

Making music, practising and the brain

Shut up 'n play yer guitar^{*}

Wieke Karsten

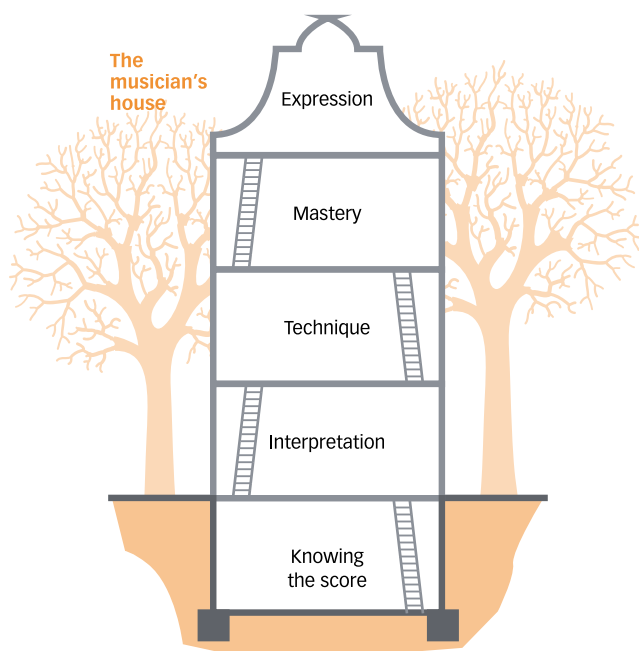
^{*} Frank Zappa

This article presents an outline of how I teach practising and performing (classical) music based on many years of experience. That experience culminated in the method 'Making music, practising and the brain', a course I give at the Royal Conservatoire in The Hague to Bachelor and Master students. I also lead workshops and summer courses for both music teachers and performing musicians.

The article is based on questions that came up during the teaching. Formulating these questions (as any researcher will know) has guided me through the process. Insights from the field of psycho-neurology and neurology have been most helpful along with ongoing evaluation of my findings by critical students, colleagues and experts. The article describes the main principles of the course at the Royal Conservatoire and how these have evolved over the years.

As long as I can remember practising my instrument (the flute) was a mystery to me. As a student little by little I managed to spend more time on it, as I felt I was supposed to. I mainly did so because the repertoire I played became more difficult. However, I never had any idea on how long I should go on practising. Picture the timeframe: in those days (and still today) hardly anybody talked about practising other than in the sense of using a metronome and varying the rhythm.

During the final of my master studies at the Royal Conservatoire, I was asked to teach the minor flute students. I realized that many of my students, and probably many other music students as well, had similar issues concerning practising. I decided to create a schedule *on what to practise* as that seemed to be an obvious starting point. After some time experimenting I created 'The Musician's House.'



The Musician's House offers a guideline for what to practise. Practising repertoire, which is regarded as the basement, can be done by thoroughly studying the score. Then little by little students can move up to the roof. The House offers opportunities for running down and up the stairs again, as practising on the higher floors may generate new ideas for working in the basement and on the lower floors and vice versa. At that time, the content of 'mastery' remained somewhat vague, even to me, but I felt there was something more to be done than just being able to play the music well.

In the meantime, the next important question rose: *when can we say that the practising is 'done'?*

To be able to answer this question, I felt that students needed to know more about *learning processes*.

When teaching a course or workshop, basic knowledge of how learning processes take place in the brain has become the starting point. When students (and teachers) realize that this involves the development of neural connectivity (including actual tissue growth, chemical processes and the making of myelin) so as to create neural networks and when they realize how much time these processes take, their attitude towards their own learning immediately changes.

