

The osu! Improvement Handbook

Skills, training plans, and what the evidence says

Built from DigitalHypno's osu! PhD skill chart, the training advice of Tonehh, Korilak, khz, BTMC, bloo, ferret_irl and others, osu!'s own interviews with its best players, and community guides going back to 2012. Every checkable claim is tested against the osu! wiki, the game's own data, and published research.

September 2026 edition. Replaces the *osu! Skill Map Study Guide* and folds in everything from it.

How to Use This Book

The book has six parts. **Part I** is the map: the skills, how they feed each other, and where the coaches agree and disagree. **Part II** takes the skills one at a time, starting from your first hundred hours. **Part III** covers setup: tablet technique, hardware and accessories, drivers and firmware, audio and skin, your hands and eyes, and playing on lazer. **Part IV** is mindset. **Part V** is the trainer: diagnosis, the practice loop, replay review, session structure, programs, weekly templates, and tournaments. **Part VI** holds tables, a glossary, resources, quick answers, and sources.

These are condensed notes in my own words, not transcripts. The videos and guides have the full explanations. Bracketed numbers point to the Sources list at the end.

Box	What it does	Labels used
Fact check (green)	Compares a claim from the chart with the osu! wiki, game data, and research	Confirmed · Adds detail · Nuance · Lazer · Research · Real-world data · By the numbers
Take (orange)	Restates a named creator's claim, then gives a verdict	Supported · Partly supported · Not supported · Contested · Agrees with the chart · Differs from the chart · Doesn't transfer · Experience-based · Dated
Drill (blue)	A practice routine you can run as written	Source is named in the title or first line

- **Experience-based** means advice from a player's own practice that no study or game data can confirm or refute. It isn't a criticism; much of the best advice in osu! is like this.
- Labels combine where a claim needs it, and an "agrees with" label can name another creator instead of the chart. **Contested** marks a claim that other strong players dispute; **Doesn't transfer** marks advice that is sound in the game it came from but not in this one.
- **Stable** is the classic client and **lazer** the new one. Values are for stable unless a box says Lazer.
- Game mechanics and pp change. This edition was checked in September 2026; the osu! wiki is the authority for current values.

How this book handles its sources

Every claim here carries one of three weights. **Game mechanics** come from the osu! wiki or the game's own code and are stated as fact. **Research** comes from published studies, which are named so you can check whether the study actually says what the box claims. **Coaching advice** comes from named players, and is labelled by how far the evidence goes, using the labels in the table above.

The coaching material is not evenly distributed, and pretending otherwise would be dishonest. This edition carries about 880 citations, of which roughly 450 are research, official documentation, or tools. Of the coaching citations that remain, one creator, Tonehh, accounts for about a third, because he has published more structured improvement material than anyone else working in the game. The remainder is spread across Korilak, DigitalHypno, khz, BTMC, ferret_irl, bloo, Almost, ScarletStory, jesse1412's thread, several unnamed video creators, three top players interviewed together, osu!'s own interviews with seven more, and community forum guides going back to 2012.

Every source in the list also carries a validity tier, from A for official documentation and B for peer-reviewed research down to E for unverified or second-hand material, so you can see at a glance how much weight a citation carries. The scale is explained in Ch. 41.

Two habits keep that imbalance from becoming bias. Where a claim rests on one person, it is labelled Experience-based rather than dressed up as consensus. Where two sources disagree, both appear, and Ch. 3 collects the disagreements rather than resolving them. When an older source turns out to have said the same thing years earlier, that is noted, because independent arrival at the same advice is worth more than repetition of it.

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The Map

1. The Big Picture

DigitalHypno's chart sorts osu! into five umbrella terms: **tapping, aim, reading, endurance, and speed**. Each branches into narrower skills, and those skills feed one another. Tapping, aim, and reading are the three core inputs of gameplay: clicking, moving the cursor, and making sense of what's on screen. [1]

Using the map: When a skill feels weak, rate yourself honestly on each skill that feeds into it. The weakest feeder is usually the best place to spend practice time. The diagnosis table in Ch. 27 turns this into a checklist.

The recurring theme: Fundamentals first. Most skill walls trace back to a shaky basic skill, and low-star maps (roughly 2 stars and under) isolate one skill at a time without other difficulties getting in the way.

FACT CHECK

- **Confirmed.** osu!'s performance-points system is built on the same core ideas as the chart: separate values for aim, speed, and accuracy, with approach rate and the Hidden, Hard Rock, and Flashlight mods raising the difficulty of fast, accurate movement. [59]

TONEHH'S TAKE

- **Theory comes after playing. Partly supported.** Tonehh argues that guides like this one are an afterthought and that top players improve simply by playing. Research agrees that skills are built by doing and that piling on technical rules can backfire under pressure, but it also shows that how you structure practice changes how much you learn. See Ch. 22. [4, 108, 129]

The coaches in this book

Creator	Who they are (as the sources describe them)	What this book takes from them
DigitalHypno	Creator of the osu! PhD skill chart	The skill map and its training logic
Tonehh	YouTube coach since 2020; returned in 2026 after four years away	Beginner mistakes, streams, tablet setup, mods, mindset, derusting, training with a busy life
khz	Top-300 player, 17th in Germany at the time, known for speed and stamina	A deathstream ladder for stamina and speed
bloo	UK osu! World Cup player at the time	Enjoyment, reading, and learning new skills
Korilak	Rose from 6 to 3 digits by 2016 and reached the top 100 in 2017	A 2016 written guide: warm-ups, a Hard Rock collection ladder, stream sets, Double Time, single-tap speed
BTMC	Streamer and top player; won the 2020 World Cup with Team USA	Commentary on Korilak's guide; a framework for pushing stream BPM; hands-on tests of tablet firmware

Creator	Who they are (as the sources describe them)	What this book takes from them
Three top players	Ranked roughly 15th, 20th, and 30th at the time, interviewed together	Farming done right, relax, alternating versus single-tapping, warm-ups, beating your own scores, and mindset
ferret_irl	Top-25 player known for tapping; wrote a 2026 improvement post	Small measurable goals, tapping technique and grounding, training without rapid trigger, low AR as a warm-up
The Followpoint	osu!'s own interview series: mrekk, WhiteCat, xootynator, Azer, Flaro, Predominador, BTMC	What the best players answer when asked how to improve, and how tournaments are actually prepared
Almost	Author of a staged streaming course on the forums	The spacing ladder, the zero-to-deathstream course, and stream accuracy training
FPS aim coaches	Two aim-training creators from outside osu!	What transfers from aim theory, and what does not
An r/osugame guide	An anonymous community guide from the mid-2010s, with tips credited to two other players	Archetype diagnosis, approach-rate training ladders, and early versions of advice later videos repeat
Community forums	jesse1412's 2012 guide and its argumentative comment thread (thelewa, darkmiz, kriers, Soly, winber1 and others), ScarletStory's 2014 guide, plus later replies from yellowbadbeast, Kaoru, WalkingAbacus and FrostyF	Pattern vocabulary and chunked reading, accuracy method, the skill cap and consistency split, posture, and the oldest recorded version of several modern claims
Others	A precision video, a consistency video, a plateau video, a hyperfocus video by a coach, and a rank-80 player's stream clip; creators not identified	Precision and Hard Rock, consistency habits, confidence, balance across skill sets, a stream roadmap by rank

2. Quick Reference

What feeds into each skill, per the chart. "Reading" is the umbrella; pattern processing and rhythm sense sit under it.

Skill	Builds on	In short
Fundamentals	—	Playing plain circles and sliders naturally
Low-star mastery	Fundamentals	Handling maps around 2 stars with ease; the one skill that feeds reading
Pattern processing	Reading, focus	Working out how a pattern should be played, often by chunking it
Rhythm sense	Reading	Staying on the beat of the music
Finger control	Tapping	Controlling your fingers; starting and stopping patterns on either finger

Skill	Builds on	In short
Cursor control	Aim	Putting the cursor where you mean to, and keeping it steady
Consistency	Pattern processing, finger control, cursor control	Performing about the same on every attempt
Accuracy	Rhythm sense, pattern processing, finger control	Hitting on time and keeping UR low
Sightreading	Pattern processing, rhythm sense	Playing a map correctly the first time you see it
Focus	—	Keeping your attention on the map
Mindblock prevention	Pattern processing, focus	Continuing to read patterns instead of playing from memory
Flow aim	Cursor control, focus	Smooth, continuous cursor movement
Precision	Cursor control, focus	Landing near the center of circles
Technique efficiency	—	Cutting wasted movement in tapping and aim
Tapping stamina	Tapping, endurance, technique efficiency	How long your tapping holds up
Aim stamina	Aim, endurance, technique efficiency	How long your aim holds up
Streaming	Finger control, tapping stamina, flow aim	Playing runs of 1/4 notes cleanly
Reading speed	Pattern processing, rhythm sense, speed	Processing patterns quickly at high AR
Tapping speed	Tapping, speed	Tapping fast
Aim speed	Aim, speed	Moving the cursor fast
Slider aim	Pattern processing, cursor control	Following sliders correctly
Nerve control	Focus, endurance	Staying steady under pressure

3. Where the Coaches Agree and Disagree

Read side by side, the sources agree on more than they disagree. Where they split, it's usually over thresholds and routes, not principles.

Consensus

Principle	Who says it	What the evidence says
Fundamentals before difficulty	DigitalHypno, Tonehh, Korilak, bloo, the rank-80 player	Learning peaks at a challenge matched to your level [108, 109]

Principle	Who says it	What the evidence says
Control before speed	DigitalHypno, Tonehh, khz, Korilak	Alternation breaks down past a critical speed; one finger tops out near 5 to 7 taps per second [114, 116]
Warm up before serious attempts	Korilak, Tonehh, the consistency video (the top players dissent on how much)	Skill dips after rest and returns fastest with task-specific practice [144, 145]
Strain is fine; sharp pain means stop	DigitalHypno, Tonehh, khz (Korilak: stop at irregular pain)	Wrist and hand pain are common in esports and rarely treated [163]
Rest and sleep are training	Korilak, Tonehh, khz	Sleep adds overnight gains; spacing beats cramming [102, 103]
Play a variety of maps	All sources	Mixed practice often aids retention in the lab; field results are mixed [118, 119]
Cap your retries	Korilak (three strikes), the consistency video (two or three tries), Tonehh (finish the map anyway)	Spaced repetitions beat massed ones, though community data finds no sign that retrying itself slows improvement; see Ch. 30 [65, 103]
Enjoyment and intrinsic motivation	Tonehh, bloo, the plateau video	Intrinsic motivation predicts performance [123]
Measure against your own past scores	Korilak, Tonehh, the top players interviewed	Specific, difficult goals with feedback on progress beat vague effort [148]
Hide the HUD if numbers make you nervous	DigitalHypno, Tonehh, the consistency video	Shift+Tab hides the interface in stable [58]

Where they split

Question	Positions	What the evidence says
Where do fundamentals live?	DigitalHypno: 2 stars and under. Tonehh: 3 to 4 stars, where bursts appear. bloo: low 3 to low 5 stars.	Different targets. Match difficulty to the skill being trained. [108]
Can you learn streams on deathstream maps?	Tonehh (2020): no, use them only as benchmarks. khz: yes, from 140 BPM. Korilak: yes, from 150 BPM.	Both routes are gradual overload with mastery gates; Tonehh later agreed there's more than one road. [5]
One skill set at a time, or a mix?	Tonehh: one skill set for weeks, then rotate. Korilak: play a bit of everything daily, lead with your weakest skill. The 2010s r/osugame guide: a whole day per skill at minimum, in week-long blocks. The hyperfocus video: play everything every session, and give a weakness a session or two at most.	Lab studies favor mixing for retention; sport studies find the benefit small or absent. Skills you stop playing do decay. [118, 119, 122]

