Peak: Secrets from the New Science of Expertise (Ericsson, Anders)

The right sort of practice carried out over a sufficient period of time leads to improvement. Nothing else.

But there is one very important thing to understand here: once you have reached this satisfactory skill level and automated your performance—your driving, your tennis playing, your baking of pies—you have stopped improving.

Purposeful practice has several characteristics that set it apart from what we might call “naive practice,” which is essentially just doing something repeatedly, and expecting that the repetition alone will improve one’s performance.

This is naive practice in a nutshell: I just played it. I just swung the bat and tried to hit the ball. I just listened to the numbers and tried to remember them. I just read the math problems and tried to solve them.

Purposeful practice is, as the term implies, much more purposeful, thoughtful, and focused than this sort of naive practice. In particular, it has the following characteristics: Purposeful practice has well-defined, specific goals.

Our hypothetical music student would have been much more successful with a practice goal something like this: “Play the piece all the way through at the proper speed without a mistake three times in a row.” Without such a goal, there was no way to judge whether the practice session had been a success.

Purposeful practice is all about putting a bunch of baby steps together to reach a longer-term goal. If

The key thing is to take that general goal—get better—and turn it into something specific that you can work on with a realistic expectation of improvement.

Purposeful practice is focused.

You seldom improve much without giving the task your full attention.

Purposeful practice involves feedback

You have to know whether you are doing something right and, if not, how you're going wrong.

Generally speaking, no matter what you're trying to do, you need feedback to identify exactly where and how you are falling short. Without feedback—either from yourself or from outside observers—you cannot figure out what you need to improve on or how close you are to achieving your goals.

Purposeful practice requires getting out of one's comfort zone.

This is perhaps the most important part of purposeful practice. Oare's music student shows no sign of ever pushing himself beyond what was familiar and comfortable. Instead, the student's words seem to imply a rather desultory attempt at practice, with no effort to do more than what was already easy for him. That approach just doesn't work.

This is a fundamental truth about any sort of practice: If you never push yourself beyond your comfort zone, you will never improve.

Getting out of your comfort zone means trying to do something that you couldn't do before.

But sometimes you run into something that stops you cold and it seems like you'll never be able to do it. Finding ways around these barriers is one of the hidden keys to purposeful practice.

Generally the solution is not "try harder" but rather "try differently." It is a technique issue, in other words.

One caveat here is that while it is always possible to keep going and keep improving, it is not always easy. Maintaining the focus and the effort required by purposeful practice is hard work, and it is generally not fun. So the issue of motivation inevitably comes up: Why do some

people engage in this sort of practice? What keeps them going? We will return to these vital questions again and again throughout the book.

I believe that a large part of it was that once he started to see improvement after the first few sessions, he really enjoyed seeing his memory scores go up. It felt good, and he wanted to keep feeling that way.

Generally speaking, meaningful positive feedback is one of the crucial factors in maintaining motivation. It can be internal feedback, such as the satisfaction of seeing yourself improve at something, or external feedback provided by others, but it makes a huge difference in whether a person will be able to maintain the consistent effort necessary to improve through purposeful practice.

So here we have purposeful practice in a nutshell: Get outside your comfort zone but do it in a focused way, with clear goals, a plan for reaching those goals, and a way to monitor your progress. Oh, and figure out a way to maintain your motivation. This recipe is an excellent start for anyone who wishes to improve—but it is still just a start.

There is an important lesson here: Although it is generally possible to improve to a certain degree with focused practice and staying out of your comfort zone, that's not all there is to it. Trying hard isn't enough. Pushing yourself to your limits isn't enough. There are other, equally important aspects to practice and training that are often overlooked.

But there is a catch: once the compensatory changes have occurred—new muscle fibers have grown and become more efficient, new capillaries have grown, and so on—the body can handle the physical activity that had previously stressed it. It is comfortable again. The changes stop. So to keep the changes happening, you have to keep upping the ante: run farther, run faster, run uphill. If you don't keep pushing and pushing and pushing some more, the body will settle into homeostasis, albeit at a different level than before, and you will stop improving.

