amount of planning to make sure that the number of repetitions on each exercise adds up. Another issue is that daily routines tend to have a desired progression, where every exercise is a preparation for what is to come. This design unfortunately ruins this structure by progressing forward faster than intended, which also is the reason why I decided not to invest more time in this design.

This led me to shift my focus from daily routines to just creating a system for practicing technique and studies. My next design was to combine exercises and studies into a random technique session, as this allowed for more adaptability. I had two requirements for

the exercises I chose. Every exercise should be quite short, and it should be a part of a bigger system (so I would not have to actively choose every exercise, but could just follow the intended progression). Then, I would pick three, contrasting technical areas I wanted to work with, and chose exercises that met the requirements I had set. Contextual interference would then be created by alternating between the three technical topics. I chose to define one "task" as one repetition of an exercise or the exercise in one key.

When I tested this, I used one book with slur studies, and one book with a combination of studies where I used studies from both the flexibility and articulation chapters.[9] In the practice session, I placed both books on the stand, on top of each other, and pulled out the book in the back every time I finished a task.

What I found, was that this approach is not truly random practice, as each instance of an exercise either would be different each time I returned to it (for example a half step down), or each exercise would be a block of many repetitions of the same pattern that move chromatically down. This meant that though some contextual interference was achieved, I never actually got to repeat the exact movement pattern I wanted to practice. On the other hand, as these studies are progressive, I would always come back to an exercise similar to the last one, which required use of the same skill in a slightly different manner.

This system is a bit unlikely to find its way into my regular practice, as it requires a lot of effort compared to the benefits. I did not really experience that much improvement in any of the skills I practiced, but I did notice that it forced me to stay more focused on the coming task, as I was constantly changing technique. This system might also work much better in a looser, low-effort version to increase concentration and to make technique practice a bit more varied, and less boring for the mind.

## 3.2 The time-based system, high effort

The time-based random practice session was intended as a practical and easy way to practice small spots in whatever material I was working on, be it solo repertoire, excerpts, etudes or ensemble repertoire. The intention was to make it a tool for creating a structure in a random practice session, without demanding rigorous planning beforehand. Just a system where I could plot in whatever spots I wanted to improve in all the material I was working

[9] Edwards, *Lip slurs,* Schlossberg, *Daily drills.*

with, and then let the timer control the degree of contextual interference. With those goals in mind, this method shows great promise, which is why I will elaborate more on this system.

**Advantages with the time-based system**

I quickly realized that the time-based system for random practice had some great advantages compared to the task-based system.

**First**, the system does not depend on the practiced material being of a certain length or structured in a certain way, but instead it serves as a framework I easily can fit in whatever I would like to practice.

**Second**, the system is highly flexible and makes it easy to adjust to whatever discoveries I make underway. If I find that shorter sessions are more efficient in a given situation, I can just reduce the length of the intervals, and the basic application of the system will still be the same.

**Third**, the presence of a timer, with a clear start and stopping time, allows the focus to be on the tasks. It allows for a greater focus during the session, as I never have to actively decide when to move on from one task to the next.

**Fourth**, this system actually offers room for reflection and planning during each interval. This is in my opinion one of the most advantageous aspects of this system. I have never been a fan of mindlessly repeating a task to practice it, as I like to make small changes to keep my brain engaged. This system allows me to actively change or adjust my approach to a problem or a task during the intervals, which also means that I can quickly implement new discoveries made during the session, into the next interval.

**Fifth**, (by far my favourite part of this system): it forces me to narrow down the goals and tasks for each interval. A one-minute interval is not very much time to do something. This forces me to choose one very clear assignment for each interval. This eliminates a common problem among many musicians, which is going into a practice session with too many objectives. It forces me to be decisive and clear with what I want to achieve during this small interval. Another great aspect of this is that when forced to operate in such small windows of time, the expectations of what I want to achieve during each interval become much more realistic and manageable. I obviously cannot fix a whole phrase in just a minute, but I might be able to improve the very first interval in that minute.

Of course, this system is not fit for all kinds of practice. It will not be a good way of getting me through daily routines or specific exercises, as I either have to wait for the timer, or move on before I complete the task. This same problem occurs when working with longer phrases.

**System structure and execution of the system**

For structuring this system, I used an interval timer-application on my phone.[10] In this application, I have made two different random practice setups. The first one utilizes a 5/1 system, which means each "practice session" lasts five minutes, and between them I have one minute to rest and prepare the next session. This allowed for five practice intervals with the full session lasting 29 minutes. I quickly realized that five minutes per interval was too long to call it random practice, even though five minutes felt very short due to me being used to blocked practice. However, I still experienced this as a positive tool for practice, as the advantages I mentioned earlier still were present, though to a smaller extent.

