How can we approach our training so our brain's intuitive suggestions are as good as they can be?

Aiden Rayner · November 28, 2026 · Version 1.0

ABOUT THIS SERIES

In October 2026, I wrote a list of all of the questions I believe the world's leading expert in Chess visualization (what I prefer to call "conceptualization") and adult Chess brains should be able to answer, but that I couldn't yet. The *What I Don't Yet Know* project is how I intend to develop answers to those questions. Each month, I research one of the questions and write a report detailing what I've learned, how I would now answer the question, and anything I still don't know about the topic.

For more information on the project, visit https://dontmoveuntilyousee.it/research.

ABSTRACT

I set out to understand what adult improvers can do to actively improve the quality of the suggestions their intuition gives them about Chess positions and possible moves.

What we experience as intuition is the automatic process of our brain simultaneously assessing positions and suggesting moves based on its schema of how Chess works. The schema is built through the extraction of "chunks", small groups or patterns of related pieces.

Intuitive suggestions are accompanied by a "feeling of rightness", which indicates whether and how much our conscious mind should get involved in the thinking process. The feeling is more connected to how easily the patterns are retrieved than any objective measure of move quality.

Intuition can fail in three primary ways: our chunks can be too simplistic; the best move can have far less weighting in our schema than a natural-but-wrong alternative; and we can find ourselves operating within a frame that restricts our thinking incorrectly. Each of these can be exacerbated by "freewheeling", an inability in the moment to consciously verify an intuitive suggestion before it is played.

We may be able to make our intuition better in our games by studying in ways that extract relevant chunks efficiently, building automatic awareness habits to ensure our intuition is armed with key details, and establishing strong conscious processes to support and iterate on the suggestions our intuition gives us.

This is essentially a *part one* on this topic. Many of the insights I discuss are pulled in from outside fields, and will need to be verified within the boundaries of Chess improvement over time.

Why this question?

Intuition, as I define it, is the brain's automatic, subconscious suggestions about a Chess position. It includes the specific moves we might consider, our interpretation of what's important in the position, and our detection of patterns in the position we may want to exploit.

In my experience, titled players will often swear by their intuition, feeling it is the best part of their game. Adult improvers, by comparison, are more likely to swear *at* their intuition. Less honed and less accurate

than the masters', an adult improver's automatic suggestions often lead them to horrible blunders, misjudging positions, and overlooking critical, even "obvious", details.

Much of my work to date has painted intuition as somewhat untrustworthy. An oft-repeated recommendation I've made is to "treat your intuition like an enthusiastic friend rated 200 points below you": it sometimes spots brilliancies but suggests a lot of mistakes too, and we must keep our conscious mind always in control.

I suspected this stance was incomplete - possibly incorrect - and I wanted to challenge it with this question.

Lifting the strength of an adult improver's intuition would likely have a big effect on their Chess skills across the board. If their brain's automatic assessments and suggestions were simply better, then all of the downstream parts of move selection and play would be better and easier also.

The first step to doing that is to understand what intuition actually *is* and how it applies to Chess, then work through how we can use that information in our training.

As a small disclaimer, I will regularly refer to functions of the brain as if they were characters with their own agency. Brains don't really work like that, but I haven't found a single paper or book on this topic where the author didn't anthropomorphize them *somewhere*.

How intuition works

For the past few decades a central idea in psychology and neuroscience is that the brain is essentially a prediction machine (Hohwy, 2013). It takes in input, compares that input to its *schema* - its stored sense of how the world works - and predicts what the cause of the input is and what may happen next. These predictions happen at a level before we're consciously aware of them, and our conscious mind only receives the result of the prediction.

When these predictions fire within a domain of learning or skill, we refer to them as our intuition. Learning a skill is a process of building a flexible, complex schema to more and more accurately represent how the field actually works, allowing correct predictions/intuitions within that field (Dehaene, 2021). The process is, surprisingly, best explained through a principle proposed by 18th-century mathematician Thomas Bayes.

Pretend you've never seen a coin before. Then someone tells you the first result of this "coin" is *heads*, and asks you to predict the second result. All you know so far is that *heads* is a possible result, so you predict *heads*, and are told you are correct. For the third, fourth, and fifth results, you predict *heads* each time, and are right each time.