Question	Positions	What the evidence says
Keep your setup fixed, or vary it?	Every osu! source in this book: settle on an area and stop changing it. An FPS aim coach: aim is adaptable motor control, not a memorized distance, and varying sensitivity in training is a tool.	Both are right about different things. Subtle variation between practice sessions nearly doubled learning in one study; the same study found the benefit disappears when the change is large. See Ch. 17 and Ch. 28. [35, 159]
Accuracy first or speed first?	thelewa (2012): build accuracy on maps you can full combo; it transfers to every speed later and never leaves. Aqo, in the same thread: accuracy is muscle memory per BPM, so push your speed limit first and train accuracy afterwards.	The thread sided with accuracy-first, and so does the piano analogy one reply offers: practising fast first produces unstable execution. Nothing has tested it in osu!. [66]
Push through burning?	Korilak: burning is what you want. khz: strain yes, pain no. DigitalHypno: burning is normal, sharp pain means stop.	Training to failure isn't needed for gains, and practicing while fatigued impairs skill learning. [131, 132]
When to use offset	Many top players: not before the top 10,000. DigitalHypno: once you can tell an offset problem from an accuracy problem.	The wiki says leave local offset at 0 unless your setup adds delay. [57]
How long to warm up	Korilak: an hour or more before serious play. Tonehh: about 30 minutes in one video, 10 to 13 in another. Two of the three top players barely warm up and say elaborate routines buy 1 to 2% at most; the third says cold hands are why players wonder what's wrong.	The post-rest dip clears with a short block of task-specific practice, which is what "just play the game" amounts to. [40, 144]
Are farm maps useful?	Tonehh: the trap that stalls new players. The top players: yes in moderation, if you chase full combos instead of pp and keep other skill sets in the rotation.	They describe the same maps and disagree about how they're played. Star rating has favored short difficulty spikes, which is what makes those maps pay. [40, 75]
How to learn Hard Rock	Korilak: a three-strike collection ladder. BTMC: isolate each setting, then two weeks of Hard Rock only. Precision video: start on your nomod top plays, then sightread.	All three ramp difficulty gradually; none has been tested against the others.
Double Time: stamina or burst speed?	Korilak: stream endurance carries over to DT bursts. BTMC: high AR and burst speed matter more.	DT cuts visible time by a third, to 300 ms at AR 10, near simple reaction time. Both matter. [47, 99]

The Skills

4. Your First Hundred Hours

Everything after this chapter assumes you already play. This one doesn't. It is also the chapter this book exists for: almost every problem in Ch. 32 starts in the first month, with a player skipping the boring part.

Setting up, once

- **Keys.** The default is Z and X, one finger each, and that is what almost everyone uses. Click on the mouse works but ties your clicking hand to your aiming hand; separating them early saves relearning later (Ch. 6). [58]
- **Audio.** Effects volume above music volume, wired headphones or speakers. You are playing to a sound, and you need to hear your own hits. Bluetooth adds about 170 ms of delay, which is several times the entire 300 window (Ch. 7). [164]
- **Turn on the hit error bar** (Options, Score meter type, Hit error). Seeing whether you are early or late from your first week is worth more than any setting you could buy (Ch. 7). [72]
- **Everything else can wait.** You don't need a tablet, a mechanical keyboard, a skin, or a custom area to reach the middle ranks; Korilak, who reached the top 100, says as much about the 100,000 to 300,000 range. Buy comfort when something hurts, not when you're stuck (Ch. 17). [31]

What the numbers on a map mean

Setting	What it does to you
Star rating	The game's difficulty estimate. Useful as a ladder, unreliable as a comparison between map types, and recalculated when pp updates (Ch. 24) [59]
AR	How long objects are visible before you hit them: 750 ms at AR 8, 600 at AR 9, 450 at AR 10. Lower AR means more objects on screen at once, which is harder to read, not easier (Ch. 8) [47]
OD	How tight the timing is: ± 50 ms for a 300 at OD 5, ± 32 at OD 8, ± 20 at OD 10 (Ch. 35) [46]
CS	Circle size. Higher CS means smaller circles (Ch. 10) [48]
HP	How fast the health bar drains when you miss

The first month, concretely

1. **Play maps you can pass, then maps you can full combo.** Star rating is your ladder: sit where you can full combo with good accuracy in a couple of tries, then move up. Both extremes fail: SS-ing easy maps teaches nothing new, and pass-hunting far above your level builds nothing you can repeat. [71, 108]
2. **Chase accuracy before difficulty.** 98% is a good early target, though don't force it while your tapping is still forming. Accuracy habits built now pay off for years; accuracy skipped now becomes the wall in Ch. 32. [31, 71]
3. **Alternate from the start.** Tap Z, then X, then Z, on anything faster than comfortable singletapping. Mashing through your first bursts is exactly how finger lock is trained (Ch. 6). [3]

4. **Play a variety of maps, not one type.** Your first few hundred maps decide which skills exist at all (Ch. 22).
5. **Expect to be bad for a while, and expect improvement to be invisible while it happens** (Ch. 23). [124]

DRILL: YOUR FIRST WEEK

- Pick five maps you can pass at your current level, across different styles: one with jumps, one with bursts, one slow and technical, one long, one you simply like.
- Play each until you can full combo it at 97% or better. Alternate every burst even when mashing would pass.
- Then raise the star rating by half a star and repeat with five new maps.
- Keep the five old maps. They are your first benchmark (Ch. 33). [3, 108]

Not yet

These are not forbidden forever. They are things that, done in your first hundred hours, cost you more than they give:

- **Mods.** Hidden, Hard Rock, and Double Time all wait until you are comfortable across a variety of maps without them (Ch. 15). Hard Rock in particular raises AR, which hides the dense reading you're supposed to be learning. [13, 15, 66]
- **Farm maps.** Short maps with a spike of jumps pay pp and teach one skill. They are not banned, but a diet of them at low accuracy produces the three walls in Ch. 32. [3, 40]
- **Relax and Autopilot.** Each removes half the game, so neither trains the half it removes (Ch. 15). One run of each is a useful diagnostic, though, and Ch. 27 explains how to use them that way. [62, 143]
- **Chasing pp and rank.** Both are lagging indicators, and both get recalculated without you playing a note (Ch. 24). [59]
- **Buying gear to fix a plateau** (Ch. 17).

5. Foundations

Every pattern in the game is built from circles and sliders, so those need to feel natural before harder maps make sense. DigitalHypno compares it to learning a language: nobody tackles complicated sentences until simple ones are automatic. "Mastery" here means comfortable and natural, not flawless every time. [1]

Low-star maps are valuable because they strip away every challenge except the one you're practicing. That makes them ideal for drilling reading, finger control, or cursor control one at a time, even if the other two are still weak. If they feel boring, play the easy difficulties of songs you love. DigitalHypno's own low-star examples in the video are an Easy and a Normal difficulty. [2]

FACT CHECK

- **Research.** Motor-learning research backs a difficulty sweet spot. The challenge point framework holds that learning peaks when practice is hard enough to be informative for your level without making performance fall apart, and a later study found evidence for that optimal point. [108, 109, 110]
- **Research.** In a meta-analysis across domains, accumulated practice explained about 26% of the differences in performance in games, more than in music (21%) or sports (18%). Critics argue a stricter definition of practice explains far more. Either way, practice matters, and so does what it consists of. [150, 151]

TONEHH'S TAKE

- **Where to start. Differs from the chart.** Tonehh rebuilds fundamentals around low 4 stars (3 if needed), where bursts begin to appear; DigitalHypno isolates them at 2 stars and below. They're training different things, and the challenge point research fits both. [3]
- **Push past your comfort zone, in moderation. Agrees with the chart.** Players who only submit near-perfect scores on comfortable maps stall, while players who live far above their level never reinforce the basics. [4]

KORILAK'S TAKE

- **Progress by star rating, not pp; aim for full combos at your comfortable level. Agrees with the chart.** He climbed from 2 to 3 stars to about 5.2 stars without tracking pp, and says average star rating rises on its own if you play what you can play consistently. [31]
- **Ignore 6-star maps until 4 stars are comfortable; focus on accuracy, with 98% a great starting target. Supported.** Challenge point research favors matched difficulty, and accuracy habits built early are what the chart calls control. [108]
- **No tablet or mechanical keyboard is needed through the 100K to 300K ranks. Experience-based.** What gear does and doesn't change is in Ch. 17.

DRILL: LOW-STAR ISOLATION

- Pick a 1 to 2 star difficulty of a song you like, easy enough that nothing but your chosen focus is hard.
- Play it three times, once per instruction: alternate every note; start every pattern on your other finger; put the cursor in the dead centre of every circle.
- Move up only when your comfortable range gives 97 to 98% full combos within a few tries. Full programs in Ch. 31. [1, 3]

6. Control Skills and Consistency

Pattern processing

- The specific skill of understanding how a pattern is meant to be played. "Reading" is the umbrella term; pattern processing and rhythm sense sit under it.

- The core habit is splitting dense or awkward sections into smaller pieces and handling them one piece at a time.
- After a misread, ask whether you were focused but couldn't parse it, could parse it but weren't paying attention, or both. Then check the skills that feed each one.
- Memorizing a hard section is legitimate (most top scores involve some), but good processing is what makes memorizing efficient.

FACT CHECK

- **Research.** Working memory holds only about four chunks at a time, and grouping items into chunks is the classic way people get around that limit. That's the cognitive basis for breaking dense sections into a few familiar pieces. [101]

Finger control

- Two sides: controlling your finger movements, and being able to begin or end any pattern on either finger.
- No special maps required. Any map works if you deliberately change which finger leads, or how you tap, until it feels comfortable. A good self-test: can you singletap comfortably with both fingers?
- It's separate from speed. Get tricky rhythms clean at slow tempos before attempting them fast.
- As a temporary crutch, memorize the tap count of a burst you keep miscounting until it becomes muscle memory.

FACT CHECK

- **Research.** When people alternate two fingers and gradually speed up, they switch involuntarily to moving them together once they pass a critical speed, and slowing down doesn't bring the alternation back. Those studies used the index fingers of both hands, not two keys under one hand, so this is a parallel to osu! finger lock rather than proof. It fits the advice to build alternation at speeds where it stays stable. [114, 115]

TONEHH'S TAKE

- **Finger lock comes from mashing through bursts you can't yet alternate. Agrees with the chart.** His fix, dropping star rating and BPM and deliberately alternating on every burst, matches the chart's rule that finger control comes before speed. Repeating a movement biases future movements toward it, which makes it plausible that mashing ingrains mashing; the mechanism is still debated, and no study has tested osu! finger lock directly. [3, 111, 112, 113]
- **Restricted fingers lock up. Experience-based.** For his first 450 or so hours he kept his thumb resting on his index finger and couldn't hold longer streams until he relearned to alternate freely. Which fingers you use matters less than whether they can move. [7]
- **Use a comeback to fix habits. Agrees with the chart.** After four years away he used the reset to start bursts on either finger instead of always his index, exactly the chart's definition of finger control. [16]

TAKE: TOP PLAYERS

- **Learn both alternating and single-tapping; they train different things. Agrees with the chart.** Alternating saves stamina, survives high BPM, and unlocks maps you otherwise can't play; single-tapping raises your top speed, tends to be more accurate at moderate BPM, and reaches some jump patterns alternation can't. The chart's own test for finger control is whether you can singletap comfortably with either finger. One finger tops out near 5 to 7 taps per second, which is why alternation becomes compulsory as BPM climbs. [1, 40, 116]

FERRET_IRL'S TAKE

- **Tapping is finger movement, not wrist or forearm movement. Experience-based, from the player best known for it.** His objection is to a widely circulated forearm-rotation method: the wrist is for broad repositioning and gripping, not for the fine control tapping needs. Other strong players credit forearm rotation for their speed, so treat this as one expert's position rather than settled (Ch. 13). [38]
- **Ground your hand somewhere that isn't your wrist or arm. Experience-based.** He relieves tension by pressing a fixed contact point, in his case a thumb against the desk edge, while noting that his own choice is an awkward position he doesn't recommend copying; a corner of the keyboard or a resting pinky does the same job. Watch what strong tapping players do with their spare fingers when they strain.
- **Fingerlock means your technique has been overwhelmed by speed or fatigue. Agrees with the chart.** Same diagnosis DigitalHypno and Tonehh give, and the same fix: drop the intensity until control returns. [1, 3]
- **Don't spam a BPM you can't play below. Agrees with everyone.** You won't reach 300 by hammering 300 when 250 is still messy. [5, 34]

Cursor control

- Steering the cursor precisely, including keeping it stable.
- If you miss the same note in the same direction again and again, consciously correct for it; the correction becomes automatic over time.
- Self-test after a miss: if you saw exactly how you misaimed, it's probably cursor control. If you didn't, look at pattern processing or focus first.