The second setup, which I made after realizing five minutes was too long, was 1/10s. This time, the practice intervals lasted one minute, with 10 seconds rest/preparation between practice sessions. The total completion time was set to 23 minutes and 15 seconds (with a five-second count in for the first session), as my usual practice sessions are around 20 to 30 minutes. This meant a full practice session would have 20 practice intervals.

**Time-based system, Video example and analysis**

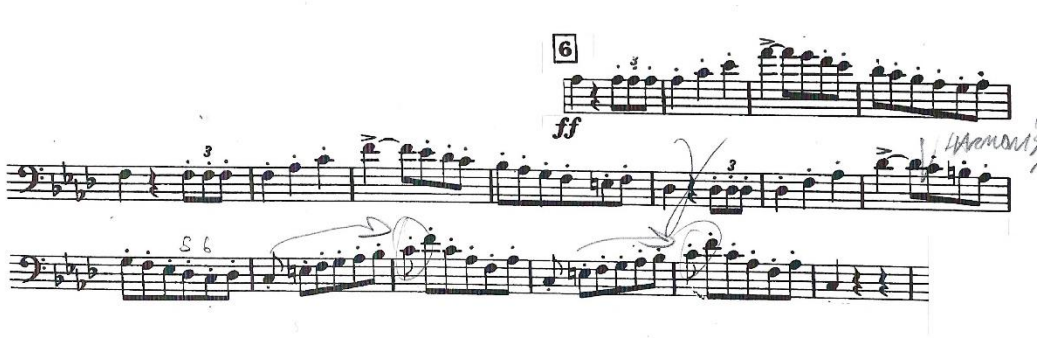
I have made a video example of a time-based random practice session following the latest setup of 1/10s.[11] This video displays a full practice session following this system, with a brief intro where I explain what I am going to do and what I want to accomplish during the practice session. Additionally, it contains a brief outro where I show what I was thinking and what I ended up focusing on throughout the duration of the session. The material I used for this video was two excerpts, which I alternated practicing. I did not limit myself to completely specific issues for each excerpt, and allowed myself to change or progress to the next problem when I felt fit. With that in mind, whenever I moved on in the excerpts, the next issue I met were similar to the previous issue, and I always revisited the original spot where I started.

[10] I have used an app named "Tabata Timer", downloaded from the google play store on my smartphone.
[11] Video 1, Video example of a time based random- practice session, using the 1m/10s system. Recorded 21.04.2020.

The excerpts played here are from “La gazza ladra” by Rossini, and from the fourth movement of “Symphonie fantastique” by Berlioz. Both have different and distinct challenges. The tasks I had for Rossini, was making the runs correct and fluent, with good articulation. Making sure that all notes vibrate and resonate fully, with a clear and identical attack. The goals I had for Berlioz, was mainly to learn the melodic progression and program where the notes are in the embouchure and my arm. This was especially important as the excerpt utilizes the alto clef, which I read less often and feel less confident reading quickly, especially on the tenor trombone. Other focus points were playing the articulations as notated and putting extra effort into making me feel confident in placing the high E flat.

For clarity, I will provide the timecodes for some points of interest and discuss their contents. (VIDEO 1)

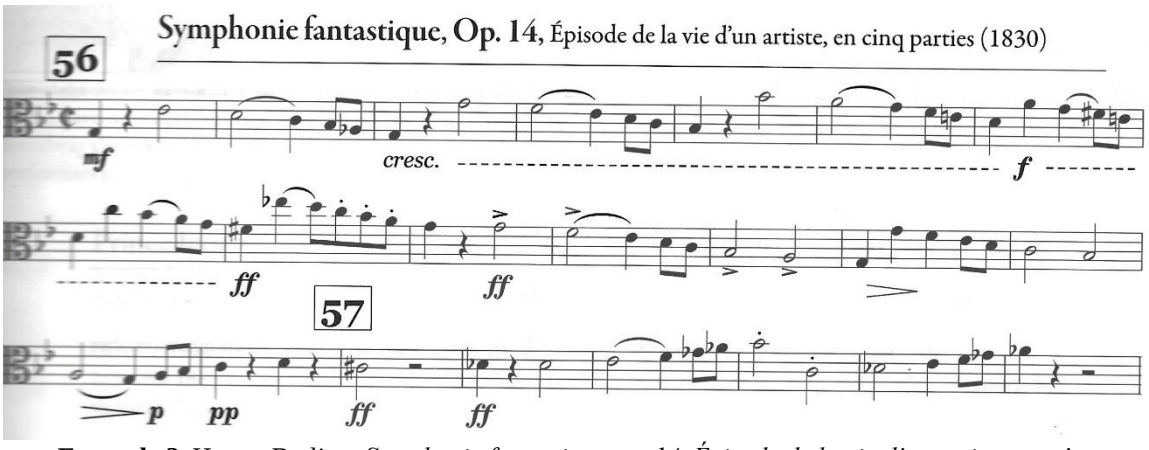
**0:00 – 1:53** Introduction to the session, displaying the application, the excerpts and explaining my goals for the session.