This explains the importance of staying just outside your comfort zone: you need to continually push to keep the body's compensatory changes

coming, but if you push too far outside your comfort zone, you risk injuring yourself and actually setting yourself back.

In other words, the most effective forms of practice are doing more than helping you learn to play a musical instrument; they are actually increasing your ability to play. With such practice you are modifying the parts of the brain you use when playing music and, in a sense, increasing your own musical "talent."

First, the effects of training on the brain can vary with age in several ways. The most important way is that younger brains—those of children and adolescents—are more adaptable than adult brains are, so training can have larger effects in younger people. Because the young brain is developing in various ways, training at early ages can actually shape the course of later development, leading to significant changes. This is "the bent-twig effect." If you push a small twig slightly away from its normal pattern of growth, you can cause a major change in the ultimate location of the branch that grows from that twig; pushing on a branch that is already developed has much less effect.

A second detail worth noting is that developing certain parts of the brain through prolonged training can come at a cost: in many cases people who have developed one skill or ability to an extraordinary degree seem to have regressed in another area.

The reason that most people don't possess these extraordinary physical capabilities isn't because they don't have the capacity for them, but rather because they're satisfied to live in the comfortable rut of homeostasis and never do the work that is required to get out of it. They live in the world of "good enough."

And, for the most part, that's okay. "Good enough" is generally good enough. But it's important to remember that the option exists. If you wish to become significantly better at something, you can.

And here is the key difference between the traditional approach to learning and the purposeful-practice or deliberate-practice approaches: The traditional approach is not designed to challenge homeostasis. It assumes, consciously or not, that learning is all about fulfilling your

innate potential and that you can develop a particular skill or ability without getting too far out of your comfort zone. In this view, all that you are doing with practice—indeed, all that you can do—is to reach a fixed potential.

With deliberate practice, however, the goal is not just to reach your potential but to build it, to make things possible that were not possible before. This requires challenging homeostasis—getting out of your comfort zone—and forcing your brain or your body to adapt. But once you do this, learning is no longer just a way of fulfilling some genetic destiny; it becomes a way of taking control of your destiny and shaping your potential in ways that you choose.

In pretty much every area, a hallmark of expert performance is the ability to see patterns in a collection of things that would seem random or confusing to people with less well developed mental representations. In other words, experts see the forest when everyone else sees only trees.

The main purpose of deliberate practice is to develop effective mental representations, and, as we will discuss shortly, mental representations in turn play a key role in deliberate practice. The key change that occurs in our adaptable brains in response to deliberate practice is the development of better mental representations, which in turn open up new possibilities for improved performance.

This is an example of one way in which expert performers use mental representations to improve their performance: they monitor and evaluate their performance, and, when necessary, they modify their mental representations in order to make them more effective. The more effective the mental representation is, the better the performance will be.

All of the students had good attitudes and were motivated to improve, so McPherson and Renwick concluded that the differences among the students most likely lay, in large part, in how well the students were able to detect their mistakes—that is, how effective their mental representations of the musical pieces were. The saxophone player had a clear mental representation of the piece that allowed him to recognize

most of his mistakes, remember them the next time, and correct them. The cornet player, on the other hand, didn't seem to have such a well-developed mental representation of what she was playing.

In any area, not just musical performance, the relationship between skill and mental representations is a virtuous circle: the more skilled you become, the better your mental representations are, and the better your mental representations are, the more effectively you can practice to hone your skill.