Consistency

Doing about the same on every attempt. It's the combined result of the three control skills, so the way to improve it is to firm those up rather than chase "consistency" directly. Unreliable control can't produce reliable results.

TAKE: CONSISTENCY VIDEO

- **Stamina is the biggest factor, then aim stability, tempo, map variety, skin, and HUD. Differs from the chart.** The chart builds consistency from the three control skills and treats stamina as its own branch. Both views agree you can't be consistent on maps that outlast you. [42]
- **Don't retry-spam; give a map two or three tries, then move on. Supported.** Spreading repetitions out beats massing them, and the chart explains the mindblock that spam invites: you start playing your memory of the map instead of the map. Korilak's three-strike rule is the same idea (see Ch. 31). [31, 103]
- **Download new ranked maps for variety; comfortable, simple maps are easy to combo but narrow. Agrees with the chart.** Exposure to many mapping styles is how pattern processing grows.

DRILL: FINGER CONTROL, BOTH DIRECTIONS

- On a map with frequent bursts at a BPM you find easy, deliberately start every burst on your non-leading finger.
- When that stops feeling strange, alternate which finger starts each burst within the same map (zxz, then xzx: see Ch. 11).
- Then singletap a slow section with each finger in turn. If one hand-shape is clearly worse, that's the one to train. [1, 66]

7. Rhythm, Accuracy, and Offset

Rhythm sense

Staying locked to the beat. It can be built outside osu! too, through an instrument or music theory, and it feeds both accuracy and sightreading.

Accuracy

- Means hitting on time (300s) and keeping unstable rate (UR) low. UR is the standard deviation of your hit errors in milliseconds, multiplied by 10.
- Rough guide on simple-rhythm maps: under 100 is good, and strong accuracy players get under 80. Complex rhythms push these numbers up.
- **Turn the hit error bar on**, under Options, Score meter type, Hit error. It appears at the bottom of the screen and shows every hit as it lands: inside the blue band is a 300, green is a 100, orange is a 50. It is the only feedback in the game that arrives while you can still act on it. [72]
- Hover over the performance graph on the results screen to see UR and hit error. It's only available right after playing or watching the replay.
- Audio helps: use loud, responsive hitsounds and set effect volume above music volume so you can hear yourself drifting off the beat.
- The map's timing decides what counts as on time, not the song. Mappers interpret music differently, and older maps often place rhythms the music doesn't have, which is why older maps build your library of patterns.
- If one pattern in an otherwise comfortable map always comes out late, memorize it and deliberately tap a little earlier there.

FACT CHECK: TIMING

- **Confirmed.** UR is the standard deviation of your hit errors in milliseconds, times 10. It measures consistency, not correctness: hitting every note equally late can still produce a low UR. [51]
- **Lazer.** Stable measures errors in map time, so a Double Time UR must be divided by 1.5 (Half Time: multiplied by about 1.33) to compare with nomod. Lazer has measured UR in real time since version 2023.1130.0, so no conversion is needed there. [51]
- **Nuance.** “Under 100 is good” is a community rule of thumb, not an official value. What a given UR means for your 300s depends on OD; see the worked example in Ch. 35.
- **Research.** People tapping along to a beat naturally land ahead of it by tens of milliseconds (around 30 ms is typical), and a smaller early lean tends to go with less variable tapping. An early-leaning hit error is normal and trainable. [90, 91, 92]
- **Research.** Musical training measurably improves rhythm perception and synchronization, and percussionists tend to show the sharpest timing of all musicians. [93, 94]
- **Research.** Hearing your own taps helps timing only slightly, but delayed feedback clearly disrupts it, and people shown the size and direction of their errors cut their early lean sharply. Keep hitsounds crisp and low-latency, and check your hit error regularly. [96, 97, 98]

KORILAK'S TAKE

- **At OD 10 you have 19.5 ms either side for a 300. Confirmed.** The formula gives ± 20 ms, but stable only counts a hit inside a window if the error is below the rounded value, so the effective window is half a millisecond narrower. [31, 46]
- **Once AR 9 is comfortable, play to the song rather than the approach circle. Supported.** People synchronize more precisely to sound than to flashes; moving visual cues narrow the gap but sound still leads. [95]
- **Never practice timing with Autopilot. Supported.** Autopilot moves the cursor for you, so you rehearse tapping without the aim it has to coordinate with. A meta-analysis of whole versus part practice backs the textbook rule that tightly linked components are best practiced together. [62, 143]
- **Drumming made his timing innate before osu!. Supported.** It matches the musical-training research above. [94]

TONEHH'S TAKE

- **Don't chase UR; it drops by itself as you improve. Supported.** UR measures spread, harder maps with higher OD force tighter timing, and practice curves keep improving while slowing down. He played patterns because he liked them; lower UR came as a side effect. [12, 46, 124]
- **Comparing UR across maps rarely makes sense. Supported.** Length, rhythm complexity, and comfort all move it. Short maps also give noisy numbers: estimated from 50 hits, a UR is typically about 10% off its true value either way; from 500 hits, about 3%.
- **Use the hit error graph to catch over- or under-streaming, then consciously adjust. Supported.** Error feedback reduces timing bias in lab studies. [7, 97]

SCARLETSTORY'S TAKE

- **Time to the song, not to the hitsounds. Supported, and it sharpens the usual advice.** Every source in this book says to make hitsounds loud, and this one explains what they're for: hitsounds are a **correction** signal that tells you whether your timing drifted, not the cue you play to. Play to the music, then use the hitsounds and the hit error bar to adjust. That matches both Korilak's rule about playing to the beat rather than the approach circle, and the research showing people synchronize more precisely to sound than to visuals. [31, 72, 95, 97]
- **A 300, 100, 300, 100, 50 pattern means you're guessing, not keeping the beat. Agrees with the chart.** Scattered errors are a rhythm problem, not an offset problem (Ch. 7).

TAKE: JESSE1412'S THREAD: ACCURACY

- **Practice accuracy on maps you can already full combo, and raise a minimum accuracy floor from 97% toward 99%. Supported.** thelewa, one of the most accurate players of that era, argues that chasing an SS over a thousand retries teaches nothing, while holding a floor on maps within reach teaches timing. It is the consistency half of Ch. 28, written in 2012. [66, 103]
- **Use loud hitsounds, effects at 100 and music at 70. Agrees with Tonehh and khz.** The same two numbers appear in a 2012 forum reply and in a 2020s video, arrived at separately. Hearing your own taps helps timing, and delayed or buried feedback hurts it. [8, 66, 96, 98]
- **Practice hard sections slowed down in the editor until you read them perfectly, then speed up. Supported.** Same segmentation the whole-versus-part meta-analysis supports, and the same method Tonehh reaches for with practice difficulties (Ch. 14). [8, 66, 143]
- **Play some taiko to build accuracy. Experience-based.** Plausible through rhythm training rather than transfer of aim; musical and rhythmic training does improve synchronization. [93, 94]

DRILL: RAISE THE ACCURACY FLOOR

- Pick three maps you can already full combo comfortably.
- Set a floor: 97%. Play each until you clear the floor, then raise it by half a point and repeat. Stop at 99%; chasing an SS over a hundred retries teaches nothing.
- Check the hit error numbers after each attempt. If your early average is clearly larger than your late average and your UR is low, that's offset, not accuracy. [51, 66]

Offset

A low UR only means your hits were tightly grouped. You can be consistently early with a great UR and still get 100s; that's the problem offset solves.

Your hits are...	Local offset (per map)	Universal offset (options)
Consistently early	Press - before the map starts	Move the slider toward +
Consistently late	Press + before the map starts	Move the slider toward -

Local offset moves in steps of 5 ms, or 1 ms while holding Alt. On the results screen, the left hit-error number is your average early error and the right one your average late error. If early is clearly larger and your UR is

low, try a small negative local offset (around -5 to -10) and test from there. Offset only helps once your hits are tightly grouped; if they're scattered, that's an accuracy problem, not an offset problem.

FACT CHECK

- **Confirmed.** Local offset changes by 5 ms per press, or 1 ms with Alt. Negative values move hit objects earlier, which is why minus fixes early hits; universal offset works the other way. [57, 58]
- **Nuance.** The wiki's guidance matches the caution many top players give: on a correctly timed map, leave local offset at 0 unless your hardware adds delay, and read the needed value from hit errors that are consistently off in one direction. [57]

8. Reading

bloo calls reading the most important skill in the game, and Tonehh's aim guide goes further, putting aim at 99% reading and 1% raw aim. The chart splits reading into pattern processing and rhythm sense, and both feed almost everything else. [1, 10, 14]

Reading on the fly

- **Sightreading:** playing a map correctly without having seen it before. Pattern processing does most of the work, and rhythm sense helps you predict what's coming.
- **Focus:** plain concentration. Sleep, food, and general self-care make a real difference.
- **Mindblock:** happens when you stop processing a pattern and run on memory instead, executing your recollection rather than what's on screen. That's why a section that went fine on a sightread can fall apart on later attempts. Staying engaged with processing is the fix.

Reading speed and high AR

- **Reading speed** is processing patterns quickly, which matters most at high approach rate (AR), the setting that controls how early objects appear. It draws on pattern processing and on rhythm sense, which lets you anticipate what's next, since music repeats and maps follow the music.
- Memorizing high-AR maps is normal; the best high-AR scores often take many attempts.
- **High-AR tip:** removing the followpoint animation from your skin leaves dense followpoints that appear before the circles do at high AR. DigitalHypno keeps a separate skin set up this way for Double Time above AR 10.