**Example 1:** Gioachino Rossini, *La Gazza Ladra*, excerpt of an arrangement for wind band.

**4:27 – 5:29** Rossini, practicing the figure in the first four bars of the excerpt. What I realized after watching it is how I actually utilize a kind of random practice to practice the figure as well. During that minute, I focus solely on that figure, changing it to be slightly different every time I do it (I only do it the same way twice in a row once during that whole minute). Here I utilize strategies like changing articulations, changing tempo, changing rhythm and playing the subdivisions. This is one of the most successful time-intervals in the video in my opinion.

**6:47 – 7:47** Rossini, this time practicing it with low contextual interference. Here the strategy is simply reducing the tempo and repeating it a couple of times. I might even consider this session as blocked practice, as I repeat the same thing multiple times, the same way. Even though it is within a very small window of time.




**Example 2.** Hector Berlioz, *Symphonie fantastique, op.14, Épisode de la vie d'un artiste, en cinq parties*, excerpt from the 4th movement, 1st trombone part.

**3:17 – 4:17** Berlioz, the very first interval spent on this excerpt during the session. I decided to focus on the two first figures, with extra emphasis on the first one. The reason for starting with two figures instead of one is to introduce the context of the phrase early on in the practice, so I can keep my musical overview with me during the practice. This way I avoid accidentally having practiced phrasing off or starting in the wrong character when I put everything back together.

**21:57 – 22:57** Berlioz, the second to last time this excerpt appears before the end of the session. I have here progressed to the end of the first part of the excerpt, which involves hitting a high E flat. The first thing I do in this practice interval, is to play the notes that come immediately after the high E flat. I work with them first to ensure security both before and after the E flat, as it makes it easier to play a difficult note if you are confident in the surrounding notes. I also play it an octave lower, to strengthen the memory of the melody, and to save some strength. This practice interval highlights the fifth advantage I mentioned earlier really well, as I spend some time preparing practicing the high note. This freedom allows me to take the time needed to optimize my attempts on the high E flat.

**25:35 – 29:39** Post-practice thoughts. Here I talk about my immediate thoughts and reflections behind the decisions I made during the practice session.

**Time-based system, reflections on the system based on the video analysis**

What I realized after recording this video, is that this is not true random practice, as this system allows for repeating the task multiple times, which places the contextual interference in the low range. One could even argue that this is a version of blocked practice, utilizing very many, small blocks. However, the short intervals and frequent changes of material provide a

form of contextual interference, which in itself makes this into a system of random practice when viewed on a larger scale.

It should also be considered that, as this practice system is able to really grab your focus, it can be very tiring for your mind. In addition, for wind players it can be quite tiring for the embouchure, as your instrument will be on your face for almost the entirety of the time. This increases the effort needed to utilize this system, as it can be quite demanding.

There are also several ways this system can be adjusted, as long as the goal of maximizing the contextual interference is kept in mind, as this is what has the biggest impact on retention and transfer. The first one is simply to reduce the time of the intervals even more. This leaves less time to do multiple repetitions, and puts more emphasis on making every repetition be valuable. My initial thought is to retain the 10-second break (a shorter one might induce stress and tension) and reduce the intervals to 30 seconds. The second solution is to add more guidelines on to how to spend the time in the intervals, to make sure that nothing is done the exact same way twice in a row. The third one is combining the two former solutions, having stricter limitations and less time in each interval, and possibly a shorter total time.

With this system, I did experience a sense of progression, and the material I practiced this way did feel a bit more secure the next days. Although, I did find that the timer induced some stress, which made me feel a sense of urgency. That made me try to rush my progression by not reducing the difficulty enough, which again led to practicing mistakes instead of ensuring correct repetitions. For this system it is especially vital that the difficulty is lowered enough.