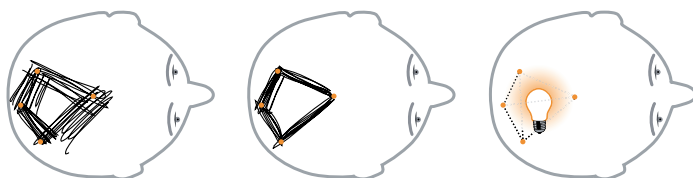
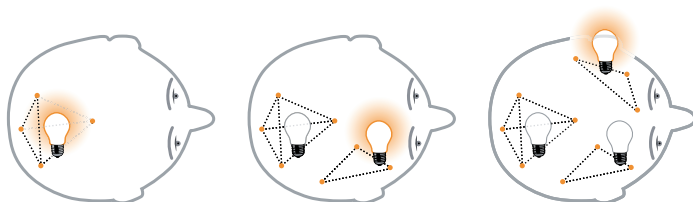


Illustration of the learning process (first plural connectivity, little by little the neural pathways become more efficient).

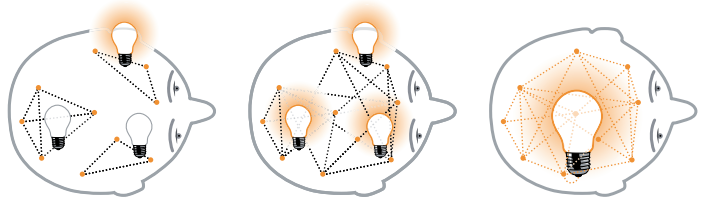
The illustration also explains an issue that causes quite a lot of frustration among students: multitasking. Or rather not being able to multitask. During the learning process when multiple tasks are required but have not yet been internalized, the brain will have to 'choose' which network to activate. Other networks involved which are not yet 'ready' will fail to perform during multitasking causing students to make mistakes. We would be wiser to regard them however not as a 'missed-takes' but as 'not yet able-takes'. Such an attitude encourages students to be more patient and less harsh on themselves.



Multitasking (not yet possible), one light bulb is on, the others are off.

Understanding more about learning processes and internalising has been shown to be quite helpful. Multitasking can be measured by the amount of *attention* that is needed for a task. A new skill asks for 100% attention, fully internalized skills 0%. On this basis students have some idea about how to test their multitasking abilities and this makes them more aware of the level they have reached in practising so far.

Multitasking possible because of internalisation.



In the course we discuss how long these processes take, in regard to learning new skills. For that we use the following timeline, based on daily practising, 6 days a week.

Understanding → not yet able – up to 2 weeks

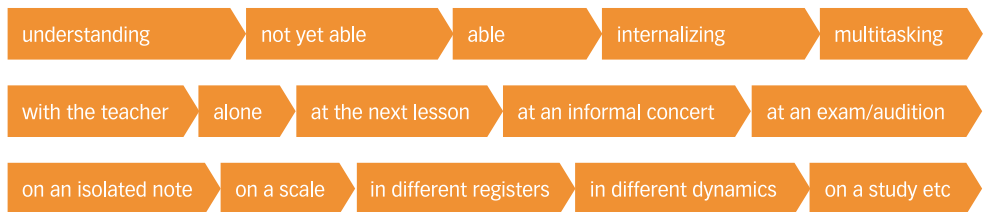
Understanding → internalising – up to 3 months

Understanding → multitasking – up to 1.5 years

The more complicated the multitasking for the brain, the more time is required.

The same applies to multitasking in difficult circumstances, like performing under pressure.

This is shown in the following timelines:



The next step is to make students reflect on *how* they practise. In the course I ask the students to practise in front of each other. Although this causes some tension, their behavior is still quite similar to that of their daily routine. Two things come to light. First of all, the way quite a lot of students practise is strikingly chaotic and restless, without much effect. *What on earth are they doing?* Secondly, the majority of students are unable to give any helpful feedback or advice to one another. Most students need to gain a bigger picture of the practising process and acquire tools for reflection.

To do so I make them look at practising from a new perspective. Obviously a large part of practising is learning the score, developing an interpretation and being able to perform the music (including technical challenges) at a high level. This we can

call a *learning* process: new connectivity in the brain is needed to be able to do so. However, if that were all there was to it, performing would be: learn → play → result. Although this seems right, it would mean the result is 'set'. We would play exactly the way we have practised.