Performers in these areas must develop clear mental representations of how their bodies are supposed to move to generate the artistic appearance of their performance routines. But even in areas where artistic form is not explicitly judged, it is still important to train the body to move in particularly efficient ways. Swimmers learn to perform their strokes in ways that maximize thrust and minimize drag. Runners learn to stride in ways that maximize speed and endurance while conserving energy. Pole-vaulters, tennis players, martial artists, golfers, hitters in baseball, three-point shooters in basketball, weightlifters, skeet shooters, and downhill skiers—for all of these athletes proper form is key to good performance, and the performers with the best mental representations will have an advantage over the rest.

It's like a staircase that you climb as you build it. Each step of your ascent puts you in a position to build the next step. Then you build that step, and you're in a position to build the next one. And so on. Your existing mental representations guide your performance and allow you to both monitor and judge that performance. As you push yourself to do something new—to develop a new skill or sharpen an old one—you are also expanding and sharpening your mental representations, which will in turn make it possible for you to do more than you could before.

First, there are always objective ways—such as the win/loss of a chess competition or a head-to-head race—or at least semiobjective ways—such as evaluation by expert judges—to measure performance. This makes sense: if there is no agreement on what good performance is and no way to tell what changes would improve performance, then it is very difficult—often impossible—to develop effective training methods.

Second, these fields tend to be competitive enough that performers have strong incentive to practice and improve.

Third, these fields are generally well established, with the relevant skills having been developed over decades or even centuries.
And fourth, these fields have a subset of performers who also serve as teachers and coaches and who, over time, have developed increasingly sophisticated sets of training techniques that make possible the field's steadily increasing skill level.

These students were motivated to practice intensely and with full concentration because they saw such practice as essential to improving their performance.

One of our most significant findings was that most factors the students had identified as being important to improvement were also seen as labor-intensive and not much fun; the only exceptions were listening to music and sleeping. Everyone from the very top students to the future music teachers agreed: improvement was hard, and they didn't enjoy the work they did to improve. In short, there were no students who just loved to practice and thus needed less motivation than the others. These students were motivated to practice intensely and with full concentration because they saw such practice as essential to improving their performance.

The improvement in performance generally has gone hand in hand with the development of teaching methods, and today anyone who wishes to become an expert in these fields will need an instructor's help. Because few students can afford a full-time teacher, the standard pattern is to have a lesson once or a few times in a week, with the teachers assigning practice activities the student is expected to perform between lessons.

These activities are generally designed with the student's current abilities in mind and are intended to push him or her to move just beyond the current skill level. It was these practice activities that my colleagues and I defined as "deliberate practice."

A short, deliberate practice is characterized by the following traits:
Deliberate practice develops skills that other people have already

figured out how to do and for which effective training techniques have been established. The practice regimen should be designed and overseen by a teacher or coach who is familiar with the abilities of expert performers and with how those abilities can best be developed. Deliberate practice takes place outside one's comfort zone and requires a student to constantly try things that are just beyond his or her current abilities. Thus it demands near-maximal effort, which is generally not enjoyable. Deliberate practice involves well-defined, specific goals and often involves improving some aspect of the target performance; it is not aimed at some vague overall improvement. Once an overall goal has been set, a teacher or coach will develop a plan for making a series of small changes that will add up to the desired larger change. Improving some aspect of the target performance allows a performer to see that his or her performances have been improved by the training. Deliberate practice is deliberate, that is, it requires a person's full attention and conscious actions. It isn't enough to simply follow a teacher's or coach's directions. The student must concentrate on the specific goal for his or her practice activity so that adjustments can be made to control practice. Deliberate practice involves feedback and modification of efforts in response to that feedback. Early in the training process much of the feedback will come from the teacher or coach, who will monitor progress, point out problems, and offer ways to address those problems. With time and experience students must learn to monitor themselves, spot mistakes, and adjust accordingly. Such self-monitoring requires effective mental representations. Deliberate practice both produces and depends on effective mental representations. Improving performance goes hand in hand with improving mental representations; as one's performance improves, the representations become more detailed and effective, in turn making it possible to improve even more. Mental representations make it possible to monitor how one is doing, both in practice and in actual performance. They show the right way to do something and allow one to notice when doing something wrong and to correct it. Deliberate practice nearly always involves building or modifying previously acquired skills by focusing on particular aspects of those skills and working to improve them specifically; over time this step-by-step improvement will eventually lead to expert performance. Because of the way that new skills are built on top of existing skills, it is important for teachers to provide beginners with the correct fundamental skills in order to minimize the chances that the student

will have to relearn those fundamental skills later when at a more advanced level. A