For the sixth, you're surprised to learn the result is *tails*! This causes you to update your understanding of the "coin" significantly. You thought there was only one option, but now you know there's at least two. You still have far more evidence for *heads* than you do for *tails*, so you probably predict *heads* again, but less confidently this time than last time.

If you do that for long enough, you will eventually figure out that only two results are possible, and that there's an equal chance of either result occurring. At that stage, your schema becomes an accurate reflection of a coin flip, even if you never actually learn what a coin *is* or that it can be flipped.

In that coin example, you have essentially taken on the role of your intuition and how it navigates any field of learning.

Our intuitive suggestions are not only affected by the schema we have about a situation, but seem to be to an extent intelligent, able to adapt to recent events and the current context (Kahneman, 2011). Usually, these adaptations are useful, but in a domain where there is often an objectively correct answer regardless of context,

such as Chess, this flexibility can pose some issues (which we'll discuss when we get to "framing").

The confidence with which intuition fires is not based on accuracy so much as what Thompson, Prowse Turner, and Pennycook (2011) described as the *feeling of rightness*. Whenever intuition fires, it does so with "an accompanying sense of the correctness of [the] answer" (Thompson et al., 2011). If the feeling of rightness is very high, our conscious mind is unlikely to get involved at all. If the feeling of rightness is low, then intuition still suggests an idea but effectively hands off the thinking to the conscious mind.

The feeling of rightness is, for our purposes, mostly about *answer fluency*, or how quickly and easily the particular intuitive answer came to mind (Thompson et al., 2011). Unfortunately for us, an intuitive suggestion can feel right in situations where the schema is accurate, but also where the schema's resemblance to the situation is overly simplistic and superficial. As Kahneman and Klein (2009) concluded, the subjective experience of an answer is not a reliable indicator of judgment accuracy.

How intuition works in Chess

In the Chess world, the established term for what makes up a player's schema is *chunks*, small groups or patterns of pieces that are connected to each other through proximity, attack, defense, same color, and same type relationships (Chase & Simon, 1973). For extra clarity, I would add *thematic* to the list, as pieces involved in a Scholar's Mate type attack, for example, are at least as linked as pieces that sit close together on the board.

A 2008 study from Orbán, Fiser, Aslin, and Lengyel concluded that "humans extract chunks from complex visual patterns by generating accurate yet economical representations and not by encoding the full correlational structure of the input" (2008, p. 2745). Applied to Chess, this may indicate that we encode in each chunk what I will call the *minimum viable pattern*, the simplest possible abstraction of details that still manages to explain and connect to our experience. An inexperienced player will likely have a superficial version of a pattern based on their limited exposure to it, while a player who has seen or used that pattern in many situations will have a much more nuanced version. With more exposure comes more exceptions, and the requirements of "viable" lift accordingly.

With the contents of the schema established, our attention turns to how our intuition actually fires when engaging with a Chess position.

One thing that seems clear is that, as Willy Hendriks put it in *Move First, Think Later* (2014, p. 15), "we don't first judge the position and then look at moves. It all happens at the same time". This echoes de Groot's famous findings, as summarized by Gobet in 2019, that "there is no clear boundary between perception and cognition: in chess and in other domains, perception, memory, and problem solving are tightly interconnected" (Gobet, 2019, p. 12). It appears the assessor and suggester functions of our intuition are one and the same.

One challenge to navigate is that if intuition's initial suggestions prove to be incorrect, intuition itself can become a hindrance, making it harder to find correct moves. A study by Bilalić, McLeod, and Gobet (2008, as cited in Sheridan & Reingold, 2013) put this to the test by fitting expert players with an eye tracker. The experts were shown Chess problems that contained a familiar solution and a better, rarer one. Most found the familiar solution quickly, and many claimed to continue on to find a better option. Despite their insistence they had moved on from the familiar idea, the eye tracker showed their attention returned over and over again to the squares associated with the familiar answer.