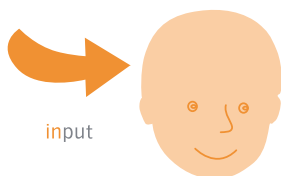
Most musicians know that there is more to it than that. Performing is, next to executing the score, about being flexible on the spot. We want to respond to the other musicians (when playing chamber music), we want spontaneity, sensitivity to the acoustics of the hall, and we want to bring over emotions and to communicate with the public. To do so, we slightly change our sound projection, timing, colouring, dynamics, vibrato and articulations. In order to be flexible, we need control of our muscles (which is what making music is), directed by our imagination and use of our senses and expression. In The Musician's House we now climb up to the next floors: mastery and expression.

This means we should extend the timeline:



In the practising process we now can diverge at two levels: *learning* and *applying for stage*.

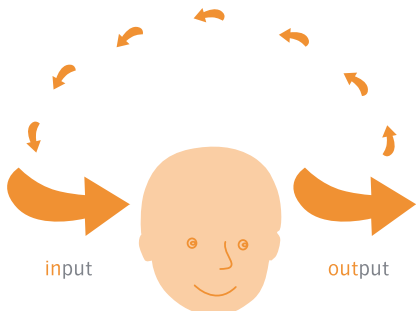
Learning I call **input**.



Applying for stage I call **output**.



This is a circular process: output creates, as result of direct feedback, new input, in the same way as input creates new output. How nice the brain is...



Making a difference between input and output proves to be extremely helpful for understanding the practising process. It also explains the chaos and restlessness that we see in many students' practising, which is caused mostly by mixing up the input and the output. Students do so for many reasons.

First, many students try to play better (output) without investing in the learning process (input). They do so, as they expect themselves to be able to do something yesterday, which shows they have no realistic ideas of how much time a learning process takes. As the desired result might not be possible yet, this attitude towards learning causes a lot of frustration and impatience.

'Wrong – wrong – wrong – wrong – right – change subject'.

Or: *'Wrong – wrong – wrong – wrong – wrong – wrong'.* Et cetera. An endless series of non-reflective repetitive attempts, hoping things will improve.

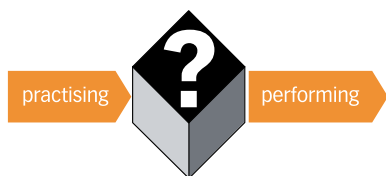
Besides no actual learning process takes place (as repetitive repetition creates almost no connectivity and the number of 'wrongs' is much higher than any 'better' version), it is alarming how this creates a feeling of negativity that is hard to break. As if students take the wrong train with no return.

Secondly, many students believe they should apply freshly learned skills immediately on all repertoire (output), hence expecting themselves to be able to multitask. *'Okay, that went well, but something else is wrong. Okay, I will improve that, but now something else is wrong. Let's do that better, but now the first thing goes wrong.'* *Ad infinitum.* Not surprisingly this might make students feel quite unhappy about themselves.

Interestingly enough, both ways of practising seem to be motivated by the wish not to make mistakes. 'Not yet able' makes some students feel untalented; they consider themselves 'losers' and they feel as if they continuously disappoint themselves and their environment. This fear of making mistakes strongly influences their practising. These students assume that by avoiding mistakes, by trying harder, by not doing it wrong, they should in fact be able to play well. They don't regard a mistake as missing connectivity, as something for which new neural pathways must be developed; they judge a mistake as a result of not really trying hard enough.

The same often happens when students 'play through.' Although we could regard this as clear output moments, based on the input practised so far, many students usually try to 'repair' the places they are not happy about *during* playing. This is quite distracting to the brain and through that their level decreases. Again this might make students feel disappointed. Learning to just observe the playing and remember the spots that need more work done, would be so much more effective.

On the other hand, some students keep practising the input although they could already let go of this and move on to practising for stage (output). Many times this has to do with a lack of trust in their own abilities, or because they simply have no idea *how to continue* the practising process towards performing.



This is nicely illustrated by the famous saying: practise something for the 200%, so on stage you can fall back to a 100%. While this in itself is impossible, the fatalism that it reflects speaks volumes, showing us how many of us perceive performing with its elements of uncertainty, losing control and the possibility of failure. To overcome this, we just keep practising and practising input and hoping for the best.