As defined, deliberate practice is a very specialized form of practice. You need a teacher or coach who assigns practice techniques designed to help you improve on very specific skills. That teacher or coach must draw from a highly developed body of knowledge about the best way to teach these skills. And the field itself must have a highly developed set of skills that are available to be taught.

In a field you're already familiar with—like your own job—think carefully about what characterizes good performance and try to come up with ways to measure that, even if there must be a certain amount of subjectivity in your measurement.

Once you've identified the expert performers in a field, the next step is to figure out specifically what they do that separates them from other, less accomplished people in the same field, and what training methods helped them get there.

Lesson: Once you have identified an expert, identify what this person does differently from others that could explain the superior performance. There are likely to be many things the person does differently that have nothing to do with the superior performance, but at least it is a place to start.

Finally, a good teacher can give you valuable feedback you couldn't get any other way. Effective feedback is about more than whether you did something right or wrong.

The question of whether anyone can become an expert performer in a given field by taking part in enough designed practice is still open, and I will offer some thoughts on this issue in the next chapter.

Gladwell did get one thing right, and it is worth repeating because it's crucial: becoming accomplished in any field in which there is a well-established history of people working to become experts requires a tremendous amount of effort exerted over many years. It may not require exactly ten thousand hours, but it will take a lot.

When we say that it takes ten thousand—or however many—hours to become really good at something, we put the focus on the daunting nature of the task. While some may take this as a challenge—as if to say, "All I have to do is spend ten thousand hours working on this, and I'll be one of the best in the world!"—many will see it as a stop sign: "Why should I even try if it's going to take me ten thousand hours to get really good?" As Dogbert observed in one Dilbert comic strip, "I would think a willingness to practice the same thing for ten thousand hours is a mental disorder."

But I see the core message as something else altogether: In pretty much any area of human endeavor, people have a tremendous capacity to improve their performance, as long as they train in the right way.

His message to clients starts with mindset. The first step toward enhancing performance in an organization is realizing that improvement is possible only if participants abandon business-as-usual practices. Doing so requires recognizing and rejecting three prevailing myths.
The first is our old friend, the belief that one's abilities are limited by one's genetically prescribed characteristics. That belief manifests itself in all sorts of "I can't" or "I'm not" statements: "I'm just not very creative." "I can't manage people." "I'm not any good with numbers." "I can't do much better than this."

But, as we've seen, the right sort of practice can help pretty much anyone improve in just about any area they choose to focus on. We can shape our own potential.

The second myth holds that if you do something for long enough, you're bound to get better at it. Again, we know better. Doing the same thing over and over again in exactly the same way is not a recipe for improvement; it is a recipe for stagnation and gradual decline.

The third myth states that all it takes to improve is effort. If you just try hard enough, you'll get better.

The reality is, however, that all of these things—managing, selling, teamwork—are specialized skills, and unless you are using practice techniques specifically designed to improve those particular skills, trying hard will not get you very far.

the traditional approach has been to provide information about the right way to proceed and then mostly rely on the student to apply that knowledge. Deliberate practice, by contrast, focuses solely on performance and how to improve it.

This strategy acknowledges that because what is ultimately most important is what people are able to do, training should focus on doing rather than on knowing—and, in particular, on bringing everyone's skills closer to the level of the best performers in a given area.

In reading reviews of an instructor, skip over the stuff about how much fun their lessons are and look for specific descriptions of progress the students have made and obstacles they have overcome.