FACT CHECK

- **Confirmed.** At AR 10, objects are visible for 450 ms and spend the first two-thirds of that fading in. Double Time shortens all visible time by a third, so AR 10 + DT leaves 300 ms. [47]
- **Research.** In a calibrated study of 1,469 adults, average simple reaction time to a visual signal was about 213 to 231 ms, with no aiming involved. At AR 10 + DT an object is visible for not much longer, so pure reaction can't keep up; anticipation from rhythm and pattern structure has to carry the load. [99]

KORILAK'S TAKE

- **Get comfortable at AR 9 before AR 10, because most nomod top difficulties use AR 9. Experience-based.** His advice for AR 9 trouble is exposure: play 4 to 5 star maps that use it. [31]

TONEHH'S TAKE

- **Never add a mod to make a map easier to read. Supported.** Putting Hard Rock on low-star maps to raise AR shows fewer objects at once, since each stays on screen for less time, so you skip the dense reading those maps exist to teach. He calls it the most common trap he's seen in four years of coaching and admits falling into it himself: he learned to stream only after about 100 hours of nomod low 5 star maps. [15, 47]
- **Higher AR also means less notelock. Partly supported.** Notelock comes from overlapping hit windows, which OD controls, not AR. Hard Rock does shrink those windows, so the effect he noticed is real, but it comes from the OD increase. [46]
- **Reading, not raw aim, is what top players built. Experience-based.** Switching to tablet, or bringing aim from shooters, raises your raw-aim ceiling but doesn't teach you to read osu! patterns, which is why the gains stall. [10]

BLOO'S TAKE

- **If your aim is inconsistent, improve your reading; the aim follows. Experience-based; agrees with the chart.** He also passes on a habit from hvick225: play a map without mods before trying it with Double Time, since the patterns are identical, just slower. [14]

TAKE: R/OSUGAME GUIDE

- **To learn an approach rate, practise one step below it. Partly supported.** To read AR 9, play dense, consistent AR 8 maps, converting AR 9 maps down if needed. Lower AR means more objects on screen at once, so it trains the harder half of the same skill at a difficulty you can learn from. It's the mirror image of the mod crutch above: deliberately harder to read, not easier. [39, 47, 108]
- **Dedicate a day or a week to one approach rate and nothing else. Nuance.** His own rotation was a week of high AR, a week of Hard Rock, with returns to AR 9 so it didn't decay. That sits between Tonehh's month-long blocks and the hyperfocus video's every-session mixing; the research doesn't settle the right block size (Ch. 23). [118, 119]
- **Climb high AR in small steps, and expect nothing to happen until it suddenly does. Partly supported.** AR 9 to AR 10 to AR 10.3 rather than AR 9 to AR 11. Individual learning curves do show flat stretches broken by discrete jumps, usually when something about the approach changes. [124, 125]
- **AR 9 is enough until roughly three digits. Agrees with Korilak.** Both put nomod AR 9 comfort before AR 10, for the same reason: it's what most maps use. [31]

Low AR as an anti-autopilot drill. Low approach rates are usually treated as a niche reading skill, but they have a second use, and a top-25 player known for tapping uses it in every warm-up: with more objects on screen at once, you overload pattern processing and are forced to read patterns instead of recognizing them. That's the chart's own distinction between reading and mindblock, where you execute your memory of a section rather than what's in front of you. Try it when familiar patterns feel automatic, when unfamiliar ones

keep catching you out, when you lean on memorization, or when your aim feels random despite steady cursor control. The goal is stronger pattern processing, not a low-AR specialism. No study has tested the drill; the case for it is his practice plus the chart's model. [1, 38, 101]

DRILL: READ THE MAP, NOT YOUR MEMORY

- Take a map you know well and play it once with the goal of naming each pattern as it arrives: line, triangle, square, burst, stream (Ch. 11).
- Then sightread three maps you have never opened, at a star rating one below your comfortable level, one attempt each. No retries.
- Compare. If the familiar map is now worse than the sightreads, you were playing memory rather than reading it (Ch. 8). [1, 44]

9. Sightreading

Sightreading is playing a map correctly the first time you see it. The chart treats it as a skill built from pattern processing and rhythm sense, and it is the one skill you cannot train by repetition, because the second attempt is no longer a sightread. [1]

It is worth training on its own for three reasons. Tournaments are sightread by definition (Ch. 34). A player who only grinds familiar maps ends up playing memory rather than reading, which is the mindblock in Ch. 8. And first-try performance is the cleanest measure of reading there is: it cannot be inflated by retries.

How to train it

DRILL: THE ONE-ATTEMPT RULE

1. Pick five maps you have never opened, one star below your comfortable level. Unranked and graveyard maps are ideal: unfamiliar mapping styles, and no leaderboard to tempt you into a second try. [16]
 2. **One attempt each. No retries, whatever happens.** The moment you replay a map it stops being sightreading practice and becomes consistency practice, which is a different session (Ch. 30).
 3. Record first-try accuracy and miss count for the set. That number, not any individual score, is your baseline (Ch. 28).
 4. Repeat weekly with five new maps. Rising first-try accuracy across sets is reading improvement that no amount of grinding a favourite map would show you.
 5. When the set feels easy, raise the star rating by half a star rather than adding maps.
- **Widen what you see, not just how much.** Old maps, unusual mappers, odd rhythms, and tournament mappools all force patterns your regular diet never produces (Ch. 11). lazer's daily challenge does this for you by choosing the map itself. [44, 61]
 - **Use low AR deliberately.** More objects on screen at once overloads pattern processing and forces you to read rather than recognize, which is why a top-25 player uses it in every warm-up (Ch. 8). [38]
 - **Chunk, don't memorize.** Sightreading rewards recognizing a shape as two lines and a note rather than as a novel arrangement of five circles. The chunking method in Ch. 11 is the sightreading method. [66, 101]

FACT CHECK

- **Research.** Practising varied tasks rather than repeating one improves retention in lab studies, even though it feels worse at the time and sport studies find the effect smaller. Sightreading sets are variable practice by construction. [118, 119]
- **Nuance.** The cost is real: your scores during a sightreading session will be worse than during a grinding session, and they are supposed to be. Judge the set, not the map (Ch. 30).

10. Aim

Flow aim and snap aim

- **Flow aim** is continuous, smooth cursor movement, as opposed to the angular stop-and-go of snap aim. It matters most for streams and smoothly mapped patterns.
- **Snap aim** means crisp, linear movement from note to note. Tonehh's route to it is reading each note individually instead of tracing the shape a pattern makes; tracing leads to rounded paths that miss, especially on squares. [10]

KORILAK'S TAKE

- **Keep your eyes on each note until you've hit it. Supported.** Eye-movement research calls this gaze anchoring: people naturally keep their eyes on a pointing target until the hand arrives, and the eyes leave smaller targets later. Korilak's point is to stop your eyes, and so your cursor, from leaving early. BTMC agrees but notes that fast maps rarely leave time to confirm the hit before moving on. [31, 32, 141, 142]
- **Aim can't be taught; use an area you're comfortable with and learn it well. Experience-based.** His favorite aim practice was square jump practice maps from 149 to 200 BPM at AR 8 to 10.

TONEHH'S TAKE

- **Read notes one at a time for snappy, consistent aim. Partly supported.** It's the same behavior as gaze anchoring above, and it slows you down just enough to add control, patience, and focus. It can't work for streams, where too many notes arrive at once; those need flow aim (Ch. 12). [10, 141]

SCARLETSTORY'S TAKE

- **Make one motion to the note, not a fast move followed by a slow correction. Supported.** He calls the second version half-snapping, and it is exactly what aimed-movement research describes: a ballistic phase toward the target plus a slower corrective phase. The corrective phase is where the time goes, and on rapid squares those lost milliseconds compound until you start circling the pattern. Training one clean motion is the straight-lines drill in Ch. 27. [72, 100]
- **Use the follow points as your movement guide, especially on squares. Experience-based.** They show the path the map expects, which is a free reading aid the game already draws for you (Ch. 11).
- **Follow every slider all the way through, even the tiny ones you could coast. Contested, and the split is instructive.** As scoring advice it's wrong: the head is what needs precision, and on fast sliders aiming short of the end is optimal (Ch. 10). As *training* advice it's sound, because tracking a slider at its own speed is the one thing in osu! that trains changing cursor speed deliberately. Follow them in skill sessions; take the efficient line when the score counts (Ch. 30). [52, 72, 158]

When you miss a jump, ask what actually failed

"My aim sucks" is rarely a diagnosis. Walk the miss backwards through the steps it passed through, which is DigitalHypno's self-test made explicit:

1. Did you **see** the object in time? If not, it's reading speed or focus (Ch. 8).
2. Did you understand where the pattern was going? If not, pattern processing.
3. Did you move toward the right place? If not, processing again, not aim.
4. Did you move too far or not far enough? **This one is cursor control.**
5. Did the cursor arrive late or early? Then it's timing and coordination (Ch. 12).
6. Did the cursor arrive fine and the tap fail? Finger control (Ch. 6).
7. Did you panic because you had already seen what came next? Focus, or nerves (Ch. 14).

Only the fourth is an aim-control problem. The others send you to a different chapter, and a jump section that keeps failing is usually failing at one specific step. [1]

Precision

Precision is landing near the center of circles. Smaller circles leave less margin, so it demands a steady cursor and close attention. It's a big part of Hard Rock.

FACT CHECK

- **Research.** Fitts's law, a model of aimed movement that has held up across many devices and populations, says the time to hit a target depends on the ratio of distance to target size, so small circles and wide spacing compound each other. [100]
- **By the numbers.** Circle radius is $54.4 - 4.48 \times \text{CS osu!pixels}$: about 36.5 at CS 4 and 32.0 at CS 5. Hard Rock turns CS 4 into CS 5.2 (radius about 31.1), roughly 27% less area; CS 8 has half the radius of CS 4 and a quarter of the area. [48, 49]

TAKE: PRECISION VIDEO

- **Precision matters at every circle size, not just tiny ones; skip CS 8 and above, since you'll rarely meet it. Partly supported.** Anything smaller than CS 4, the de facto default, trains it. The CS 8 cutoff is experience-based, though tournament Hard Rock does top out near CS 7.8 ($CS\ 6 \times 1.3$). [41, 49]
- **Hard Rock is the precision tool: smaller circles, a vertical flip, and AR and OD capped at 10. Confirmed.** [49]
- **Start Hard Rock on your nomod top plays for a few weeks, then sightread; mix nomod back in to see your progress. Agrees with Korilak and Tonehh.** Details in Ch. 31.
- **If you play without Hidden, learn Hard Rock without it too; don't learn two reading styles at once. Agrees with Korilak.** [31]
- **Hard Rock refines skill; Double Time raises the ceiling, so don't skip DT entirely. Experience-based.**
- **Precision earns little pp since high circle size was nerfed in 2015. Dated.** pp has been reworked several times since, most recently in July 2026; check the current system before drawing conclusions. [59, 79]

TAKE: R/OSUGAME GUIDE

- **Train aim by raising circle size, or with Hard Rock, and repeat a map until the misses thin out. Agrees with the precision video.** Set CS to where you start missing randomly, hold it until your miss count drops and combo rises, then move up. Fitts's law is the reason it works as overload: shrinking the target raises difficulty in a controlled, measurable way, and osu! trainer or lazer's difficulty adjustment does it without Hard Rock's AR and OD changes. [39, 41, 56, 83, 100]

DRILL: FIND OUT WHAT ACTUALLY FAILED

- Play a jump-heavy map at your level and, after every miss, answer one question before restarting: did I see it, understand it, move to the right place, move the right distance, arrive on time, or tap wrong?
- Tally ten misses. The column with the most marks is the skill to train, and only "wrong distance" sends you to cursor control.
- Re-run the tally a week later on the same map to see whether the drill moved the right number. [1]

What osu! can borrow from FPS aim theory

FPS aim training has a vocabulary osu! lacks, and borrowing it sharpens what you practise. It also has limits that don't survive the trip across, so both are worth stating.