Dramatically, the comparisons between these expert players and a control group showed that the presence of a familiar-but-suboptimal solution alongside the less-familiar optimal one dropped a player's performance to the level of a much weaker player (Bilalić et al., 2008, as cited in Sheridan & Reingold, 2013). If this is the effect on expert players, I feel it is likely that a similar, if not worse, version of the effect happens to beginner

and intermediate players also.

Sheridan and Reingold (2013) attempted to find the boundaries of this phenomenon by changing some parameters and adding in novice players as well. They found that when the familiar move was a blunder, all of the experts and most of the novices were able to avoid selecting it and gradually stopped looking at it. This suggests that our intuition is responsive, to an extent, to our conscious decisions about the quality of moves. I would suggest, though, that disengaging from the familiar-feeling blunder may be easier to do in the controlled setting of a research study, and under the cognitive strain of a game it may prove harder to achieve for many players.

Much of the Chess literature on intuition refers to what strong or expert players do, implying that weaker players may do something different. On a conscious level there are certainly some differences between a strong player's process and a weaker one's, but on an intuition level it appears to me to be the same process. The strong player just has a better schema, and as such their intuition is better equipped to offer correct assessments and suggestions. We're all human with human brains.

When intuition fails

Intuition in Chess appears to have three primary modes of failure.

1. The chunk is too simplistic to be useful.

The brain attempts to extract the minimum viable pattern when building chunks, but Chess is a game of nuance and exceptions that punishes play based on overly simplistic assessments. If a chunk is not nuanced enough to handle a particular situation, our intuition will become prone to misfiring based on that chunk.

As an extreme example, during a coaching session with a 700-rated student, I watched them play a live game and had them talk me through their thinking. Within the first several moves, they had their bishop on f4 and a knight on c3, and they declared, "Oh, the Fried Liver!" The Fried Liver is an opening played with a bishop on c4 and a knight on f3, the *mirrored* position to the one my student's intuition fired in. They attempted to play the position like it *was* the Fried Liver, but the pattern doesn't work the same mirrored as it's the queen and not the vulnerable king guarding the key target square. My student's chunk for the Fried Liver Attack was based only on how the bishop and the knight interact, and didn't yet include even which side of the board it applied to.

As a more universal example, most beginner players go through a period of playing moves like Qxg2 expecting checkmate, only to lose their queen to a long-distance bishop that defends the key square. After enough of these painful losses, the bishop gets included in their chunk for that pattern, and their intuition stops firing the same way if the bishop is still present.

These were two examples from beginner players, but this concept applies to any chunk learned by any player at any level of the game.

2. The correct move has significantly less support in the schema than a natural-but-wrong option.

The predictions our intuition generates are heavily guided and weighted by our prior experience. The eye-tracker study makes it clear: if there is a familiar option in a position, it makes it much harder to find a less familiar option (Bilalić et al., 2008, as cited in Sheridan & Reingold, 2013).

The clearest example of this is how difficult it can be to find in-between moves during capture chains. The correct response to a capture is overwhelmingly to capture back. Outside of particular theoretical sequences, I would guess that out of any ten-thousand captures a player experiences, only several hundred would include an

in-between move. The result of this mismatch in weighting in our predictive schema is that capture chains feel inevitable, like a domino fall, and it rarely occurs to us to even *consider* playing something other than capturing back.

3. Our intuition is operating within an incorrect or irrelevant "frame".

Framing is the context our intuition uses about a position that guides its assessments and suggestions. A frame can be created by intuition itself, but it can also be responsive to conscious thoughts, in a simultaneously top-down and bottom-up relationship.

From the top-down direction, our frame can be affected by who we think is better in the position, our assessment of the momentum of the game, the rating of our opponent relative to ours, or any number of other bigger-picture concerns.

From the bottom-up direction, intuition is constantly, automatically assessing what's important based on its schema and pointing our attention at those details, and can become effectively blind to anything else. Often this framing is helpful and allows efficient thinking about only what's relevant in the position. If a frame is incorrect for the situation, however, it can lead us to miss key details about the last move or wider position and/or attempt to solve the wrong problem.

