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MEMORY AND THE VIOLIN PLAYING

– How playing the violin affects memory

TURKU AMK
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BACHELOR'S THESIS | ABSTRACT

TURKU UNIVERSITY OF APPLIED SCIENCES

Performing Arts / Music

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Mamedova Nargiz

MEMORY AND THE VIOLIN PLAYING

- How playing the violin affects memory?

The thesis consists of two parts. The artistic part is a video recording of my violin concert, B exam, which took place in the 12th of December in Almaty, Kazakhstan. The artistic part is the main part of my thesis.

The goal of this thesis was to gain more knowledge on the field of neuroscience, memory functions and brain activity and, after writing my thesis, to become a better pedagogue. The aim of the author was also to find motivation to violin playing for her students, based on the scientific way of approach, not only on personal will.

This study was made by taking advantage of different literature and many lectures which are available on the websites of Stanford University, the University of California. Oxford University etc.

The increased understanding about the brain processes that the author gained through writing this thesis helped her to be better a violin teacher and helped her to deepen the method of teaching the violin, which she has already applied with her violin students.

Hopefully this study will benefit the people who think this information is usable.

KEYWORDS:

Neuroscience, memory functions, the brain processes, teaching method, violin

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Nargiz Mamedova

MUISTI JA VIULUNSOITTO

- Miten viulun soittaminen vaikuttaa muistiin?

Opinnäytetyö koostuu kahdesta osasta. Taiteellinen osa on videotallenne viulukonsertistani, B-kurssitutkinnosta, joka järjestettiin 12.12.2020 Almatyssa Kazakstanissa. Taiteellinen osa on pääosa opinnäytetyöstäni.

Kirjallisen opinnäytetyön osassa kirjoittajan tavoitteena oli saada enemmän tietoa neurotieteen, muistitoimintojen ja aivotoiminnan alalta ja opinnäytetyön kirjoittamisen jälkeen tulla paremmaksi pedagogiksi. Kirjoittajan tavoitteena oli myös löytää viuluoppilaidensa viulunsoittoon motivaatiota, joka perustuu tieteelliseen lähestymistapaan, ei pelkästään henkilökohtaiseen tahtoon.

Tämä kirjallinen opinnäytetyö tehtiin hyödyntämällä eri kirjallisuutta ja monia luentoja, jotka ovat saatavilla verkkosivuilla Stanford University, The University of California. Oxfordin yliopisto jne.

Lisääntynyt ymmärrys aivojen prosesseista, jonka tekijä sai kirjoittamalla tämän opinnäytetyön, auttoi häntä olemaan parempi viulunsoitonopettaja ja syventämään sovellusmahdollisuuksia opetusmenetelmästä, jota hän on jo käyttänyt viuluoppilaidensa kanssa.

Toivottavasti tämä tutkimus hyödyttää niitä pedagogeja, jotka pitävät tätä tietoa käyttökelpoisena.

ASIASANAT:

Neurotiede, muistitoiminnot, aivoprosessit, opetusmenetelmä.

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1 INTRODUCTION

This thesis consists of two parts. The artistic part, which is the main part of my thesis, is a video recording of my violin concert, B exam, which took place in the 12th of December in Almaty, Kazakhstan.

The written part of the thesis is based on my curiosity in the field of neuroscience and brain activity. I have been interested in the field of memory and the brain for the last four years. I have read different literature and listened to many lectures, which are available on the websites of Stanford University, the University of California. Oxford University etc.

The goal of the written thesis is to gain more knowledge on the memory and the brain and, after writing my thesis, to become a better pedagogue. My aim is also to find motivation to violin playing for my students, based on the scientific way of approach, not only on personal will. At the moment, I am a full time violin teacher at the Music College of Semey city in eastern Kazakhstan. I have 10 teenaged students specialized in the violin.

The questions of memory have always been relevant. What is the process of memorizing? How memory is stored in the brain? Why sometimes can people memorize one simple detail, or a smell, and remember it for their entire life but when it comes to a book or a lecture — it is hard to keep it in mind for even half an hour? Sometimes people easily forget something that they just have in mind. These questions have always been interesting for me as a violinist as well as a pedagogue. How does the information get from the surface of our perception deep into our mind? What are the techniques to control these processes? How to apply the remembering skills for something good?