## 3.3 The problem-based system, low effort

At this point, I started to realize that I needed to make a “low effort system” . The biggest goal with the low effort system, is to make it appliable to as many situations as possible, without requiring deliberate planning. I decided that the best way to go would be to strip my system down to the essentials, and use concrete and defined tools or instructions, such as “keep changing something up so you never play a spot the same way twice in a row,” “swap between spots often,” or even just “just one repetition per spot, and prepare the mind better before each attempt.” Then, using these rules, I can take a piece of music and pick a couple of spots I need to work on, and then switch between them. The benefit of this, is that it

makes this system so it can be brought out when it is needed, without having to lock up a whole practice session to a specific system.

The risk of this approach, is that since I am in charge of the degree of contextual interference in a much higher sense than in the previous systems, there is a risk of losing control over what I am actually working on, or even just accidentally reverting to old habits and change to blocked practice. This means that the low-effort system cannot be used mindlessly, as it requires much more active decision making and more focus to actually make the benefits of random practice achievable.

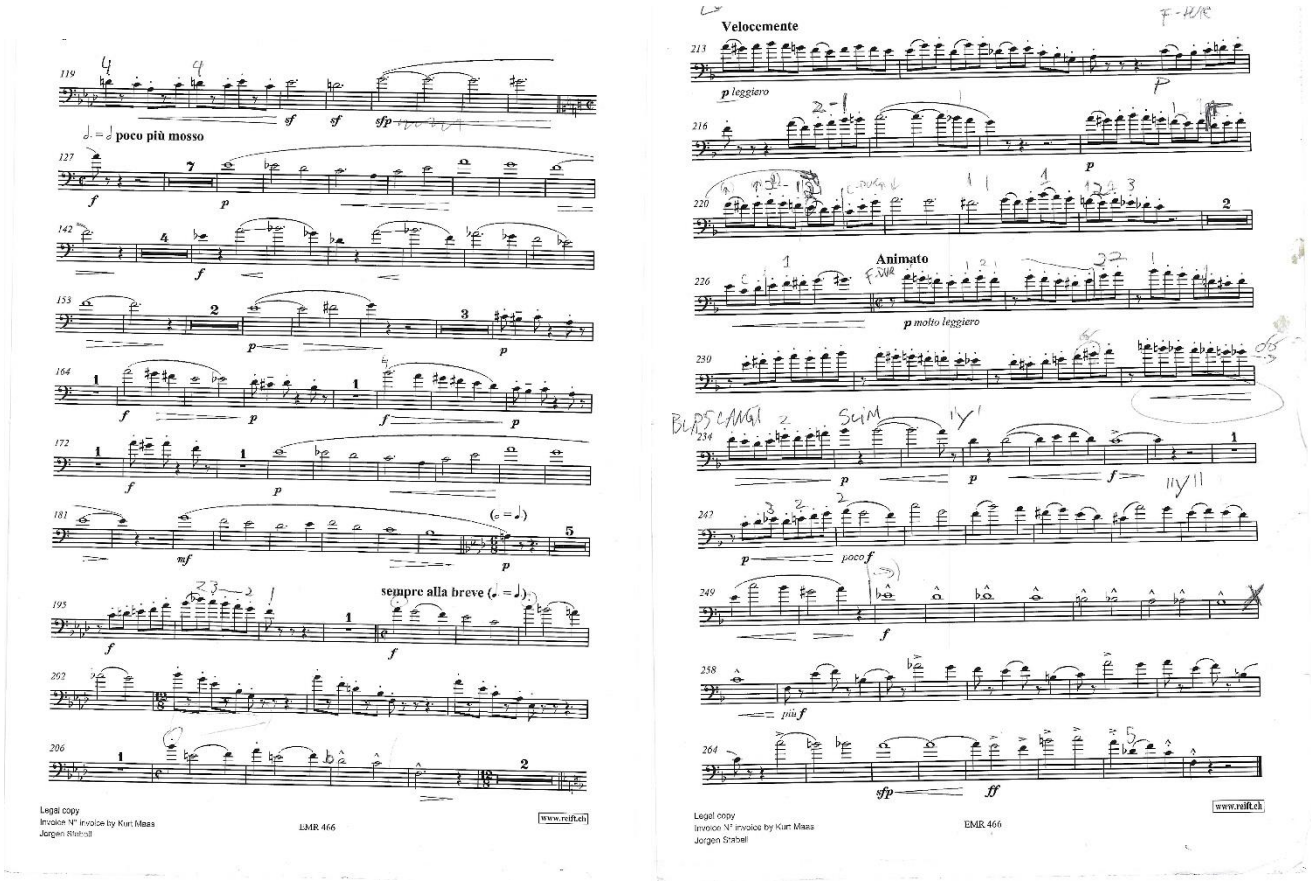
**Problem-based system, video example and analysis**

For this experiment, I decided to record myself doing some regular practice sessions, and then freely implement random practice elements whenever I felt they could help solve something. This usually led me to combining two methods of creating contextual interference. The first and most obvious action was to change spots often. The second element I used was to constantly change something in the way I played a passage, according to what problem I wanted to solve. That way, I would address a specific problem, attempt to solve it, and then switch places. When I returned to a spot, I would either try to solve it in a different way, repeat what I did in the previous instance, or address a new problem in the same spot. I decided that when working this way, one instance should be "working on a single problem". That way, I could tailor the duration and content of each instance individually and in real time.