FPS mechanic	osu! equivalent	What it actually is
Flicking	Snap aim to jumps	A ballistic movement: planned, then executed without correction. Fitts's law governs it (Ch. 10)
Tracking	Slider aim, spinners	A continuous movement matched to a target's velocity and corrected from error
Target switching	Jump chains, stream aim	Repeated ballistic movements where the cost is the transition, not the individual hit

FPS mechanic	osu! equivalent	What it actually is
Tension management	Technique efficiency	How much force you hold, and whether you can hold it only where it's needed

FACT CHECK: SACCADDES AND PURSUIT

- **Research.** Your eyes have two systems, and they map onto the two aim styles exactly. Saccades are ballistic jumps, uncorrectable once launched, with a latency around 200 to 250 ms. Smooth pursuit is continuous, matched to a target's velocity, corrected from error, and faster to initiate at about 90 to 150 ms. Snap aim is a saccadic task; slider tracking is a pursuit task. [158]
- **Research.** Pursuit only works up to roughly 30 degrees per second of target motion. Past that your eyes fall behind and insert catch-up saccades, which is what a fast slider does to you: you stop tracking it and start jumping to where it will be. That is the mechanism behind the standing advice to follow a fast slider's direction instead of tracing its shape, and to aim slightly short of the end. [55, 158]
- **Adds detail.** Pursuit also needs a visible moving target, which a stream doesn't provide. On streams your cursor moves smoothly while your eyes saccade from note to note; flow aim is smooth in the hand, not in the eye. [158]

TAKE: FPS AIM COACHES

- **Read the target's movement instead of predicting it. Doesn't transfer.** The reverse applies in osu!: In an FPS the target is another player, so guessing ahead is punished and reading movement cues is the skill. osu! objects don't move and their timing is fixed and repeatable, which is why anticipation from rhythm and pattern structure is correct here: at AR 10 with Double Time an object is on screen for about 300 ms, near simple reaction time, so pure reaction cannot carry it. Borrow the discipline, not the rule. [36, 47, 99]
- **Isolate flicking, tracking, and target switching rather than "practising aim". Agrees with the chart.** This is the same argument as training feeders rather than umbrella skills, and it is why the diagnosis table in Ch. 27 splits aim into cursor control, precision, and flow. [1, 36]
- **Match your sensitivity to the game's movement range; too fast fatigues the wrist, too slow fatigues the arm. Partly supported, and it translates.** The osu! version is tablet area: a small area loads fingers and wrist, a large one loads the arm, and comfort tells you more than any recommended number (Ch. 16). Pointing research finds performance flat across a broad middle range with costs at the extremes. [36, 139]
- **Manage tension: hold it where it's needed and nowhere else. Agrees with khz and ferret_irl.** Nerves tighten the hand, and a tight hand misses targets that aren't moving. khz's lighter tapping to recover mid-stream, ferret_irl's grounding, and DigitalHypno's light grip are all tension management under other names. Aches, sharp pain, spasms, or cramping mean the technique is wrong, not that you need to push harder (Ch. 13). [1, 5, 36, 38]
- **Aim training transfers to the game it was built for. Doesn't transfer.** Tonehh's point stands: raw aim brought from shooters raises your ceiling without teaching you to read osu! patterns, and reading is where jump misses actually come from (Ch. 8). What crosses over is the training logic, not the aim. [10]

Slider aim: how sliders are scored

On the chart, slider aim draws on pattern processing and cursor control.

- A slider has a head (the start circle), ticks along the body, and a tail (the end). You only get a miss if you miss every part. Hitting at least half the parts gives a 100; fewer gives a 50. Sliders with no ticks give a 300, 100, or miss.
- Missing a tick breaks combo. Missing the tail doesn't; you just lose that one point of combo.
- The head is the only part that needs real precision. Once it's hit, the follow circle (the ring around the slider ball) is much larger than the head, and you only need to be inside it at the checkpoints. Between checkpoints you're free to drift.
- Ticks and reverse arrows check when the ball reaches them, but the tail checks slightly before the visual end. On fast sliders, aim a little short of the end; on fast sliders with no ticks, a straight line from the head to near the end can still earn a 300.
- Takeaway: hit the head cleanly, then follow the slider's overall direction instead of tracing its exact shape.

FACT CHECK

- **Confirmed.** A slider earns a 300 only when every part is hit, a 100 when at least half the parts are hit, and a 50 when at least one part is hit. [52]
- **Confirmed.** Ticks only check whether you're inside the follow circle and holding a key at that moment; leaving the ball between checkpoints carries no penalty. [54]
- **Confirmed.** In stable, the tail is checked 36 ms before the slider's end, which is why aiming short works on fast sliders. [55]
- **Adds detail.** In stable, slider heads are lenient on timing: a head hit anywhere inside the 50 window still counts toward a 300 for the slider. [46]
- **Lazer.** Lazer makes slider-head timing count toward accuracy but loosens tails: on very fast sliders you only need to be tracking somewhere in the final 36 ms. [55]

11. Reading Patterns by Name

Skills are what you train. Patterns are what you search for. A player who can say “I lose spaced streams and squares” can find practice maps in five minutes; a player who says “my aim is bad” cannot. The vocabulary below is the community's, stabilized across more than a decade of guides. [1, 66]

Pattern	What it is, and what it tests
Jump	Two objects placed further apart than the map's normal spacing. Tests aim speed and precision; cross-screen jumps test both at once
Square	Four jumps forming a square, in any rotation. Tests pattern processing more than aim, and chained squares are called tornado jumps
Triangle, star	Three or five objects in a closed shape. Same demand as squares, at different counts
Stream	Consecutive 1/4 objects. Tests finger control, tapping stamina, and flow aim (Ch. 12)
Spaced stream	A stream with wide spacing between notes, so it becomes an aim test at the same tap rate
Burst, triple	Short runs, often three to eight notes. The bridge between singletapping and streaming

Pattern	What it is, and what it tests
Fast singles	Spaced notes at borderline stream speed, too fast to tap comfortably with one finger but spaced like jumps
Stack	Objects on the same spot. A stream that doesn't move; pure tapping
Slider stream	Short sliders in place of stream notes. Rewards holding over tapping, and punishes mashing
Tech	Irregular rhythms, odd snaps (1/3, 1/6), and unusual slider shapes. Tests reading above everything else

Don't read a pattern as a shape

The oldest concrete reading method in osu! comes from that 2012 thread, and it still holds: **never look at a pattern as a whole**. Break it into lines of two notes and count them.

- **Two notes = one line.** Think “one-two”.
- **Triangle = a line plus a note.** Count “one-two, one”.
- **Square = two lines**, the second running opposite to the first. Hit the first note of each line and ignore the transition in between.
- **Star = “one-two, one-two, one”**, because three-note counting breaks down when the pattern cuts across the playfield.
- **Five notes or a pentagon = three, then a line.**

FACT CHECK

- **Research.** This is chunking, and it's the same limit that makes it necessary: working memory holds about four chunks at once, so a five-note shape read as five items overflows while the same shape read as “line, line, note” does not. [101]
- **Adds detail.** The method's author adds a trick worth stealing: count the pattern with the hitsounds rather than the visuals, so you know when it ends and can move your attention to the next one before it arrives. [66]

TAKE: JESSE1412'S THREAD

- **Squares are the pattern nearly everyone fails, and reading them as shapes is why. Agrees with the chart.** Pattern processing, in DigitalHypno's terms, and the fix is the same: split it into pieces you already know. [1, 66]
- **High AR is arguably the easiest to read once mastered, because nothing else is on screen. Supported.** At AR 10 objects are visible for 450 ms rather than 600 or 750, so fewer overlap. That is the same mechanism Tonehh warns about from the other side: comfort at high AR can hide an inability to read dense low-AR screens (Ch. 8). [15, 47]
- **Practicing Hard Rock as a newer player wrecks your sightreading, leaving you able to play only fast maps. Agrees with Tonehh.** Written in 2012, eight years before the video that makes the same argument, by a different player about a different symptom. [15, 66]
- **Pick your sensitivity or area and stop changing it, so muscle memory can form. Agrees with everyone since.** The same rule the 2026 top players give. [19, 40]
- **Mouse players should use low DPI. Contested, even in the thread.** One reply recommends staying under 800 and going lower; another top mouse player of the era recommends high DPI, under 2000, and says it helps more in the long run. Pointing research puts both inside the broad middle range where performance is flat, which is the honest answer: neither is wrong, and changing constantly is worse than either. [66, 139, 140]

Spinners

Spinners are the one hit object this book has otherwise ignored, and they are almost pure mechanics.

- **Hold the key down and spin in one direction** until the circle fills. Releasing the key, or lifting the pen, stops the spin being read at all.
- **Never reverse direction mid-spinner.** The game drops your spins per minute to zero and resets the orientation before it starts counting again, so a reversal costs more than a slow spin would have.
- **Keep spinning after it clears.** Extra rotations pay bonus score *and* restore health, which makes a spinner the cheapest health recovery in a map when you're close to dying.
- **The ceiling is 477 spins per minute**, which is also the rate the Auto mod spins at. Spun Out spins for you at 287, so if a map's spinners are the only thing failing you, that mod exists.
- Technique is unglamorous: a small, fast circle near the middle of the play area, driven by the wrist for a mouse or by short pen circles on a tablet. There is no research here and no top-player consensus worth quoting. [53]

FACT CHECK

- **Adds detail.** Spinner rotation still has to be completed under Relax, which automates tapping but not spinning. It is one of the few things that mod does not do for you. [53, 62]

Triples: which finger starts

A triple is three 1/4 notes, stacked or moving. There are two ways to tap them:

- **zxz, then xzx** — alternate which finger starts each triple. Harder to learn, but each finger rests between triples, so consecutive triples cost less.

- **zxz, zxz** — always start on the same finger. Easier to keep a rhythm, but your lead finger is effectively streaming while the other rests.

The first is the chart's finger-control test in miniature: can you start a pattern on either finger? Build it at speeds where it stays clean, then raise the tempo. [1, 66]

DRILL: NAME THE PATTERN, THEN CHUNK IT

- Open any map at your comfortable level in the editor, or watch it in a replay, and write down the five patterns that recur most.
- For each, decide its chunking before you play: line, line plus note, two opposing lines, three then a line.
- Play the map twice with that plan in mind. Squares and stars are where the difference shows first. [66, 101]

12. Streaming

A stream is a run of notes in 1/4 rhythm, twice as fast as 1/2 singletaps. On the chart it builds on finger control, tapping stamina, and flow aim. [1]

Notes in a row	Name
2	Double
3	Triple
4	Quad
5	Quint (five-note burst)
5 to 8	Burst
9 or more	Stream
Long enough that stamina dominates (often around 32 or more)	Deathstream

The subtle part is coordination. With flow aim, your cursor sits over each note only briefly, often for less time than the 300 window lasts. Time each tap to when the cursor is actually on the note, even if that means rushing or delaying slightly: a perfectly timed tap while the cursor is off the note is a miss, not just a lower judgment.

FACT CHECK: LOW BPM IS HARDER TO HIT

- **By the numbers.** Hit windows are fixed in milliseconds, but the gap between notes shrinks as BPM rises, so the *share* of each gap that counts as a 300 grows with speed. At OD 8 the 300 window is 64 ms wide: that's 51% of the gap between notes at 120 BPM, 77% at 180, and 102% at 240, where the window is wider than the gap itself. Slow streams demand real timing control; fast ones forgive it, which is why accuracy on slow streams is its own skill and why it exposes finger control that speed hides. [46, 67]
- **Adds detail.** Almost's accuracy ladder follows from that: train stream accuracy on simple spacing, raise OD one step at a time from 7 upward once you hold 99%, and pick a BPM floor you actually need rather than grinding 120 BPM streams you'll never play. [67]

FACT CHECK

- **Nuance.** The note-count cutoffs are community conventions, not official definitions. Tonehh puts streams at about 9 to 32 notes and BTMC calls 7 the borderline; everyone who uses them calls them vague. [3, 34, 73]
- **By the numbers.** $1/4$ notes arrive at $\text{BPM} \div 15$ per second: 12 per second at 180 BPM and 16 at 240. Alternating splits that load between two fingers; see the stream speed table in Ch. 35.
- **Research.** Keyboard studies put a single index finger's maximum tapping rate at roughly 5 to 7 taps per second. A 180 BPM stream needs 12 notes per second, so fast streams are close to impossible without splitting the work between fingers. [116]

“I can't stream 180” isn't a diagnosis

Asked by a viewer how to push stream consistency past 180 BPM, BTMC's first move is to refuse the question as stated: that sentence contains at least four variables, and which one is failing decides what you practice. [34]

Variable	What it changes
BPM	The tap rate: 12 notes per second at 180 BPM, 6 per finger
Object count	How long the run lasts, and so whether it tests control or stamina
Spacing	How much aim the stream needs. Stacked streams barely move the cursor; wide ones are an aim test at the same tap rate
Pattern complexity	Curves, direction changes, and shifts in spacing, which load reading and flow aim rather than tapping

The four trade against each other. The same run is playable with more objects and wider spacing if the BPM drops, and at higher BPM if the count and spacing drop. Trying to raise all four at once is how a player gets stuck on a number.