This is how many musicians deal with difficult passages. *'When we practise these in many, many different ways, backwards and forwards, with and without different rhythms et cetera, then we know them so well, we just have to 'push a button' and the passages will roll out of our system. If need be we could do it blindfolded. If need be, we could do so on an automatic pilot. In fact, that's what we seem to be aiming for: a solid, trustworthy automatic pilot.'*

Now we face an interesting dilemma. It is important to practise until we reach a level of internalization and multitasking. With this, we *could* play on the automatic pilot. What I found during these years is that we *should not want to aim at playing on automatic pilot*. On automatic pilot, our performance will not have the desired 'on the spot flexibility' because it is based on strong procedural motor habits which are not consciously controlled by sensory imagery or direct sensory feedback. It also means we don't need to pay attention to the task, and this offers room for thoughts that have nothing to do with music making. These thoughts can be innocent and dreamy during comfortable situations. However, on stage they will quite probably become negative. Autopilot seems attractive, since when the input is trained well, negative thinking will not even interfere with the level of playing. Nevertheless, it will possibly influence the musician's state of mind. Too many young talents play really well on stage while in the meantime their thinking is self-destructive. Playing on autopilot will never offer the enjoyment of making music in the moment itself (mastery and expression) and it will never offer the highest level of musicianship that we aim for. We need to know more about how to continue practising so we can find the best ways to train performing and offer the brain a better alternative to autopilot.

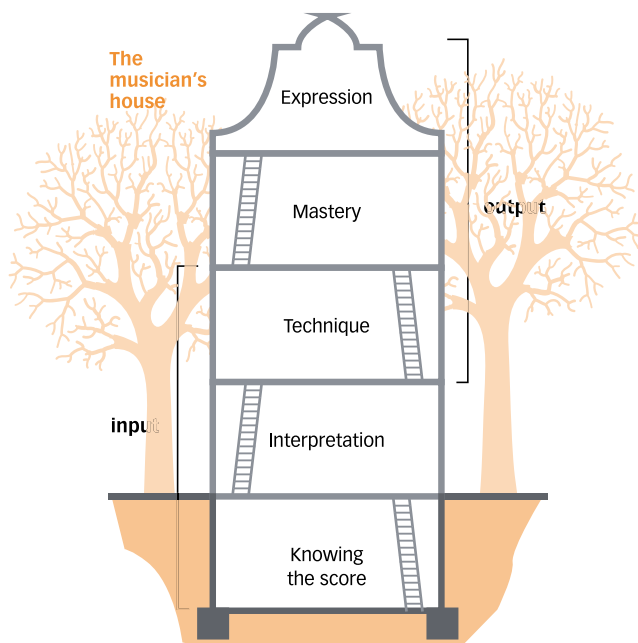


But first we have to ask ourselves another question. Why has autopilot in music making become so powerful and accepted as strategy towards performing?

In practising repertoire and instrumental technique, the brain tends to take the quickest neural road possible. When children learn to play the piano, they don't necessarily connect the movement of their fingers to sound. As soon as their

brain gets the 'trick', their attention fades and the pupils will start playing on their motoric autopilot. In the pedagogy of music the triangle 'reading – fingers – sound' is often mentioned, however, the neural connectivity between reading \longleftrightarrow sound or fingers \longleftrightarrow sound is hardly ever explicitly trained. This has two major impacts: when the motoric autopilot functions, the children will stop practising and secondly, there is a great risk the children will lose their interest in making music, especially if practising by themselves is the only musical activity they undertake, besides the weekly music lesson.

Encouraging pupils and students to base the input on a broader neural perspective (including the triangle 'reading – fingers – sound' \longrightarrow active listening, body awareness, score interpretation, creativity etc.) will prevent the motoric autopilot from taking over. Then, when the practising of repertoire and skills have reached a certain level of internalizing, it is important to continue practising in a way that enhances a sensory and expressive control of the motor activity. Neural motor action plans must be developed based on musical ideas like interpretation, harmony, musical structure, characters and expression. The aim of practising output is to have these motor action plans controlled by a variety of choices. Sound images, visual images, kinaesthetic images and emotional images will become the driving force *behind* the motor actions.