Memory is all we have from the very beginning of our life. Everyone has different pictures of young age memory, and usually, people do not remember the first few years of their life because those years are considered unconscious. However, our brain remembers everything: the first touch of a mother`s hand, words that we hear around, smells, people, environment, nature. We memorize it from the very first day and when repeated many times, we start to copy and perform what we have heard or seen. That is how we step our first step, say the first word, and learn simple things like putting on knickers.

The same processes happen when we learn to play an instrument. From the very first lesson, all that the instrument teachers ask from a violin student is to memorize: how to

hold the instrument, position specifics, the notation of the music, rhythm, and others. Knowing the memory processes and their abilities are one of the key points for the future pedagogue. As well as strong parts, every brain has its weaknesses and an instrument teacher needs to consider many possible functional and behavioural weaknesses that might cause problems in a pupil's studies.

I would like to point out information that I find important for future instrument teachers as well as for students. This information is based on my studies in the subject, the contents of lectures and books and my personal experiences. Memory is a scientific field, to be studied and explained by a neuroscientist and I have no competency to write about it as research. As a future teacher, I have ideas and knowledge on this subject based on my experience and curiosity. This curiosity brought me to study the subject of memory by myself, using available information.

To understand how the memory works I also need to have some understanding how the brain is working. It is remarkable how incredibly fast the brain works. It includes the ability where concern the huge number of items as well as parallel processing of data.That enables us to interpret complex stimuli in our environment within a second. The brain has a massive storage capacity. (What is Memory 2015) By some estimates throughout our lives, we remember the about 1 billion bits of information. Even though the brain seems very small but it has a massive structure.

The numbers of neurons can be compared with the ballpark of stars in the core of our Milky Way galaxy — which is around 100 billion. (Cherry, K., 2020) Nevertheless, not only the number of neurons is impressive, but what is incredible — the connections between them: hundreds of trillions of connections, which is creating a network of staggering complexity. Every action, every thought we have, every sensation, every emotion we are experiencing, the very sense of identity — all emerges from the functioning of the brain. As well as strong parts, the brain has some distinct weaknesses, which lead to many functional and to behavioral problems.The problems of brain function and memory, in particular, have been known for a very long time.

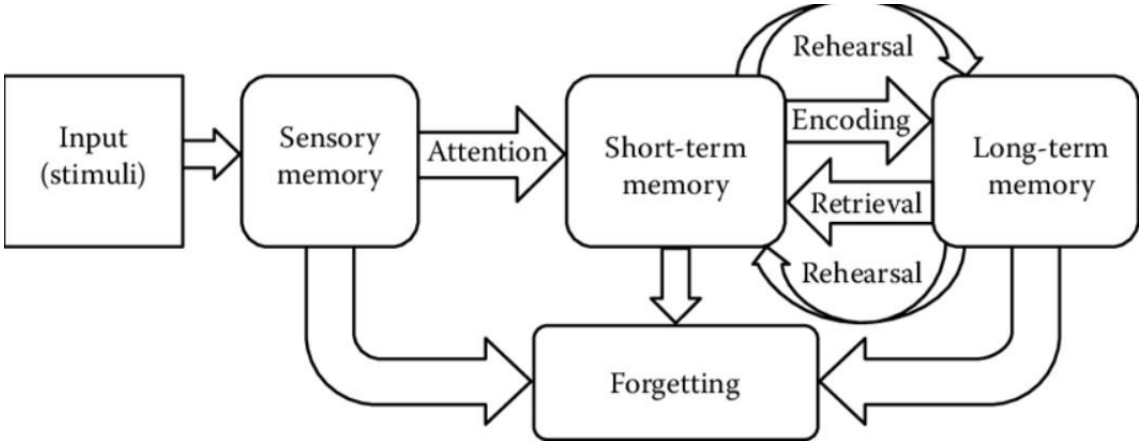
2 WORK OF THE MEMORY

The first scientist who did serious research on memory was one of the German scientists of the 19th century — Herman Ebbinghaus. He discovered that there are two kinds of memory: short and long term. Short term memory is a short phase during the first minutes after receiving new information. During the second phase, the amount of received information is less, but after processing this amount of the information is stored for a very long time. It can be stored at the same level for a week or even months. Therefore, Ebbinghaus showed that the processes of remembering are uneven. (New world encyclopedia 2017)