FACT CHECK

- **By the numbers.** At 180 BPM notes are 83 ms apart, so seven of them last about half a second and thirty last 2.4 seconds: identical tap rate, roughly five times the stamina demand.
- **By the numbers.** Spacing sets cursor speed, not tap speed. At 180 BPM, a stream spaced 50 osu!pixels apart needs an average cursor speed of about 600 osu!pixels per second; stacked at 10 pixels it needs 120. That's why “dense 180” and “spaced 180” are different skills. [100]

BTMC'S TAKE

- **Seven notes is where a burst becomes a stream. Nuance.** One more convention alongside the nine-note one above. The label matters less than his point behind it: the demand changes with the count.
- **Push one variable at a time from a base that works. Agrees with the chart.** If 180 BPM at seven objects is solid, try 175 at nine, or 185 to 190 at five with constant spacing. That's the challenge point framework applied to four dials instead of one, and it's the same start-from-the-bottom logic khz and Korilak use with BPM alone. [5, 31, 108]
- **The variety is what builds the underlying skills. Agrees with the chart.** He names finger control, stamina, and reading as the foundation streaming sits on, which is the chart's structure in his own words. [1]

TAKE: JESSE1412'S THREAD: STREAMS

- **Split streams into two kinds: long and fast. Agrees with BTMC.** A long stream is anything from about 20 to 200 notes; a fast stream is one that's hard to clear from the first note. They need different approaches, which is the object-count dial in Ch. 12 stated in 2012.
- **Tense and hook the fingers for fast streams; relax for long ones. Contested.** jesse1412 describes a claw-like hooked hand for speed and a relaxed hand for endurance. khz and ferret_irl argue the other way: tap lighter and ground the hand to relieve tension, and khz uses lighter tapping specifically to recover mid-stream. Nobody has tested these against each other; what they share is that both change technique deliberately rather than pushing harder. [5, 38, 66]
- **Spam is not streaming ability. Agrees with the chart.** One contributor dropped to 120 BPM to stream accurately on keyboard, then reached clean 180 BPM long streams about ten months later. That is khz's ladder and Korilak's five-month climb, from a third player in a different decade. [5, 31, 66]

How hard is a stream? Spacing, in order

Almost's streaming guide ranks stream difficulty by spacing rather than by BPM, which is the single most useful ordering in this book for choosing what to play next. Roughly easiest first: [67]

Step	Stream type	Note
1	Spacing of half a note or less	Barely moves the cursor: a tapping test (Ch. 12)
2	Curved streams	Flow aim proper begins here
3	Changing spacing within the stream	Acceleration, not just direction
4	Between half a note and one note of spacing	Aim load rises sharply
5	One note of spacing	Each note is its own small jump
6	Odd shapes: W-shaped, self-overlapping	Reading cost, not aim cost
7	More than one note of spacing	Spaced streams
8	A stream with jumps inside it, unbroken	Two skills at once
9	Irregular streams full of jumps	The top of the ladder

His recommendation is to spend months with 95% of your playtime inside the first two or three categories, at lower BPM, until misreading one genuinely surprises you. Everything above that is optional until then.

ALMOST'S TAKE

- **Read a stream by looking directly at each circle you have to hit, and let the cursor follow your eyes. Supported.** On singles you can snap your eyes to each note; on streams the eyes move more fluidly, but the target is still the individual circle rather than the shape. He adds one concrete tip: lock your eyes onto the very first circle of the stream. That is gaze anchoring, and it matches both Tonehh's individual-note reading and the eye-movement research in Ch. 10. [10, 67, 141]
- **Don't consciously manage hand tension. Contested, and the evidence cuts both ways.** ScarletStory, khz and ferret_irl all say to relax and tap lightly; Almost argues that tension is a natural response to a strenuous task, that it falls away on its own as the same BPM becomes easier, and that your subconscious regulates it better than deliberate control does. Both halves have support: fingertip force raises carpal tunnel pressure, so lighter really is safer, while consciously monitoring a well-learned movement is a known route to choking. The reconciliation the book offers: build technique and speed so less tension is needed, keep the light-touch habit in slow practice, and don't police your hand mid-run. [67, 106, 135]
- **When training top-end speed, keep some low-BPM streams in the session. Supported.** At your limit you alternate all-out with no conscious speed control, and players who only do that lose the ability to stream slower maps. That is the specific mechanism behind the "control before speed" rule every source here repeats. [67, 114]

How the skill grows

Every source that teaches streams uses the same ladder: clean bursts, then longer bursts, then short streams, long streams, and deathstreams. Tonehh places bursts from about 3 to 4 stars, longer bursts at high 4 stars, and first streams from high 4 to mid 5 stars. Three things have to come together along the way: tapping, flow aim, and stamina. [7, 8]

TONEHH'S TAKE

- **Your tapping must be automatic before you can work on flow aim. Supported.** Skill learning moves from effortful to automatic, and only automatic skills free your attention for something else; consciously monitoring a well-learned movement can even make it worse. The rank-80 player's roadmap puts the same step, tapping without thinking about it, just before stream aim. [8, 45, 106, 160]
- **For flow aim, trace the stream's shape, matching its speed changes and curves, or read it in chunks. Experience-based.** He found picturing the whole stream as a slider made him over-aim, and reading it a few notes at a time worked better, which fits the chunking research in Ch. 6. [8, 101]
- **Start around 160 to 180 BPM; lower BPM streams demand more finger control, not less. Experience-based.** khz (140 BPM) and Korilak (150 BPM) start lower but on long practice maps with a different goal: building control and stamina together. [7]
- **Deathstream practice maps are benchmarks, not a way to learn streams. Dated.** In his 2020 guide Tonehh said to avoid them for learning; in his later video with khz he conceded they work if you have the mindset to grind. [5, 7]
- **Don't use Relax to practice streams. Supported.** Relax taps for you, and its leniency lets a flick land notes a real tap would miss, so the one skill you most need to train isn't trained. [8, 62]
- **Keyboards aren't the problem. Supported.** Mechanical switches help consistency but aren't required, and polling rate only matters at extreme levels. The numbers are in Ch. 17. [7]

SCARLETSTORY'S TAKE

- **Freezing mid-stream is anticipatory muscle tension, not a speed problem. Agrees with khz and ferret_irl.** You see the stream coming, your body braces for a stressful event, your fingers stiffen, one of them holds a key half a second too long, and you speed up to compensate and mash. That chain explains why the freeze usually happens on the stream you were dreading rather than the harder one you didn't notice (Ch. 14). [5, 38, 72]
- **Press the keys lightly; hard presses cost stamina and control. Supported.** His test is to type as hard as you can, then as lightly as you can, and compare how long each lasts. khz uses lighter tapping to recover mid-stream, and fingertip force measurably raises carpal tunnel pressure, so the light version is easier on the hand as well as faster. [5, 72, 135]
- **The fix is slower streams, not harder ones. Agrees with every stream route in this book.** Low BPM teaches how your fingers hand off to each other, which is what stops the lock-up at high BPM (Ch. 31).

DRILL: ONE KEY, TWO FINGERS (SCARLETSTORY)

- Bind one key to something wide, a spacebar or shift, and stream a slow section using both fingers on that single key.
- Because the key won't register a second press until the first finger lifts, sloppy overlap simply doesn't sound. You can hear exactly where your hand-off fails.
- Treat it as a diagnostic and a feel exercise, not a playstyle. Return to two keys once the transition feels clean. [72]

TAKE: RANK-80 PLAYER

- **Don't play stream maps at 4 stars; first learn to alternate, and to stop and restart bursts. Agrees with the chart.** [45]
- **A roadmap by rank: alternation in bursts at 6 digits; long runs of 50 to 90 notes with good UR by about 30K to 40K; tapping without thinking at 4 digits; then stream aim, where most players move too smoothly and should follow each curve sharply; finally speed (Double Time at 260 BPM and up) and high circle size. Experience-based.** One top player's path, and rank thresholds shift with every pp rework. [45]

Four complete stream routes, bursts up the star ratings, khz's deathstream ladder, Korilak's sets, and the We Luv Lama cuts, are laid out as drills in Ch. 31.

DRILL: ONE VARIABLE, ONE SESSION

- Write your current clean stream as three numbers: BPM, note count, spacing (Ch. 12).
- This session, raise exactly one and hold the other two: 5 BPM up with a shorter run, or two more notes at 5 BPM lower, or the same run with wider spacing.
- Full combo it, then stop. Next session, push a different number. The full routes are in Ch. 31. [34, 108]

13. Stamina and Speed

Endurance and technique

- **Endurance** is holding up under sustained strain, whether physical (tapping and aim stamina) or mental (nerve control).
- **Technique efficiency** means cutting unnecessary movement in tapping and aim to reduce strain. There's no universally correct style. Trying other players' styles is a good way to experiment, but adapt them rather than copying one player wholesale.
- Top players contradict each other on technique, and often in public: one of the best tappers in the game argues against thinking of tapping as forearm movement, while the widely shared post he is arguing with says the opposite and has its own adherents. [38] Treat conflicting technique advice as evidence rather than law. Test one change at a time (Ch. 28), give it long enough to adapt, keep the movement comfortable, and stop if anything hurts. A method that suits one player's hand may not transfer to yours.
- **Tapping stamina** is how long your tapping holds up. It's different from speed: one is a short burst of output, the other is sustaining it. Train it like exercise: warm up, push gradually, and practice regularly without maxing out every session. A burning feeling is normal; sharp pain means stop. DigitalHypno points to RyuK's and Spare's videos for more depth.
- **Aim stamina** is the same idea applied to aim. A light grip on the pen or mouse helps, and energy spent struggling to read leaves less for tapping and aim, so better reading speed also helps stamina.