A key challenge of framing is that we have no layer of awareness above the frame telling us what's inside it or out of it. Daniel Kahneman coined the phrase "what you see is all there is" (2011, p. 85) to describe how the things that have our attention in the moment are effectively all that exist in that moment. In Chess, we could present the idea as "what's in our frame is all there is", with the same result.

As an example, I had a 1400-rated student play a live game and talk me through their thinking. The student had a strong attack on the kingside and their opponent was cramped and couldn't defend. Then the opponent pushed a pawn in the center of the board into tension with my student's pawn. I watched my student's thinking shrink to the frame of "do I take or do I push?". They thought deeply about each option, calculated them both, and even at one point said, "I think I've screwed this up". Taking and pushing were *both* bad moves, but it never occurred to my student to ignore the pawn and continue with their attack, because that idea *did not exist inside their frame*.

How likely any of these failure modes are to cause an error is heavily affected by whether or not we are in a state I call "freewheeling".

This is when our intuitive move suggestion goes straight from intuition to being played on the board, with only the most cursory, if any, conscious review. These are the impulse moves, played and in many cases immediately regretted.

The first cause of freewheeling is that the *feeling of rightness* (Thompson et al., 2011) that comes alongside any intuitive suggestion can be too high for the objective quality of the move. When a suggestion feels right, our conscious mind is unlikely to look deeply at it or consider ways it may be incorrect. Of course, our intuition often suggests correct moves; the challenge is simply that a good move with a high feeling of rightness and a bad move with a high feeling of rightness are indistinguishable from each other in the moment.

The second cause of freewheeling is that, even if our intuition attempts to hand off the thinking to our conscious mind as it can do when the feeling of rightness is low, we may not have the cognitive resources in that moment to give the suggestion the attention it needs. Worse still, the brain under strain may see the new intuitive idea as a release valve of sorts, and we'll find ourselves playing it without thinking, simply to relieve the cognitive load. I would suggest this is a key factor in the infamous "long think, wrong think" phenomenon.

The role of the conscious mind

In a recent email exchange, IM John Bartholomew described his experience of finding good moves as starting with a strong automatic filter that mostly suggests best or near-best moves, followed by a conscious iteration process that refines those suggestions (email dated November 3, 2026). I find this split more representative of the actual experience of Chess than anything entirely based on chunks or anything entirely based on structured conscious thinking processes. Our intuition frames and proposes, our conscious mind checks, refines, endorses, and/or rejects.

The conscious iteration process could include lookahead search or simply collecting more information about what the move changes and checking for potential blunders. Intuition fires and refires during this process, guiding the conscious mind and being guided by the conscious mind in a kind of loop. Eventually, when a move looks promising, we play it.

The conscious mind does not act as a neutral second party in this process, but instead mostly operates within the frame it's been given by intuition. A honed iteration process that has become flexible and adaptable over time may guide us to adjust the frame somewhat, as, for example, calculating ahead can draw your attention to new information and cause your intuition to reassess what's important in the initial position.

The deployment of our conscious mind is not free, and uses up space in the same limited mental resources that are also tracking the position, handling emotions, keeping us focused, and conceptualizing/visualizing variations. If we cannot pay the costs, we freewheel, and even if we manage to pay those costs we still chew up extra time on the clock.

A challenge for beginner and intermediate players is that the conscious iteration process has to do more work to catch bad moves, because the intuitive suggestions are coming from a less attuned schema. Also, the conscious iteration process itself is likely less practiced and less efficient, requiring even more of their mental resources when deployed. The combination means they're likely to freewheel more often than expert players, and when they do, their mistakes are more likely to be damaging.

So what should we do differently in our training to improve our intuitive suggestions?

The research points me toward three recommendations. These recommendations are informed by research insights generated largely outside the field of Chess and require more experimentation before they should be considered proven ideas within Chess improvement.

1. Train with a large number of concrete positions that feature the same or similar solutions.

Repeated exposure to the same pattern in different situations may have a bigger impact on our in-game pattern recognition than will only training with random, unrelated puzzles or even revisiting a pattern in the same position over and over. This may allow the brain to extract a more nuanced and accurate minimum viable pattern that is more suited to application in actual Chess games.