For this method I have two video examples from two different practice sessions, which also include commentary of what I am thinking and working with at any time. In the first video I practice a study from my book of technical studies by Robert Müller.[12] In the second video, I practice my part of the Koetsier concertino.[13] The repertoire in both of these videos was things I needed to improve or fix as I had to perform or present it in the near future. That gave me a very good idea of how well these methods helped me progress, and the quality of the retention from those sessions.

[12] Müller, *Technische Studien*, 17, exercise 8b.
[13] Koetsier, *Concertino op. 115.*

First of all, my subjective experience was that after both these sessions with the problem-based system, I felt noticeably more secure the next times I played the material I had practiced with this system. This was especially apparent after the second practice session, as I noticed a clear change the following days. The Koetsier was especially challenging for me, and I still remember my excitement after that practice session when I discovered that I started the next day at approximately at the same level. This means that the session in question led to very high retention. As the second session was the one where I noticed the biggest difference in confidence and consistency, I am going to use that session as an example, and provide some timestamps with some comments. The following comments and timestamps refer to video 3, part 1, and the sheet music provided is the two last pages from the first part of the Koetsier Concertino.




**Example 3.** Jan Koetsier, *Concertino op. 115 for 4 trombones, 1st trombone part, 3rd movement, bar 119 - 271.*

**0:53:** I start practicing the first spot at bar 213 by playing it an octave down. Here I had already identified that one problem was that I did not fully hear the correct notes in my

head, so I allow myself a few repetitions to identify where I am not singing the right note in my head, and I also alternate with some singing to help place the notes in the right places. Playing it an octave lower also allows me to “lock in” the intonation and pitches in my head without getting too tired. Then I can also bring the quality of sound I have in the lower octave up to the correct octave for a resonant and vibrant sound.

**2:28** Second spot, bar 227. Here my struggle was placing the correct notes in my embouchure and memorizing the slide pattern. Also, I had a tendency to reduce the air pressure when I started to think, so I just did one repetition of the whole phrase, sang a part of it, played it an octave lower with glissandos, went up an octave, played the same phrase twice legato, added articulation, once with the subdivisions, and finally I played half of the phrase with the “solved” way of playing. The whole process described above meant to solve two problems, namely to correct pitches and to ensure a constant airstream throughout the phrases without disturbing the clarity of articulation.

**3:55** Start of the third spot, bar 264. This is the ending of the concertino, and during a run-through, I would be quite tired at this point, after struggling with my high range losing some accuracy, clarity and elegance. Out of experience, that means I need to improve my confidence on where the notes are, so I dare to put a clear articulation and the proper air pressure behind the notes. Whenever I am slightly in doubt of where the note is, I tend to hesitate somewhat, and consequently I will not have the required air speed and energy to play the high notes well when I am tired. So, this instance my main focus was to improve security of where the notes are, and to play every note as confidently and deliberately as possible, even if it meant missing the note. This revealed which notes I were placing at the wrong place in my head and in my embouchure, the most obvious note being the last D, the fourth note before the end. I work on this for a while by singing and putting some extra focus on that specific note.

**5:45** I return to the first spot, this time I start directly where I left, by singing through the whole section. And then playing some passages I sang with a tuner. I eventually also increase the tempo a little, to identify where difficulties would happen, and why. I end that instance with a few run-through attempts. Unfortunately, this is a proof of what I anticipated might happen with this system, which is the risk of getting hung up on a specific problem and suddenly end up making a practice block instead.

**11:00-17:00** During this period I have a block of breathing and blowing exercises to remind myself of how I should work with my air in the high register, and also to give my lips some rest. This is an example of how low effort systems that allow for bits of practice with low contextual interference can be beneficial, as I at this point is focused on fixing my blowing technique, not to practice it.

**17:05-20:45** Here I swap the third spot with a new, fourth spot, at bar 195. I felt I had addressed the problem in the third spot well enough to have its priority reduced. I spend this time alternating between learning the passage and doing the blowing exercises from earlier.