FACT CHECK

- **Real-world data.** In a survey of 65 collegiate esports players who practiced 3 to 10 hours a day, 36% reported wrist pain, 32% hand pain, and 56% eye fatigue, yet only 2% had sought medical attention. Pain that persists deserves a professional's attention, not more practice. [163]
- **Research.** A meta-analysis of motor-learning studies found that cramming practice together hurts both performance and learning compared with spreading it out. [103]
- **Research.** In a classic finger-tapping study, a night of sleep made people about 20% faster on a practiced key sequence with no loss of accuracy, while the same time awake produced about 2%. Part of your improvement happens overnight. [102]
- **Research.** Training all the way to failure isn't needed for strength or muscle gains, and practicing a motor skill while fatigued impaired learning in a 2019 study, with effects lasting into later sessions. [131, 132]

TONEHH'S TAKE

- **Play consistently, but take breaks. Supported.** Keep accumulating hours over weeks and months rather than cramming, and stop when your fingers, hand, or eyes hurt. The evidence above backs both halves. [4]

KORILAK'S TAKE

- **Burning in your forearms and fingers is what you want; push beyond your limit. Not supported.** Failure isn't required for gains and fatigue impairs skill learning. To his credit, he also says to stop at any irregular pain in the arm, wrist, or fingers because of RSI risk, which he experienced as a drummer. [31, 131, 132]
- **Five back-to-back runs, a five-minute break, three sets. Nuance.** It's a stamina protocol and works as one; for learning, spacing beats massing, so keep precise technique work for when you're fresh. [31, 103]
- **Don't play anything fast right after the routine. Supported.** Fatigued play risks rehearsing sloppy movement. [132]
- **Holding 160 BPM for two minutes makes 170 to 180 BPM bursts cleaner. Partly supported.** Related skills share components, but the chart keeps stamina and speed separate, and each BPM step asks more of each finger. [31]
- **Rare "infinite stamina" days are worth exploiting. Experience-based.** BTMC links them to a relaxed technique that lets you recover mid-stream, the same thing khz describes as tapping lighter. [5, 32]

FERRET_IRL'S TAKE

- **Strain and pain are different sensations, and you should learn which is which. Agrees with khz.** Strain burns; pain aches or stabs, and anything like pins and needles means stop immediately. The same line every source in this book draws, stated in the clearest terms. [5, 38]
- **Don't rest your wrist on a hard desk, and don't compress your forearm against one. Supported.** A wrist rest or a folded towel spreads the load, and resting on the elbow instead of the forearm keeps pressure off the muscles that actually move your fingers. Carpal tunnel pressure rises with both wrist extension and fingertip force, so reducing sharp local pressure at the wrist is sound. [133, 134, 135]
- **Changing your position may make you temporarily worse. Supported.** Performance dips while a movement is being relearned, which the challenge point framework predicts and which is not a reason to revert on day one. [108]

Speed

- **Speed** is the umbrella for doing things quickly: reading, tapping, and aim speed. Technique efficiency helps, but speed still has to be built gradually, and sleep, diet, and general health all affect it.
- **Tapping speed** is simply tapping fast. Train it like strength: regular practice with gradual increases.
- **Aim speed** is how fast you can physically move the cursor. It's usually less of a bottleneck than reading or tapping speed, and better cursor control improves it indirectly.
- **Reading speed** is covered in Ch. 8.

BTMC'S TAKE

- **At high AR, the real Double Time killer is preparation time, not stamina. Partly supported.** With less time to see a burst coming, he sets up his tapping technique worse and loses speed; at lower AR the same maps get much easier. The numbers back the squeeze: AR 10 + DT leaves 300 ms, close to simple reaction time. His advice to push higher-BPM bursts over mid-BPM stamina for DT is experience-based. [32, 47, 99]

TAKE: CONSISTENCY VIDEO

- **To get faster, play burst-heavy maps about 15 BPM above your comfortable speed. Agrees with khz.** khz climbs in 10 BPM steps; both are gradual overload. [5, 42]

TAKE: R/OSUGAME GUIDE

- **Split stream training in two: short fast bursts for speed, long streams for stamina. Agrees with BTMC and khz.** It's the same insight BTMC states as variables: BPM and object count are separate dials, so train them separately (Ch. 12). [5, 34, 39]
- **On stamina maps, rest briefly and then beat your own combo and accuracy. Agrees with the top players.** The same beat-your-locals method they describe a decade later, and the same measurement Korilak used with his stream sets. [31, 40]
- **Avoid maps you can pass by mashing, and don't add approach rate you can't read while training speed. Supported.** Mashing trains mashing (Ch. 6), and if reading is the limiter then the map is no longer testing speed. BTMC makes the same point about high-AR Double Time from the other direction. [34, 111]

DRILL: FIND THE EDGE OF YOUR STAMINA

- Pick a long stream map about 10 BPM below your comfortable speed and play it to the end, noting where your accuracy collapses rather than where you fail.
- Rest five minutes. Play it again and compare the collapse point.
- If the collapse comes earlier the second time, you are training fatigue, not stamina: stop for the day. Burning is fine; sharp pain ends the session (Ch. 20). [5, 132]

14. Nerves and Pressure

Nerve control is staying steady under pressure, built from focus and endurance. The core idea, which DigitalHypno credits to a tweet by Bubbleman, is that nerves appear when your attention moves from the task in front of you to the outcome, like realizing mid-run that you're on pace for a great score. [1]

- **Reduce the nerves:** go in with no expectations, or mentally downplay the score you're holding. Hiding the HUD with Shift+Tab removes combo, accuracy, and time remaining (even during breaks), leaving less to fixate on.
- **Build tolerance:** idke's approach is to retry immediately after a nervous run without cooling down, so you get used to playing while shaky.
- **Build familiarity:** Tonehh's approach is to play the target map often enough that a good run feels like somewhere you've been before. [8]

FACT CHECK

- **Research.** Practicing under pressure works. Expert basketball players who practiced free throws under induced anxiety for five weeks, and expert dart players who practiced high on a climbing wall, held their performance under pressure, while those who trained normally declined. Even mild anxiety during practice protected novices later. This is the lab version of idke's method. [104, 105]
- **Nuance.** For well-learned skills, consciously monitoring your own movements can itself cause choking. "Focus on the process" works best as staying absorbed in the map, not micromanaging your fingers. [106]
- **Research.** Combining high anxiety with a negative instruction (the equivalent of "don't miss") significantly hurt dart-throwing accuracy. Phrase self-talk as what to do. [107]
- **Confirmed.** In stable, Shift+Tab toggles the in-game interface, while Tab alone toggles the scoreboard. [58]

STONEHH'S TAKE

- **You can't switch nerves off; top players get nervous too. Supported.** Nerves are a normal stress response, and the research above shows that training with them beats trying to avoid them. [8, 104]
- **If you miss mid-map, finish it anyway, so you learn the rest of the map. Experience-based.** He credits the habit to the top player 8K.
- **Drill hard sections with practice difficulties cut from the map in the editor. Supported.** Maps are sequences, and practicing a sequence in segments that keep aim and tapping together is the kind of part practice the meta-analysis supports. [143]
- **Build consistency by extending map length gradually, adding about 30 seconds at a time. Supported.** It's gradual overload, the challenge point idea applied to length. [108]
- **Stop overthinking and let flow happen. Supported.** Skills learned without explicit rules held up better under stress in golf-putting studies, and flow, full absorption with fading self-consciousness, is linked to better performance. [4, 127, 129]

Nerves are the one topic Korilak's otherwise thorough guide never covers, a gap BTMC points out at the end of his read-through. [32]

DRILL: PRACTISE THE RUN, NOT THE MAP

- Choose a map you can pass but tense up on. Hide the HUD with Shift+Tab so combo and accuracy are invisible.
- Play it five times without checking the score between attempts, finishing every run even after a miss.
- Then play once with the HUD on. The gap between the two tells you how much of the problem is nerves rather than skill (Ch. 14). [8, 58, 104]

15. Mods

General rule: ease in with simpler maps before stepping up, and never add a mod to make a map easier to read (Ch. 8).

- **Hidden:** circles fade out instead of showing approach circles, so rhythm matters more, though some players find the cleaner screen easier. Learn it (or learn nomod, if you only play Hidden) on low-star maps first, and at lower AR let your cursor trail further behind than feels natural. Treat it as its own reading style rather than a harder version of nomod.
- **Easy:** halves CS, AR, OD, and HP. The big AR drop crowds the screen, so chunking patterns becomes essential, and bright, distinct combo colors help. Useful for pattern processing, but not required.
- **Double Time:** runs the game clock at 1.5×, not 2×, raising the demand on reading, tapping, and aim speed. Which one dominates depends on the map.
- **Hard Rock:** raises CS, AR, OD, and HP. The real demands are precision, reading speed, and accuracy. Find which is weakest and train each separately before combining them, since a weakness in one can pass for another (for example, "bad accuracy" that's really discomfort with the AR). Once two feel fine, use Hard Rock itself to train the third.
- **No Fail, Relax, Autopilot:** No Fail lets you finish maps above your level; Relax taps for you and Autopilot aims for you, so neither trains the skill it replaces (Ch. 7, Ch. 12).

FACT CHECK

- **Confirmed.** Easy halves CS, AR, OD, and HP. Double Time speeds play up by 50% without changing the listed AR or OD, which shrinks hit windows and visible time by a third; Half Time does the reverse. [46, 47, 48]
- **Adds detail.** Hard Rock's exact changes are $CS \times 1.3$ and AR, OD, and $HP \times 1.4$, each capped at 10, and it mirrors the map top to bottom, which can break patterns you had memorized. [46, 47, 48, 49]
- **Confirmed.** The wiki notes that top players often consider Hidden the easiest difficulty-increasing mod, because objects fade on a consistent schedule and you can time hits off the fade itself. [50]
- **Research.** People synchronize much better with moving visual cues than with flashes. Approach circles are a moving cue; Hidden takes it away, which is why rhythm carries more weight. [95]
- **Confirmed.** In stable, Hidden and Hard Rock multiply score by 1.06 and Double Time by 1.12; Easy and No Fail halve it. Lazer uses different multipliers. [62]

TONEHH'S TAKE

- **Learn Hidden once mid to high 4 stars are comfortable, and Hard Rock or Double Time once you're comfortable across a variety of mid 5 star maps. Experience-based.** He calls that point the sweet spot: you've finished the game's long tutorial and can branch out without bottlenecking yourself. Korilak waited even longer, until about 4,500 pp. [13, 31]
- **Hidden is the one mod you can one-trick without paying for it later. Partly supported.** It changes how the map is shown, not its difficulty settings, and the wiki notes top players often call it the easiest difficulty mod. But it's a distinct reading style, and nomod still dominates tournaments. [13, 50]
- **A Hard Rock one-trick only learns AR 10: any map from AR 7.2 up becomes AR 10. Confirmed.** The arithmetic holds ($7.2 \times 1.4 = 10.08$, capped at 10); the reading risk is experience-based. [13, 49]
- **Learn Hard Rock about one star below your comfortable nomod range, where accuracy, not aim, is the problem to solve. Experience-based.** He says players ranked around 2,000 to 3,000 fixed their Hard Rock accuracy this way.
- **Start Double Time on DT farm maps that are high 3 stars without mods, about low 5 with DT. Experience-based.** He means maps built around basic bursts and jumps above 200 BPM, not the jump-only farm maps of Ch. 32.