If you complete twenty-five puzzles and none of them feature the same pattern, you're unlikely to encode anything useful into chunks (though this does have other benefits). If you consistently return to the same pattern in the same position without variety over time, you're unlikely to extract the kind of nuance that would help you reliably recognize that pattern or similar patterns in other positions.

2. Build simple awareness habits to better arm our intuition with key details move-to-move.

Intuition always frames our awareness down to what it assesses and suggests is useful. If the frame is incorrect for the situation, it presents huge challenges for us in finding correct moves. One way we can make it more likely certain key details appear in our intuitive frame is to build simple and automatic awareness habits that end up running as part of your initial intuitive assessments.

Depending on your skill level and types of details you overlook, candidate awareness habits may include identifying anything the last move attacks, anything the last move undefends or weakens, or maybe any new alignments that have appeared in the position with the last move (like a queen and king on the same diagonal). For some players, a good habit to start with is even considering your opponent's last move *at all*, as many players find their intuition regularly framing things to only include their own ideas.

If that is too simple for your level, you can practice these same awareness habits during calculations, making sure you're taking in *all* of the details that change with each move. A poor frame can descend and make you blind to threats or opportunities mid-calculation as well.

I recommend you pick one awareness habit to build and focus on exclusively until it feels more or less automatic and you've stopped needing to remind yourself to do it.

My favorite technique for practicing awareness habits actually came from one of my students and has been named after her. You can learn more about Jessika's Review in this article: https://dontmoveuntilyousee.it/articles/jessikas-review

3. Prioritize building efficient conscious iteration skills over learning a rigid per-move thinking process.

Conscious thinking processes we force ourselves to deploy are costly, and will likely fail us when our mental resources are overwhelmed and it matters most. Improving our ability to efficiently loop back and forth with our intuition, I would suggest, would prove more effective in the long run.

To help achieve more effective iteration, we can build good conceptualization/visualization skills, strong awareness during calculations, and accurate future-position evaluation skills. However, beyond the visualization/conceptualization and awareness side, I don't yet have a clear sense of what a highly efficient conscious iteration process should look and feel like. This is a prime candidate for a future *What I Don't Yet Know* report.

Conclusion

I started this research considering intuition as both a strength and a hindrance, something to be monitored closely and often worked around. Now I can see that intuition is really running the show in many ways, and our role as players and improvers is to build its schema, arm it with the information it needs in the moment, and build efficient conscious iteration skills to loop with it, enhance it, and catch the inevitable misfires.

There's still plenty for me to learn on intuition, and a lot of experimentation required to see if and how some of the ideas I discuss here apply directly to Chess improvement. I have already begun to apply some of these ideas in my work to see the results, and I look forward to revisiting this topic in a future report.

What I still don't know

Below are several questions prompted by this research that I don't yet have a studied, defensible point of view on.

- do the Orbán study's findings translate to how we build Chess chunks? And if so, how do we best deploy that finding in our own training?
- does creating our own concrete positions to explore particular patterns help us build a more nuanced understanding of the pattern and extract detailed chunks more effectively?
- what does an efficient conscious iteration process look like, and how can we best learn to do it?
- what causes the phenomenon pattern overrides, where unfamiliar elements of the position can be unconsciously substituted in our thinking by elements we're more familiar with?
- can our pattern recognition actually change what our eyes perceive?
- how and why do chunks fade over time, and how do we efficiently prevent that?

Unfortunately, I ran out of time to finish Willy Hendriks' *Move First, Think Later*, but it is clearly relevant to this topic. I want to engage further with his argument, and hope I have represented his work appropriately here.

Disclaimer

I'm not a cognitive scientist or a titled player. I'm a guy who reads a lot, plays with ideas, and has had the fortune to work directly with a lot of adult improvers on these topics. Some of the things I've written above may be incorrect, misinterpreted, or misrepresented. If that is the case, I own any mistakes and apologize. I will research more, I will go again. That's the whole point of the *What I Don't Yet Know* project.

Also, you'll notice I capitalize "Chess" whenever it's mentioned in the report outside of quotes or titles. I know it's generally written as lowercase, but I refuse to show Monopoly more respect than I show Chess.

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