**20:50** I once again return to the first spot, and already the progression starts to show. As I am playing through half of the section, I am already quite tired in my muscles, but I hit the centre of the notes better, the front and clarity of the articulation has improved, and my slide moves more precisely with more confidence. I now start doing changes to the rhythms at challenging places to keep my brain engaged, and to bring my slide technique to a higher level than necessary to play the piece.

**Problem-based system, reflections on the system based on the video analysis**

In retrospect, I realized that I ended up just making small blocks with some contextual interference inside, and not really true random practice, As I mentioned earlier, my goal with this system was not to have true random practice, but to create low-effort tools that utilized random practice elements that could be easily incorporated in my regular practice.

One of the benefits with blocked practice, is that I can invest time into using tools and exercises to fix problems, and do the whole process in one go, while random practice has the potential to separate the exercises so much that it loses its purpose. A big benefit with this system is that it becomes a mix of the best of both random and blocked practice, by forcing the player to be very concrete with how to solve a problem, but still giving room for finishing the problem-solving process. That way, I can start practicing the solution, instead of having to do the problem-solving process over the span of several short sessions, where it is easy to lose sight of what the problem was in the first place.

Also, like I said, I did see more noticeable results after this specific session than after "regular" practice sessions, and I did feel much more confident in the spots I had practiced the next time I played them in a performance-situation. Unfortunately, I did not use this system the week before the concert, so I did not feel as confident then. An interesting thing to note is

that even though the concert is a high-pressure situation, the other performance situations had similar levels of pressure for me, and I felt much, much more confident the days after this practice session. That in itself is to me a testament to this system being worthwhile experimenting with.

It is important to note that as this system is a looser form of random practice, the amount of contextual interference is not maximized. There might also be potential to increase the retention and transfer even more by just increasing the amount of contextual interference.

# 4. Reflections

## 4.1 General reflections and newfound knowledge

This project has truly taught me a lot about how humans learn and save motoric skills, and has shown me how I respond to such big change in my practice regime. The biggest discovery was perhaps how reluctant I was to change, and how much effort it actually took to convince myself to follow through on the changes I had decided I would make. It was much harder than I expected it to be, and my habits had much deeper roots than I thought they did.

I had multiple epiphanies in other areas as well during this process, especially in terms of realizing how I very often operate on half of my focus (or less). That was especially apparent when I put my phone on the stand to record practice sessions, and I suddenly was much more focused than earlier, just because it was being documented for the world to see, yet even then, I was not at full focus. When I realized how much focus I had yet to use, I also found out how much of my energy it took to stay in that state, and that it was an area that could use some improvement. Especially if I wanted to keep using my random practice systems, as they require a high level of concentration.

I also want to add that throughout this work, I had to come to terms with the fact that this is supposed to be artistic research, not scientific research. Therefore, my reflections and conclusion were shaped with usability and personal relevance in mind. For a project like this, especially when it is done from an artistic perspective and not a scientific one, it can be hard to show actual results and draw concrete conclusions, as everything is done from a very subjective point of view. That means my own sense of security and my own sense of progression was the guide for my conclusions and reflections, as the guideposts of success will first and foremost be the usability in my own artistic practice.

## 4.2 Results and reflections after working with random practice systems in a musical context

After trying out the different systems I made over a longer span of time, as well as experimenting with how to make them work for myself, I have come to the conclusion that random practice is worth the effort. All of the systems improved whatever I chose to work on

well enough that I would continue using them, and recommend them to friends, colleagues and students.

One could also argue that any way of practicing would have done the same improvement, or that my “regular practice” maybe is not deliberate enough, and that the improvement came from practicing more deliberately and not from practicing randomly. Nevertheless, I still experienced improvement and progression after using these methods, so they certainly did not do my playing any harm. Just that in itself is a great argument to keep using and improving these systems!

My personal experience was that I achieved a higher grade of retention and transfer when I was practicing randomly, and that I felt more confident in runs and technical passages than I often do in performances. There was also no doubt that my focus was much better during random practice-sessions as well, and precisely focus have been one of my main issues as a trombone player for some time now. This is why I probably will just use these techniques and systems more and more as time pass by and as I get even more comfortable with them.

## 4.3 Reflections around the differences between the systems and their benefits

While all three systems are based around the same principles, the differences in execution give them all different areas of use, and different areas where they excel. What I arrived at, was that the task-based system worked very well for shorter studies and exercises, as well as similar things that are repetitive and have a clear, defined point of completion. Anything where one task could be easily defined. The time-based system was without a question the best system to maximize concentration, and as long as the time was short enough, it also yielded good results, and put many well-focused repetitions “into the bank”. The problem-based system was especially great for learning new material, as it was easily adjustable for whatever needed priority, but also because it forces me to actually define a few problems i want to solve, and then do them one at a time, all while still coming back to them.