Inspired by the work of Ebbinghaus, scientists Richard Atkinson and Richard Shifrin started to work on figuring out what is happening on the border of this transition from one phase to another memory? They found that, if during the process of the previous transition from short-term into long-term memory, the person is given a new task, which he must remember, the new task interferes with remembering the previous information. Based on this, they decided that the brain requires a great number of resources and so any overlays can be a hindrance to the development and do not allow the memory to form. However, if the second task is given a little later, after 15—20 minutes, the information is absorbed, remembered, and can be stored in memory for a long time. (Atkinson–Shiffrin memory model 2020)

It means that if during the process of remembering the information there was new information given, it would disturb the attention and then, the information is not going to be remembered for the long term. It will remain in memory for some time and then disappear. However, later, the division of memory appeared to be divided into three components: Sensory memory, short-term storage, and long term storage. The incoming sensory information, first of all, enters the sensory register, where it remains for a very short period, and then it erases and disappears.

Short-term storage is a random access memory. In short-term storage, information is completely erased and disappears in about 30 seconds, however, thanks to a control process called “repetition”, an individual can keep a limited amount of information in this storage for as long as he wants and then it can be moved to long-term storage. (McLeod, S. 2017)



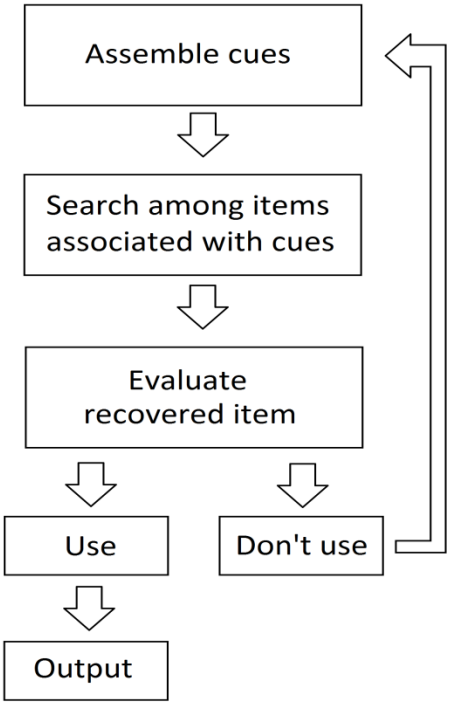
Picture 1: Memory model. (Atkinson, R. C., & Shiffrin, R. M. 1968 pp. 89–195.)

This can be described in terms of the flow of information: entering and exiting the short-term storage. If the information was fixed: using continual repetition, supported by auditory and visual memory, the information is immersed in the phase between long-term memory and can be stored there for a long time. Consciousness is considered as a phase of a short term memory. It means that we are functioning on the system of short-term memory: We make decisions, solve problems, think and receive information, we choose a direction, and so on. (Short-term working memory 2017)

However, later, this theory has been criticized in the neuroscience field by many other scientists/ researchers who have presented a more accurate model of memory.

My focus in this thesis is mainly on the search of associative memory.

The difference between two memory storage models, the Atkinson/Shifrin model and the Search of Associative memory/SAM, is that instead of three, memory storage occurs only in two different ways: either in short or long storage location. Transferring information from one storage location to another is not only considered as repeating and rehearsing information but also as the associative method. This model also requires a need and future use of the information, meaning, that only the information selected to be useful in the future, is transferring to long-term storage.



Picture 2: Search of associative memory. (Raaijmakers, Jeroen G. W.; Shiffrin, Richard M. 1981. pp. 93–134)

Playing an instrument requires strong brain activity, because of a parallel work of two areas of the brain. Muscle memory, visual memory, auditory memory are involved and involuntarily help a person to achieve certain progress. The active use of energy and brain activity makes musician's brains develop slightly differently. The density and quality of the neural network increases. Playing an instrument and learning new musical material leads to an intense improvement in the quality of the brain and the effectiveness of grey and white matter.