I suspected that his group karate lessons were failing to keep him fully focused and engaged. In group classes, with the instructor at the front and all of the students following en masse, it is far too easy to just "go through the motions" instead of actually practicing them with the specific goal of improving a particular aspect of one's performance

I really started to practice where it was a conscious action working towards a specific goal, not just hit balls or putt.

Learning to engage in this way—consciously developing and refining your skills—is one of the most powerful ways to improve the effectiveness of your practice.

Instead of letting her mind wander, she could be focusing on her technique, trying to make each stroke as close to perfect as possible. In particular, she could be working on sharpening her mental representations of her stroke—figuring out exactly how her body feels during a "perfect" stroke. Once she had a clear idea of what that ideal stroke felt like, she could notice when she deviated from that ideal—

From then on, Coughlin made a point of staying engaged in what she was doing, using the time spent swimming laps to improve her form. It was only when she began doing this that she really started to see improvement in her times, and the more she focused on her form in her training, the more success she had in her meets.

People who are just learning to focus on their practice won't be able to maintain it for several hours. Instead, they'll need to start out with much shorter sessions and gradually work up.
Focus and concentration are crucial, I wrote, so shorter training sessions with clearer goals are the best way to develop new skills faster. It is better to train at 100 percent effort for less time than at 70 percent effort for a longer period. Once you find you can no longer focus effectively, end the session. And make sure you get enough sleep so that you can train with maximum concentration.

The hallmark of purposeful or deliberate practice is that you try to do something you cannot do—that takes you out of your comfort zone—and that you practice it over and over again, focusing on exactly how you are doing it, where you are falling short, and how you can get better.

Note that these students weren't simply doing the same thing over and over again: they were paying attention to what they got wrong each time and correcting it. This is purposeful practice. It does no good to do the same thing over and over again mindlessly; the purpose of the repetition is to figure out where your weaknesses are and focus on getting better in those areas, trying different methods to improve until you find something that works.

To effectively practice a skill without a teacher, it helps to keep in mind three Fs: Focus. Feedback. Fix it.

Break the skill down into components that you can do repeatedly and analyze effectively, determine your weaknesses, and figure out ways to address them.

Despite the first word in the term "mental representation," pure mental analysis is not nearly enough. We can only form effective mental representations when we try to reproduce what the expert performer

can do, fail, figure out why we failed, try again, and repeat—over and over again.

What we learned from Steve's experience holds true for everyone who faces a plateau: the best way to move beyond it is to challenge your brain or your body in a new way.

Cross-training of any sort is based on the same principle—switch off between different types of exercise so that you are constantly challenging yourself in different ways.

With all of this in mind, I suggested to Josh that if he wanted to speed up the pace at which he could memorize the order of a deck of cards, he should try to do it in less time than it normally took and then look to see where his mistakes were coming from. By identifying exactly what was slowing him down, he could come up with exercises to improve his speed on those particular things instead of simply trying, over and over again, to produce some generalized improvement that would decrease the amount of time he spent on an entire deck of cards.

This, then, is what you should try when other techniques for getting past a plateau have failed. First, figure out exactly what is holding you back. What mistakes are you making, and when? Push yourself well outside of your comfort zone and see what breaks down first. Then design a practice technique aimed at improving that particular weakness. Once you've figured out what the problem is, you may be able to fix it yourself, or you may need to go to an experienced coach or teacher for suggestions. Either way, pay attention to what happens when you practice; if you are not improving, you will need to try something else. The power of this technique is that it targets those specific problem areas that are holding you back rather than trying this and that and hoping that something works. This technique is not widely recognized, even among experienced teachers, even though it might seem obvious as described here and is a remarkably effective way to rise above plateaus.

Instead, what distinguished the most successful spellers was their superior ability to remain committed to studying despite the boredom and the pull of other, more appealing activities.

Then after a while, reality hits. It's hard to find the time to work out or practice as much as you should, so you start missing sessions. You're not improving as fast as you thought you would. It stops being fun, and your resolve to reach your goal weakens.