In the House, we now find a large part of the content of the mastery level. In mastery, students learn to play their instrument or sing according to their musical choices. In mastery, students will train to react to other musicians, to project their sound and storytelling towards an audience, to change their playing because of the acoustics of the hall and to keep their music making flexible.

Students often realize that they are not able to do so. They do not possess a sound image that makes their muscles move, despite the many hours they have spent on solfeggio and aural skills. In the course, we discuss what this means in practical terms and how they can train these skills.

In recent findings on motor learning, the difference between motor activity without (musical) meaning and sensory and emotional based motor activity is explained by internal and external focus. Internal focus is the focus within our own body and external focus is a focus on anything outside our body. External focus can be based on a clear goal (like a dartboard) or can be based on imagery, which are representations of the outside world. Feeling my arm move backwards and forwards is an internal focus, imagining my arm moving like a swing in a children's playground, is external. When in a difficult passage I focus on my fingers, it is internal. An external focus would be to sing the melody in my mind (forward inner singing) in such a way it would make my fingers move because of this. When movements are based on this kind of sensory representations, the neural activity in the brain differs. An external focus often makes the motor activity more effective and better fit for output.

So by now I have mentioned the words *focus* and *attention*. These terms have proved to be extremely important for creating the basis for practising and performing. It took quite some time before I myself realized the importance of this. Today, focus and attention play leading roles in the course.

Finding focus and attention is not easy. Yet at the conservatoire we expect students to focus at all times. A critical question: are most musicians able to describe focus and are teachers able to convey the message? When I ask musicians to explain focus, we end up in a circular word game: *'Focus, that's concentration...'* But what do you mean by concentration? *Concentration is focusing on one thing at a time.* Okay, but then: what is focus? *Uh, it means you are in a certain state of mind.* Okay, but what do you mean by that? *That you pay attention to something, so that you are aware of it.* Okay, but what do you mean by that? *That you are able to focus.'* And so on.

From research we also learn about the importance of 'the right focus' during practising. For this the words 'deliberate practising' or 'deep practice' are used. However, this still doesn't give us any answers. So a new question has arisen: *what is 'the right focus'?*

I was happy to come across *'The Circles of Attention'* of the German sport psychologist Hans Eberspächer. In this model, Eberspächer describes on what or where a player can focus (or pay attention).

1. Me and my task
2. Direct distractions
3. It is versus should be distractions
4. Winning / losing
5. Consequences of winning / losing
6. Question of essence: what am I doing here?

The model of Eberspächer is used as a tool for training task focus. As long as athletes focus on their role in the game, they are fine. Changing the focus to anything else is a distraction, even if it is as close (in team sports) as the opponent. Instead of focusing on the opponent, it would be better to focus on the ball and where the ball should go (the goal or the team players). The higher the number of the circle, the more the focus has drifted away from the original task.

I applied this model to music making changing the names and content of the circles. I did so, as I realized that Eberspächer's circles are mainly used for winning a game. The use of the circles during training sports is generally output-based. In the musicians' case, quite a significant part of the practising process (and this is particularly true for students in the early years of their education) will be spent on input.



Although the *learning process of motor skills* might be similar to sports, *learning repertoire*, which will continue lifelong, is a typical aspect of being a musician. So to make the model more applicable to both input and output, this is my translation:

1. Conscious awareness
2. Giving instructions
3. Oh no
4. The environment
5. The past and the future
6. Question of essence: what am I doing here?

1. Conscious awareness

With conscious awareness we pay attention to what we want to learn (input) or how we want to perform (output). This awareness stimulates the activation of neural connectivity and enhances the quality of our playing. Attention or focus is primarily achieved by *using our senses consciously*. Listening to a certain sound, feeling a part of our body, looking at the conductor, are ways to explain and find focus and attention.

2. Giving instructions

In the 2nd circle we use *thinking* in a way that helps to find the focus for practising and performing. With thinking I mean: verbalising, using words. However, thinking should be an activity that occurs as little as possible *during playing*, as thinking requires other neural activity than making music. In circle 2 we verbalize the choice of focus: *I want to listen to a certain sound, I want to feel a part of my body, I will look at the conductor*.