However, the memory of different people can develop in different ways. Someone remembers quickly and stores information only in short-term storage, but they do not immediately remember it for long. Someone, on the contrary, cannot remember anything at once and it takes a lot of effort, repetitions to master the information, and certain skills in sound reproduction. To build strong long-term memory and maintain the knowledge and skills for a lifetime we need to understand the best way of learning information.

2.1 Long term memory: Repetition

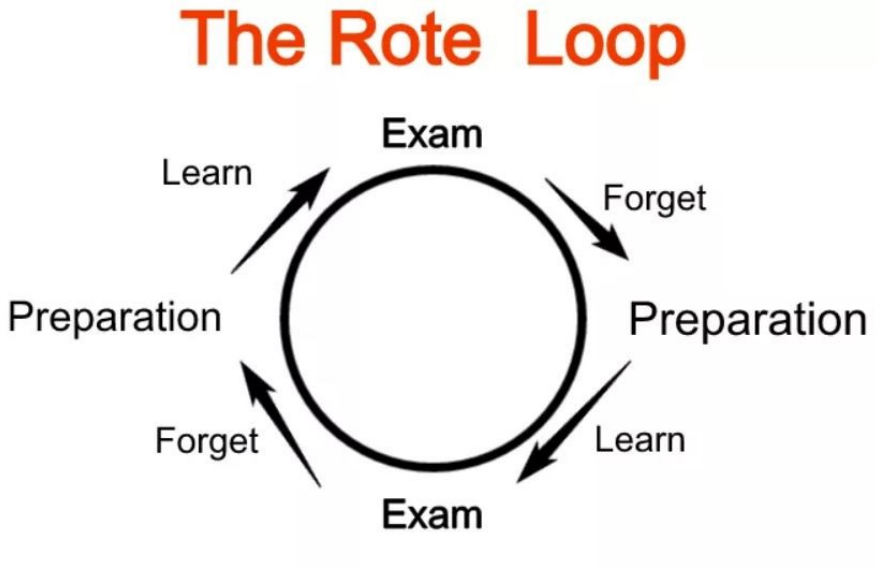
In elementary school, most of us have been learning things through repetition. The term for this method is ROTE. It is a mechanical way memorizing information by repeated repetition. Rote appeared in the Middle Ages when there was a shortage of written books on monasteries. The texts were considered sacred, so people learned by heart. Mechanical memorization involves the cerebellum, which is responsible for the stereotypes of the organism. When cramming some information, the only thing that can be done with this information is to simply reproduce it. About this kind of memorizing one does not understand and it does not make any sense. For some people, repetition and then memorizing is an effective way of learning. But for most people, it is not the most efficient or effective way.

The negative matters of rote:

- large investment of time and effort
- remembering the material is possible only in a certain sequence.
- no deep understanding about the material, inability to answer additional questions
- limited amount of memorized information
- material is quickly forgotten

(The difference between rote learning and meaningful learning 2017)

In some Asian countries and in Kazakhstan this way of learning is still in use. Teachers tell their students to play music over and over again until they learn it by heart. Usually, that is why most Asians practice for 8–12 hours a day. They repeat the thing over and over again. Some teachers say it is effective, but from my experience, I know that there is a better way to learn efficiently.



Picture 3. The Rote Loop. (Motwani, R. 2017.)