Of course, all of them have potential issues I have to be aware of. Increasing contextual interference also means that since I get much fewer attempts in a row at everything I do, the overall difficulty increases. This also means that I have to reduce the difficulty of the tasks I do during these sessions to such an extent that I can perform repetitions with good quality. There is no use having high retention and transfer, if the retained and transferred

product is of low quality. With these systems, it is also very easy to end up spending a lot of time on very little material.

Nonetheless, my overall experience testing these systems has been very positive. In my own opinion, I have been able to reap great benefits from using these systems, as long as they have been used deliberately and in the right way. I feel very safe in saying that random practice, when organized adequately, is very applicable in a musical context, and can be a great tool for any musician to further improve their craft.

# 5. Conclusion

"Can organized chaos in the practice room lead to improved consistency and confidence in performances?" That was the question I started with. After this process of trying to adapt the concept of random practice into a tool usable for music, I would say that yes, it can, but that this way of practicing has certain requirements that need to be met for it to be effective to a sufficient extent.

What I have realized while working on this project is that as this way of practicing can be done in so many levels of "trueness", this subject is also very easy to misunderstand or use in a suboptimal manner, although such a suboptimal way of using random practice often will lead to an improvement anyway, as the concept invites to more deliberate and focused practice. A great example of this is actually my own attempts to make random practice-systems. As I have mentioned earlier, none of my methods are actually true random practice, but could be better described as "soft" versions of random practice-concepts.

Due to this, to properly answer my preliminary question, I will take a moment to elaborate what I believe the requirements for successful random practice are, as well as my reasoning behind these requirements. I will also address some of the misunderstandings I have seen and heard about random practice, that I think are important to clear up.

**Properly understanding why random practice works**

I have presented this concept and the research behind it on multiple occasions for several people, and a recurring question made me realize how easily the concept is misunderstood. When looking at results and the figure from Shea and Morgan's study, I was often asked: "Since the blocked group have better performance during the acquisition stage, would it not be more efficient to learn a skill blocked and then practice it randomly?" The problem with this is that the reason for the poor performance during the acquisition of the sequence also is the reason for the superior retention and transfer. The high contextual interference increases the difficulty and the cognitive requirements for performing the task, which again makes it stick better.

A common misconception is that random practice is about randomness, and many seem to fixate heavily on aspects of that, which brings me to perhaps the most important

realization required to properly utilize random practice. Random practice is not really about randomness, but rather about creating high contextual interference. Put in simpler terms, the focus should not be to make your practice random and unpredictable, but rather to avoid consecutive repetitions, while still doing the same amount of repetitions. Understanding this difference will allow for more flexible and efficient ways of practicing, as the core concepts then can be maintained even through changes and adjustments.

**Realizing that the new difficulty requires compensation, and why**

As mentioned before, increasing the contextual interference also increases the difficulty of the task. Being forced to constantly change, remember, plan and execute different sequences poses much higher cognitive demands, which means that we will probably perform poorer unless we compensate for the increase of difficulty. In a musical context, I would argue that this is especially important, as we want our playing to be as accurate as possible, and we would want to avoid practicing mistakes. Reducing the difficulty of the task, usually by playing slower, forces us to be more deliberate and accurate in our one attempt before we change the task again.

Another perk of understanding that the increased difficulty require compensation, is that the increase in difficulty is the foundation for the increased confidence in performances. When I first was introduced to the concept of random practice, I was presented with the phrase: “Blocked practice leads to confidence in the practice room, and insecurity in the performance. Random practice leads to insecurity in the practice room, and confidence in the performance.” After my own testing and attempts at random practice, I realize that this is absolutely true. Traditional blocked practice builds confidence by giving several attempts at challenges, so the first attempt can be used to “aim.” Unfortunately, during performances, we only have one attempt.

For a musician, this is probably the biggest perk of random practice. Though your confidence can be rattled by the increased difficulty in the practice room, when you get to the performance, you actually get to do exactly what you practiced, which is nailing any challenge on the first try. I also believe that the reason why many find random practice unpleasant in the beginning is because it reveals how insecure a passage really is. I have personally practiced passages blocked and felt confident in them, until I practice them randomly and realize that I am only able to play them well on the second try.