Eventually you stop altogether, and you don't start up again. Call it "the New Year's resolution effect"—it's why gyms that were crowded in January are only half full in July and why so many slightly used guitars are available on Craigslist.

So that's the problem in a nutshell: purposeful practice is hard work. It's hard to keep going, and even if you keep up your training—you go to the gym regularly, or you practice the guitar for a certain number of hours every week—it's hard to maintain focus and effort, so you may eventually stop pushing yourself and stop improving.

In fact, if anything, the available evidence indicates that willpower is a very situation-specific attribute. People generally find it much easier to push themselves in some areas than in others.

I think that anyone who hopes to improve skill in a particular area should devote an hour or more each day to practice that can be done with full concentration

Thus, to maintain your motivation you can either strengthen the reasons to keep going or weaken the reasons to quit. Successful motivation efforts generally

There are various ways to weaken the reasons to quit. One of the most effective is to set aside a fixed time to practice that has been cleared of all other obligations and distractions. It can be difficult enough to push yourself to practice in the best of situations, but when you have other things you could be doing, there is a constant temptation to do something else and to justify it by telling yourself that it really needs to

get done. If you do this often enough, you begin practicing less and less, and soon your training program is in a death spiral.

When I studied the violin students in Berlin I found that most of them preferred to practice as soon as they got up in the morning. They had set up their schedules so that there was nothing else to do at that time. It was set aside specifically for practice. Furthermore, identifying that period as their practice time created a sense of habit and duty that made it less likely they'd be tempted by something else.

Good planning can help you avoid many of the things that might lead you to spend less time on practice than you wanted.

More generally, look for anything that might interfere with your training and find ways to minimize its influence.

The first is general physical maintenance: getting enough sleep and keeping healthy. If you're tired or sick, it's that much harder to maintain focus and that much easier to slack off.

The second thing is to limit the length of your practice sessions to about an hour. You can't maintain intense concentration for much longer than that—and when you're first starting out, it's likely to be less. If you want to practice longer than an hour, go for an hour and take a break.

Studies of expert performers tell us that once you have practiced for a while and can see the results, the skill itself can become part of your motivation

As long as you recognize this new identity as flowing from the many hours of practice that you devoted to developing your skill, further practice comes to feel more like an investment than an expense.

Another key motivational factor in deliberate practice is a belief that you can succeed. In order to push yourself when you really don't feel like it, you must believe that you can improve and—particularly for people shooting to become expert performers—that you can rank among the best.

Perhaps the most important factor here, though, is the social environment itself. Deliberate practice can be a lonely pursuit, but if you have a group of friends who are in the same positions—the other members of your orchestra or your baseball team or your chess club—you have a built-in support system. These people understand the effort you're putting into your practice, they can share training tips with you, and they can appreciate your victories and commiserate with you over your difficulties. They count on you, and you can count on them.

finds that creativity goes hand in hand with the ability to work hard and maintain focus over long stretches of time—exactly the ingredients of deliberate practice that produced their expert abilities in the first place.

Creativity will always retain a certain mystery because, by definition, it generates things that have not yet been seen or experienced. But we do know that the sort of focus and effort that give rise to expertise also characterize the work of those pioneers who move beyond where anyone has been before.

While people with certain innate characteristics—IQ, in the case of the chess study—may have an advantage when first learning a skill, that advantage gets smaller over time, and eventually the amount and the quality of practice take on a much larger role in determining how skilled a person becomes.

2012 study of tennis players looked at the success and rankings of junior tennis players—that is, younger players who are working and competing to become professionals—and compared that with their success after turning pro. There was no relationship.

But since we know that practice is the single most important factor in determining a person's ultimate achievement in a given domain, it makes sense that if genes do play a role, their role would play out through shaping how likely a person is to engage in deliberate practice or how effective that practice is likely to be.