First I ask my violin students to decide what they will learn and why they need to learn it. Finding the reason and motivation to learn is the first step of understanding. A violin player needs to ask himself/herself for example next questions: What is the function of this violin etude? Do I like this music? Do I enjoy playing it? If they repeat and learn whatever I taught them, they will forget this music after a few weeks. They need to decide themselves what they want to learn permanently and remember. When they do not know the answer about the function of a violin etude, I will explain. For instance, it is important to think which technique is going to improve their playing technique if they practice it and how learning this bow or a left-hand technique will help them in the future. However, the repetition is a good thing for musicians but the unconscious repetition of the text does not be useful. There is no need to play poor notes, there should be a concept of music.
To be a true musician, is to understand and feel the idea of music. Playing the violin is art, not something just to repeat and represent/ imitate. Art involves understanding. Somehow we just feel when something is right, we like or dislike a certain object and the same is true for violin playing. From the very first class, if it is a young child or an adult, what the violin teacher should do, is to explain and provide the information in that way, that pupils will understand the context, the structure, the meaning, and the reason. The concepts and feelings once grasped will stay with them for a lifetime.

2.2 Associative memory

The earlier mentioned search of associative memory is one of the key points to learn new information. Since the brain filters the information, it also decides rather this information is constructive and will be needed in the future or it is not useful. Knowledge should be considered in terms of its application or use. (Wendy A., Suzuki 2005.)
A meaningful piece is a piece that relates to something we already know. Meaningless it may be, when new information does not fit with the information already established. Better learning will happen when a person can associate the new knowledge or skill with something, that he/she already understood. The brain is actively and consciously processing and restructuring the new input. This leads to higher awareness and a better understanding about the subject matter.

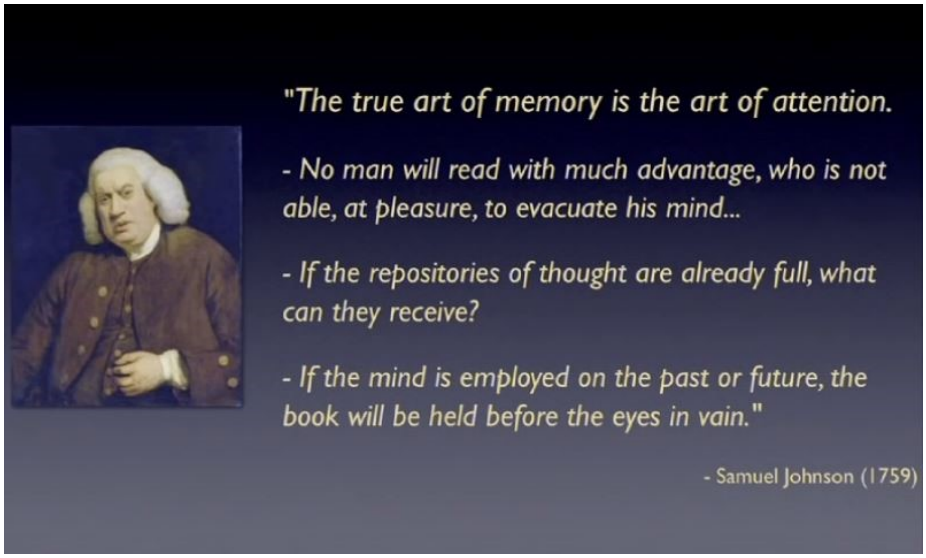
As a teacher, I try to make music meaningful in my violin classes, so I tell stories, give examples and images. Still, sometimes my examples do not work for my students. This is when I ask them to tease it out and tell their associations to me. Sometimes painting can help in this matter, to create a better imaginary picture to understand the meaning of a music piece.
The association options are endless and personalized to individual knowledge. The connection they are building can be completely different, funny, and crazy, and as I have noticed, those work the best way. As long as associations between the music and existing knowledge combine one common idea the music and the content of the music will be remembered for a very long time. I still remember my first violin classes, when I was 6 years old and used to play a song about Bee, and my teacher used a lot of associations to open up my creativity. Back then I learned the song with pleasure and in a very short period and I still remember it.

3 ATTENTION AND INTERFERENCE

Musicians build a repertoire throughout their life. Once a violinist learns a new music composition, it should be remembered for a long time. Playing the violin is hard work. The violinists must practice every day of their lives for at least 3–4 hours to maintain skills for as long/ high level as possible. Regular violin lessons will not guarantee results if one do not follow certain rules. Sometimes the brain simply refuses to process information. It becomes difficult to force oneself to practice.