**Understanding and accepting that it will feel counterintuitive for a long time**

Realizing that random practice probably will feel counterintuitive for a long time might be one of the more subtle requirements, but an important one, nevertheless. Ever since we are taught to play, we are taught to practice in a blocked fashion, which is very understandable. Blocked practice is predictable, easy to structure and most importantly, as mentioned before, creates confidence in the practice room. When learning to play, creating good habits and structured practice is very important, and blocked practice fits this ideal well. However, when we reach that point where we want to diverge from blocked practice and delve into random practice, we usually have a decade or two of blocked practice behind us. This can lead to random practice feeling very counterintuitive and messy. Also, if we add the increased difficulty as well as the reduced feeling of security, random practice is easily perceived as "ineffective" during the session.

Properly understanding this baggage of blocked practice that we carry with us, as well as our own biases, is vital for random practice to work. I myself realized several times during this project that when my systems provided room for more consecutive repetitions, it was not always because it would be efficient, but simply because I wanted the comfort of several attempts. In reality, this comfort jeopardizes the benefits I would have gained from more deliberate, but uncomfortable practice.

I believe this is the trap we most easily fall into when attempting random practice. I certainly have done so several times this project. My last system, which was the closest to actually being considered as random practice, also resulted in significantly higher retention and confidence than the other systems that left room for "ego-feeding" by allowing several consecutive attempts. Without realizing that this is a risk, it is easy to either deem random practice as ineffective or change it into blocked practice with smaller blocks to increase our comfort, and then greatly reduce the benefits.

**Making the effort of creating structure**

Although I just said that random practice is not about randomness, the random factor, or rather, the chaos it can lead to needs to be addressed. Random practice can lack transparency, as mixing the repetitions very easily can make the player lose control over their

practice. Once again, I speak from experience. At times, especially with the problem-based system, I found myself adding and removing passages to the mix, while also losing track of the number of repetitions I had done on each passage. The times I have been able to keep a certain structure to the mix of passages, I have also achieved the best results, as well as felt the most confident in my own practice and playing.

Creating structure while still maintaining high contextual interference has been my biggest challenge with this project, which I have to admit I have yet to solve in a way that I am satisfied with. My goal was to create different ways of structuring a random practice session without having to do a lot of work beforehand, but that has mostly led me to either having no structure and control, or ending up with practicing in blocks or blocked patterns. However, the effort invested in creating structure would give me enough control and oversight to be able to finish my sessions without having to deviate from my methods.

I noticed that I was much more likely to finish sessions with great structure, and would be more tempted to end prematurely the looser the structure was. I found that my trust in the method was closely correlating to how much I felt like I had control, and that when that feeling of oversight started failing, the trust in the method would quickly deteriorate.

It is also important to realize that this way of practicing is very focus-demanding, which means that the overall structure of the practice day should take this into account. Making the time to plan out both how and when in the practice day to use a random practice system can have a big impact on the results, and is an important part of successful random practice.

**Final thoughts**

One of the biggest drawbacks of random practice is the knowledge and awareness needed to fully take advantage of the benefits it can offer. As random practice is such a complex subject and so erratic by nature, mistakes and misunderstandings will inevitably happen, and they will not be recognized and improved upon without the proper understanding of the topic. It is unfortunately very easy to believe random practice is achieved, without actually achieving it, missing out on the great benefits of proper random practice. It is only when that knowledge and understanding of random practice is present, that the player will be able to recognize where and how contextual interference is applied, and adjust their system

accordingly. As I already have mentioned, none of the systems created are optimal systems of random practice. But, due to my understanding of the core concepts of random practice, I know how to adjust said systems to increase the contextual interference, without jeopardizing the benefits.

However, even though the contextual interference is not as high as it could be, or that true random practice is not achieved, attempts at random practice have in all cases I have seen, led to an increase in focus, and more deliberate practice. That in itself is for many musicians a goal for a practice session, and will make any attempt at random practice worthwhile. Even if the full potential is not reached, there will still be benefits to take advantage of.

Random practice differs little from “regular” practice in the regard that conscious and deliberate execution is the key to success. But if you have the knowledge required, and are able to create organization in the chaos, while still managing to maintain high contextual interference in the practice session, you can with no doubt look forward to significantly improved confidence and consistency in your upcoming performances.

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# Attachments

1. VIDEO 1: Video example of a time-based random practice session, using the 1m/10s system. Recorded 21.04.2020.
2. VIDEO 2 PART 1: Video example of a regular practice session utilizing random practice elements. Recorded 24.11.2020.
3. VIDEO 2 PART 2: Part 2 of the above-mentioned video.
4. VIDEO 3: Video example of a regular practice session utilizing random practice elements. Recorded 25.11.2020.