3. Oh no

The difference between the thinking in circle 2 and circle 3 is judgement. In circle 2, the thinking is based on a 'to do' instruction. In circle 3, the thinking is not instructive but commenting. *'Oh no, that was wrong! It was out of tune!'* Most of the time the judgements will be negative, as many students regard making mistakes as failure. Some students wrongly assume that criticism can only be done in circle 3. However, circle 1 can be even more critical, as sensory observation (listening, watching or feeling the body) offers clear and objective information about the actual playing.

4. The environment

In this circle students (and don't we all...) worry what passers-by might think of their practising and during the lesson they imagine what their teacher might think of their progress. On stage they worry how the audience or jury might judge their playing.

5. The past and the future

In circle 5 students keep thinking about how they should have acted differently in the past (I should have started practising this piece much earlier...) and they worry about coming concerts, auditions and exams as well as about the future as a whole.

6. Question of essence: what am I doing here?

Being able to classify their attention and quality of thinking turns out to be of great value to students. They now can recognize where their mind is going and take appropriate action if needed.

Alongside the model of the circles, I realized there was another kind of distraction: daily life. So I named this: Alice in Distractionland. Although routine distractions may seem innocent, their effect is always the same: distracted is distracted. Whatever causes the attention to drift away, we have to learn to return to circle 2 and 1.



So how can one be in circle 2 and 1?

I would like to say that outside circle 2 or 1 we cannot speak of practising. For performing circle 1 is the state of mind that must be aimed for. The attention found in circle 1 will enforce the growth of neural connectivity during learning and enhance the brain to find the best neural pathways for musical output.

I already mentioned some examples of students' practising in which this clearly wasn't the case. An important reason for losing the right focus is confusing input and output (strongly influenced by a judgemental attitude towards learning). Often students end up in circle 3+ because of a lack of preparation. Many musicians just start playing, without taking the time to get into the desired state of mind and set goals. Over the years I have found some essential requirements for preparing. First, the three-second rule. We must put our instrument down (or relax our body / arms when in a sitting position), and take time to change from instruction level (circle 2) to a chosen awareness (circle 1). Only then we should start playing.

When students find it hard to verbalize instructions, they can use de Wet van Wieke (Wieke's Law): first feel your body, then feel the pulse of the music in your whole body and then sing the music in your head. Only then start playing.

The three-second rule (or alternatively, Wieke's Law) can be the starting point for all playing, both in practising and performing. It also guarantees repetitions (as so often done in practising) to be of *retrieval* (rebuilding / reloading neural connectivity) quality.

Secondly, I make students experience the power of bodywork. When students have trouble finding circle 1, I make them do a (short) physical warm-up including jumping, running on the spot and mobility exercises. This 'call to action' brings the students back into the moment and successfully helps them to choose their focus consciously.

Next to these observations and strategies, there seem to be various practical reasons why many students end up in Distractionland or circle 3+. Some are so obvious that teachers may feel they don't need to mention them. Nevertheless, to students they can mean the world, as it explains why continuously being in circle 2 and 1 isn't possible.

- When practising input, our attention curve is limited. It could be 10 minutes or less. Students can check after a set time what the quality of their focus is, using an alarm clock (preferably not a smartphone).
- We may consider drifting away, boredom and irritation as alarm signals → take a break or change the subject.

Knowing this will give some guidelines for students in planning their practising:

- When practising input for one hour, it works best to divide the time in sessions of 10 / 15 minutes or less. After two sessions it is wise to take a short break (5 minutes) including a little bodywork.
- After 4 sessions of 10 / 15 minutes (or less) a longer break will be beneficial. Recommended: take the pause equally long as the practising time.

In the course the aim is to make students practise more consciously and thus more effectively. For this, I have them ask three questions:

1. In which circle am I?
2. Do I want to practise input or output?
3. Do I want to explore or to internalize?

Question 1 and 2 may now be clear to the reader. The third question, 'Do I want to explore or to internalize?' makes students realize they don't always have to 'set' a result. By allowing themselves to experiment, e.g. with the interpretation, the notes or instrumental technique, students show more patience and creativity in their practising. The possibility of explore and experimenting, knowing that this is fruitful to the learning process, makes practising more fun. Only after feeling that they have been fooling around enough, can they choose to practise in order to internalize. And knowing that the brain just needs one minute full focus per item per day, crowns it all...