In my personal experience, I face lack of concentration while performing or practising, or attendance during of a concert. I am there, sitting and hearing the music — but I do not listen. Moreover, I do not remember the performance or the concert after a few days, and I can not tell what a musician was playing nor the details of the performance. That is a big problem during my practice. Since my mind is not concentrating on the process of practice I can play the same line of music over and over again, thinking about something else, like what shall I have for dinner or did I remember to turn off an iron at home. My hands move automatically and often I make many mistakes, play out of tune, and even worse — my mind remembers all those poor-quality sounds and movements, it remembers all the mistakes and after that kind of practice, I play worse than before the practice.

Unconscious practices do harm to musicians and it is better not to play than to play without concentration. It becomes a habit because the brain remembers all the actions that we repeat over and over again and the brain sense out them into a long term memory. It is very important to ask oneself: What is lacking in such activities and why can't I concentrate? The answer is: it is because of lack of attention.



Picture 4. Lecture of Dr. Adam Gazzaley (Gazzaley, A. 2012.)

3.1 Attention and distractions

We may feel sensation with our sense of touch, we might hear beautiful violin sound, but there is no evidence that we pay attention to it. Sometimes the attention/ the ability to make percepts can be considered weak because of its limitation in terms of how widely this characteristic can be distributed/ broken up. Moreover, attention/ the ability to make percepts base on our own experience. It is something that people direct their thoughts and mind at a moment.

There are two kinds of attention: overtly and covertly. **Overtly** attention is in the case, when one looked at the object which caught the attention. **Covertly** attention is talked about when one does not have the object around, but in mind he/she thinks and imagines that object. There is ability in most people's brains to direct attention to a different subject without even moving. Distractions of attention are concerned with, when there is external or internal information, that is irrelevant to goals at the moment. (Gazzaley,A.2012.)

External distraction can be anything that is around us, but nowadays, in the age of social networks, people are getting to the point of being distracted every second. Almost everyone has a smartphone in their pocket and the smartphone brings a huge amount of information during the whole day. Instagram, Facebook, YouTube, Twitter, TikTok, etc. have an endless feed, advertisements, and entertainment for any kind of taste. If you ever have seen these social networks, you know how it looks. There are always new videos and publications, an endless list of publications from different accounts, all over

the world. The feed can be updated every second and every second there will be a new post/video/picture/twit.

If we talk about a new trend with billions of views, it is an endless feed contained short video clips, with a duration of about 15–30 seconds. I know examples of when children spend half of their day checking TikTok with its clips alternating themselves over and over again. It is more interesting to focus on those pictures or colourful, short videos than to read a long text or to play the violin. Playing the violin takes much more energy and effort, that is why the brain chooses to focus on something easier. Something, that will not waste that big amount of energy. The brain always tries to save its energy, to protect the body from devastation. Moreover, the brain wastes 25% of the body's energy, and to waste less, it always finds ways to be saved.

Imagine how short the trained attention of these children is: they pay attention to a short 15 seconds lasting videos, and then jump to another one straight away. Those short video clips are the most likely to be forgotten, if not repeated, that is why most of the accounts buy a promotion of a video to make it popular, in order to add it into the feed over and over again to make it seen many times, and then remembered. Those accounts and videos become popular and famous, with them one can earn a lot of money on advertisements and live happily for ever. Still, what about the memory and the brain of their viewers? What will happen to a person, who is trained to pay attention for not longer than 30 seconds? It is a big tragedy of our time.

I am a part in this tragedy because I face the same problem. I understand that scrolling the feed will not bring me anything other than a waste of my time, but I still have Instagram and Facebook accounts, and I spend a lot of time checking it. Recently, I have noticed how hard it becomes for me to focus on playing the violin. It also gets harder for me to remember the music and to learn new pieces. The situation is getting to the point of **internal distractions.** I do not have anyone or anything around me but my violin, but I still can not focus on playing and different items attend/ attack my mind.

As a teacher, I see how hard it is for my students to keep their focus at the moment of playing the violin too. They get always distracted by anything and they cannot focus on the violin practice. For me, it is a big challenge, s well as for my students to remember the content of the music. It is a real challenge for the brain to remember Beethoven's violin Sonata. Our brain should concentrate on lots of dynamics, notes, and expression. It is very hard because the brain has been trained in social media trained in social to pay attention only on someone’s action, not to act itself. However, as mentioned before, like any skill, attention can be trained.

3.2 Exercises for concentration

Here are a few tips that I use with my students and I practice myself.

25 minutes of practice / 5 minutes of rest

It is hard to keep focus straight away if the focus is not trained. So what you have to do in order to train your focus and habit of practising. Set up a stopwatch, decide what to practice on — it can be a particular phrase or a passage. Try to play it the best way you can, putting all your attention and intention into it. Try to do everything that is written in scores, try to remember and do everything that your teacher suggested. After 25 minutes, take a 5-minute break. It is enough to rest. During the break do something you enjoy: put on some music, have water, call a friend, talk to a child, or even better — make a little stretch. When 5 minutes are gone, continue to practice for another 25 minutes.

When you get used to this kind of practice, you will find out you can practice and keep concentration for 30, 40, 50 minutes, an hour, and even more. This Is what called training. Slowly but surely, take the time and you will notice that you can go without feeling any pain and enforcement.

Any kind of remembering and practising needs to be for joy, not for struggle, then a person will not be trying to run away from it.

Meditation

I know, meditation can barely be related to music and playing an instrument, but it is a matter of fact, that meditation is a way to train attention and focus. I ask my students to concentrate on their feelings, their breath, muscles and this is also one kind of meditating on the process. Playing the violin is one way to keep attention on one subject at a time and it can be considered as meditation.

Prepare a calm place where nobody and nothing can disturb you.

You do not realize how much you are controlled by the environment. The brain has to relax for some time, without processing information from the outside world. Put your body in a comfortable position, close your eyes, and breathe. Focus on your breathing, the way you inhale and exhale. In the beginning, it can be only 5 minutes of meditation. Do meditation every day in a quiet place, in the beginning for 5 minutes, and try to increase the meditation time by 30 seconds every day. You will notice changes in concentration and attention quality.

4 CONCLUSION

Playing the violin activates neural endings, trains fine motor skills, attention, and hearing. There is a combination of intellectual work with motor activity. If the program of the concert is difficult, then in terms of physical costs it is like a good workout. But for all the physical properties and benefits of violin playing, the original property of the violin is to bring pleasure and express art.

Understanding the work of brain processes, personally helped me to understand the processes of assimilation of information. In pedagogical terms, I learned that it will take time for the violin student to understand and master the music material for a physiological reason. The brain cannot assimilate all the information deeply quickly in time. Usually faster learning means superficial learning. To learn violin playing needs at least time, and as much as possible an understandable explanation. How to move the bow, with what speed and pressure to play, why to highlight certain phrases, what is the harmonic role in all this?

Cognitive understanding of the benefits of developing memory/ about memory developing benefits through violin playing can help many people to avoid, or at least to slow the brain's ageing process and memory impairment. The knowledge that memory can be trained shows how our goals compete with the environment to dictate how we perceive life, how we engage ourselves and how we remember that, and how much our memory changes as we get older.

There is only one negative physiological matter of playing the violin — problems with the back. Still, this problem can be easily solved, once we do regular yoga or stretching exercises.

The understanding about the brain processes helped me to be better a violin teacher and helped me deepen the method of teaching, which I am already using. I wanted to share my thoughts and knowledge to those who might find this subject useful.

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DVD recording and the Hand program of the Concert Performance 12th December in Almaty, Kazakhstan

1. **Mamedova N. 12.12.2020. Concert Performance in Almaty, Kazakhstan https://yadi.sk/i/jti6ZjkMS0dyeA**
2. **The Handout of the Concert Performance 12th of December in Almaty, Kazakhstan:**

The program:

- **N.Paganini – caprice no 5,**
- **W.A.Mozart – Sonata for violin and piano in E minor, K304**
- **J.S.Bach – Sarabande and Gigue from Second Partita for violin solo**
- **A.Khachaturian – Violin concerto 1st movement**
- **G.Wieniawski – Polonaise A major**