In teaching practising, the need to talk about performing is obvious. Twenty years ago, nobody discussed the possible issues connected with performing. 'Performance anxiety' or 'choking', which are the official terms, did not exist, though many musicians suffered from this. When I started my investigation, I did not foresee that these subjects would be so connected to practising. Today, it has become a substantial component of the whole trajectory of practising from start to stage.

Performance anxiety is a three-stage rocket reaction to possible danger (which is what a performance seems like to the brain). Based on the dominance of the evolutionary oldest parts of the brain it manifests itself in physical reactions like muscular tension in the neck, shoulders and jaw, a faster heartbeat, more shallow breathing, cold sweaty hands and a dry mouth. These physical reactions can be explained as a preparation for 'freezing, fighting and fleeing', the so-called FFF-reaction. Evolutionary newer parts of the brain, like the amygdala, translate this FFF-reaction into strong emotions such as fear, anxiety and anger. And on top of that the cortex will create negative thoughts (circle 3+). The order of the three steps may depend on the situation and on the person. This rather massive defence mechanism (comparable to killing a mosquito with a hand grenade) overrules the musical brain, and thus obstructs a high level of music making and causes despair to musicians. Even today, when I lecture on this subject, students and teachers are upset that they have never been told about this before. The neurobiological explanation of stress, with such an impact on our daily life, is still largely unknown.

When I was a student, the only cure for dealing with performance anxiety was to perform as often as possible, assuming this would help to solve any problems. If it didn't, students were thought to be 'unfit for the job.' Sometimes the advice was to see a psychologist; to deal with the negative thinking and the negative emotions. Since then, more helpful tools have come to light, such as learning to neutralize the physical FFF-reaction by improving posture, physical relaxation and a more effective use of muscles, as well as training task focus; using methods like mindfulness, meditation and mental training.

Now a new question arises:

Does only the actual performing cause anxiety or does the way we practise create physical and mental tension and thus enhance performance anxiety as it becomes habitually associated with making music?

I believe the answer speaks for itself.

Students (and teachers) must be aware of the many moments when anxiety may arise during practising:

- When not practising in circle 2 and 1
- When practising without the three-seconds rule
- When mixing up output and input
- When allowing the motoric autopilot to take over

We must accept the consequences: *when practising causes anxiety, there is no circle 1. If we do not train to be in circle 1, how on earth would we be able to bring this state of mind to stage? And: if we do not train an alternative output to the autopilot, how would we be able to 'fulfil' our mind on stage?* The necessity of training conscious awareness, both during input and in output, including learning how to neutralize physical and mental tension, is obvious.

To make the story even more complicated, we must bear in mind a curious 'chicken-or-the-egg issue.' When students suffer from physical tension, e.g. in their

hands or neck and shoulders, they experience difficulties with inner singing and interpretation. Physical tension also holds back the quality of thinking needed for circle 2. Although there is no anxious situation, the three-step-rocket seems to have been launched. Vice versa, when students find themselves in circle 3+, we can always speak of physical tension. The exact starting point of anxiety may not always be traceable. More research on this is needed.

Many aspects of *music making* literally cause tension and thus anxiety. I believe these aspects are greatly underestimated in both teaching and practising. Think of playing high notes, making big dynamic changes, playing fast and / or difficult and expressive passages. All these musical moments give rise to physical and mental tension and again we must be greatly aware of the chicken/egg issue. On this, too, more research is needed.

Recognizing anxiety during the *whole* practising process and during music making itself, is of utmost importance. In my course students learn to observe themselves when being calm, both physically and mentally. Alongside this, students have to accept the existence of the other us: anxious and stressed, circle 3+. Acceptance of this holistic evolutionary system and development of a new, neural alternative for dealing with stress, including a well-trained musical output, is the real challenge to students, teachers and conservatoires.