KORILAK'S TAKE

- **Learn Hard Rock before Double Time, so AR 8 maps with DT (effectively AR 9.67) are easier than the AR 10 you already know. Confirmed.** AR 8's 750 ms of visibility becomes 500 ms with DT, which sits two-thirds of the way from AR 9 to AR 10. [31, 47]
- **Double Time is the best way to get faster. Experience-based.** Everything becomes high BPM and high AR, and you're forced to keep up.
- **Both DT and HR improve overall skill; his nomod got better after he learned mods. Experience-based.** It agrees with Tonehh, whose speed stalled until he trained streams, stamina, and finger control (Ch. 22). [11]
- **Hidden adds 8% pp. Dated.** pp bonuses have been reworked many times since 2016. [59, 79]
- **No Fail costs 10% of your pp. Dated.** That was true until January 2021. Now each miss on a No Fail play trims pp by 2%, capped at 10%, so a No Fail full combo loses nothing. BTMC's comment that No Fail no longer affects pp is right only for full combos. [32, 60, 74]

TAKE: TOP PLAYERS

- **Relax is a poor way to improve, even though a few strong players used it. Supported.** Relax taps for you, so half the game goes untrained, and its leniency lets a cursor reach a circle by any route; a nomod player has to be on the note at the moment they tap. Their conclusion, that players who improved with it would have improved more without it, is experience-based, but the mechanism is straightforward. [40, 62, 143]
- **It matters less what you play than how you play it. Agrees with the chart.** Their phrasing for what the chart calls deliberate practice, and the reason a No Fail score above your level isn't automatically a waste: one of them keeps a speed collection full of D and C rank No Fail attempts, and the point is that each attempt improves on the last. Setting one such score and never returning is what teaches nothing. [40]
- **A C rank on a map far above you, chased for validation, is different. Supported.** They compare it to loading a bar you can't lift with bad form: nothing is trained, and the same player usually can't S rank something two stars easier. That's the challenge point argument for practising just above your level rather than far above it. [108]

DRILL: ISOLATE THE MOD BEFORE YOU USE IT

- Pick the mod you want to learn, then train its ingredients separately on nomod maps or with lazer's difficulty adjustment: higher CS for Hard Rock's circles, higher OD for its timing, higher AR for its reading; higher BPM for Double Time's speed.
- Whichever ingredient fails first is the one to train. Only then put the mod on, starting about one star below your comfortable nomod range.
- Learn one reading style at a time: nomod players learn Hard Rock without Hidden (Ch. 31). [1, 13, 31, 56]

Setup

16. Tablet Technique: Grip, Area, Hover or Drag

Tonehh's Tablet Beginners series makes one argument three times: grip, area, and hover versus drag are preferences, and comfort decides. His later video on tablet problems adds the part beginners don't expect: finding and keeping a comfortable setup is a struggle for everyone, including top players. [18, 19, 20, 21]

Grip

- Common grips: the **dynamic tripod** (thumb, index, and middle finger), the **lateral tripod** (thumb higher, pen resting on the middle finger), their four-finger versions, the **dynamic and lateral quadrupods**, and the **thumb grasp**, with the thumb wrapped around the pen. Top players also win with unusual grips, including a five-finger grasp and one held very low at a steep angle.
- If your normal writing grip hurts, try holding the pen higher.
- To test a grip, draw circles and squares and ask yourself honestly: can I point where I mean to, and could I get used to this?

TONEHH'S TAKE

- **Grip doesn't limit your aim as long as it's comfortable. Supported.** In a study of 120 children, the four mature pencil grasps, the same four he describes, produced equal handwriting speed and legibility, and a follow-up found the same after a 10-minute writing task. Handwriting isn't osu!, but both are fine pen control. [18, 137, 138]
- **Don't copy a top player's grip just because they're good. Supported.** Same evidence: no mature grip has a built-in advantage.

Area

- The area is the part of the tablet mapped to your screen. In 2020, top players ranged from about 55 mm wide to full area and beyond, and one well-known player used about 216 mm. Small and large areas both reach the top.
- **Starting point:** about 80 mm wide at the screen's aspect ratio. If you can't reach circles, make it smaller; if you over-aim, make it bigger. Change it about 5 mm at a time, then fine-tune in much smaller steps once it feels controllable.
- **Horizontal trouble:** untick "force aspect ratio" and shorten the width, which cuts the distance for sideways jumps. Many top players do this.
- **Once it's comfortable, stop making big changes.** And don't expect switching from mouse to tablet to improve your aim right away.

TONEHH'S TAKE

- **Area is preference; no size limits your aim. Supported.** Pointing research finds performance fairly flat across a broad middle range of control-display gain, the ratio of cursor movement to hand movement, with costs at the extremes: very high gain (a tiny area) hurts accuracy on small targets, and very low gain (a huge area) means more movement. Those are mouse and touchpad studies. [19, 139, 140]
- **Larger areas give more precision but cost more movement, and stamina, on fast maps. Partly supported.** Same research; the stamina part is experience-based.
- **The pro areas he lists. Dated.** It's a 2020 snapshot, and his own later video shows several of those players changing area since. [21]

VISCOSE'S TAKE: THE COUNTERARGUMENT FROM FPS

- **"Muscle memory" is the wrong model, so changing your sensitivity doesn't destroy your aim. Partly supported.** His case: aim is adaptable fine motor control, not a memorized force or distance, which is why top players switch sensitivities and still hit shots, and why mousepad wear and humidity don't wreck everyone's aim. The underlying point is sound, since what players call muscle memory is motor learning, and adaptation to a changed mapping is fast and well documented. The osu! caveat is real, though: a tablet in absolute mode is a fixed map from tablet position to screen position, not a rate, so an area change moves every target rather than scaling your movement. Mouse players sit closer to the FPS case than tablet players do. [35]
- **Vary your settings during training, keep them fixed when the score counts. Supported, with a limit.** In the study he cites, a second practice session with subtly altered force requirements nearly doubled the learning gains compared with repeating the identical task, and skipping that second session was about 25% worse. The authors are explicit that the change must be small: make the altered task too different and the benefit disappears. So this supports deliberate small variation between sessions, not the setup thrashing every other source in this book warns about. [19, 40, 159]
- **A "suboptimal" setting can isolate a skill. Experience-based, and worth testing.** His example is using a low sensitivity on a flick-heavy task to train the arm, or a high one on a precision task to train the wrist. The osu! translation is in Ch. 28. It fits the variable-practice literature, though no one has tried it in this game. [35, 118]
- **Don't change anything right after a bad play. Agrees with everyone.** Tilt-changing your setup replaces a skill problem with a settings problem, and he notes that a setup feeling "off" is usually a symptom of a weak area rather than a cause.

SCARLETSTORY'S TAKE: AND ITS CRITICS

- **Pick a setting and stick with it; changing area or DPI weekly puts you back at square one. Agrees with everyone since 2012.** You end up reteaching yourself which movement produces which cursor distance. [72]
- **The reply worth reading is the disagreement. Contested.** A top mouse player of the era answered that a setting which suits you at two months may not suit you at a year, because your physical ability changes, and that you should settle once your aiming hand is fully trained rather than on day one. The same reply argues that comfort isn't the same as effectiveness: several top players hold pen or mouse in ways nobody would call natural, and made them natural through practice. Set against the modern advice in Ch. 28, the resolution is about *when*: experiment deliberately and early, settle once it works, and never thrash. [40, 72, 159]
- **A tablet doesn't make you better; it needs its own muscle memory from scratch. Agrees with Tonehh.** Written a decade before the same warning in Ch. 17. [19, 72]

Hover, drag, or both

Style	Strengths	Drawbacks
Drag (pen touches the surface)	Friction steadies the cursor and makes aim snappier; a consistent pen height	Wears the surface (a cover fixes it, at the cost of a new texture); big jumps can feel slower at first
Hover (pen just above the surface)	Freedom of movement for big jumps; no wear	Shakier without friction; you have to keep your pen height consistent (Cookiezi rests his pinky on the tablet for this)
Both	Hover between patterns, drag on bursts and stacks, or tap the pen onto circles for snap	Needs pen clicks disabled if you tap-aim

TONEHH'S TAKE

- **Choosing is 99% comfort; every drawback can be trained around. Experience-based.** Top players succeed with each style. [20]

When the setup fights you

- Even a top player with 3,600 hours posted about still searching for a comfortable grip. Struggling is normal.
- A comfortable grip can be “forgotten” overnight. Take a photo of your grip when it feels right so you can find it again.
- Small fixes players use: grip tape or tennis overgrip (or even toilet paper) on the pen, a cloth under the wrist, and tape to hold the tablet in place.
- Preferences change over years. Several all-time greats changed grip or area after setting records. Changing because you're uncomfortable is fine; changing every week isn't.
- Mouse drift is the main reason players switch to tablet, but mouse players reach the top too, and some top players have switched back to mouse.

TONEHH'S TAKE

- **Pick the most comfortable option and stick with it despite small flaws. Experience-based.** List the pros and cons of each option you try; everyone's hands are different, so the trade-offs are too. [21]

TAKE: TOP PLAYERS

- **Tablet versus mouse doesn't matter. Agrees with Tonehh.** All three players interviewed called it pure preference, one of them plays mouse at the very top, and they put the top ten at roughly a six to four split at the time. Each has its own failure mode: a pen that slips against a mouse that drifts. Their rank figures are a snapshot, not a constant. [21, 40]
- **Changing settings constantly is worse than any setting you might land on. Agrees with Tonehh.** One of them copied a top player's area years ago and has moved about 5 mm since. The failure they describe is never giving a configuration long enough to show whether it works, which applies equally to tablet area, skins, and actuation points on a Hall effect keyboard (Ch. 17). Pick something reasonable, then leave it alone. [19, 40]

TAKE: CONSISTENCY VIDEO

- **Mouse players need room: a cramped space confines your arm and makes drift worse. Experience-based.** [42]

17. Hardware and Accessories

Hardware doesn't play the game for you. Korilak says you need neither tablet nor mechanical keyboard through the 100K to 300K ranks, Tonehh points to top scores set on laptop keys, and switching to a tablet doesn't improve aim by itself. What gear buys is comfort and consistency: a setup that feels the same every session and doesn't hurt. Buy in that order. [7, 19, 31]

Tablets

- **The community standards.** The Wacom CTL-472 (small, cheap, still the default recommendation) and the older CTL-480 and CTH-480 are the two families you'll see most in osu!. BTMC won the 2020 World Cup on a 480, and the 472 is the model most often flashed with custom firmware today. The CTL-4100 line is the 472's successor, and XP-PEN, Huion, and Gaomon sell cheaper alternatives of varying quality. [22, 32, 33]
- **What matters when buying:** active area size (a bigger area gives finer control per screen pixel but asks for more arm movement), report rate, driver support, and whether the tablet applies smoothing you can't switch off.
- **What doesn't:** pressure levels, tilt, and extra buttons. osu! uses cursor position and nothing else.
- **Firmware compatibility** is now worth checking before you buy: the community firmware sites currently list the PTK-470, PTK-670, PTK-870, CTL-472, CTL-672, CTH-480, and CTL-4110. See Ch. 18, including the risks. [86, 87]

Pens, nibs, and grip tape

- The pen matters far less than the tablet, but a worn nib drags and skips; keep spares and swap them when they flatten.
- **Grip tape is the cheapest upgrade in the game.** Players wrap pens in tennis or badminton overgrip, self-adhesive silicone or electrical tape, or, as Tonehh says he did in a pinch, toilet paper under tape. The goal is a grip that doesn't slip when your hand warms up and doesn't need to be squeezed. [21]
- Tape changes the pen's diameter and balance, so treat it like an area change: expect a short adjustment period, and don't re-wrap it every week.
- A cloth under the wrist, and tape or a mat to stop the tablet sliding, solve two more of the small annoyances that quietly cost consistency.
- **Sweaty hands** ruin grip before they ruin aim. Wash your hands and clean the pen and tablet: skin oil is half the problem. If your hands sweat heavily no matter what, that can be palmar hyperhidrosis, a recognized medical condition with a real treatment ladder that runs from clinical-strength antiperspirants through tap-water iontophoresis to prescription options. It's worth a clinician rather than another grip tape. [38, 161, 162]

Keyboards, keypads, and Hall effect switches

- **Mechanical switches** make key presses more consistent than a mushy membrane, but they aren't required. What is required is a keyboard that doesn't double-press or drop inputs.
- **Hall effect (magnetic) switches** sense a magnet's position instead of closing a contact. That allows an adjustable actuation point (commonly 0.1 to 4.0 mm, and as little as 0.05 mm on some rhythm-game pads) and **rapid trigger**, where the key resets the instant it starts travelling back up instead of at a fixed point. Vendors credit Wooting with popularizing rapid trigger. [89]
- **osu! keypads** are two- to four-key boards built around these switches, often with a small screen showing key travel and press counts. The best known is the SayoDevice O3C: magnetic switches, rapid trigger, actuation adjustable in 0.05 mm steps, and an advertised 8,000 Hz polling rate. [88]
- **What this buys you:** less travel per tap and a shorter reset, so your fingers move less at high BPM, and actuation you can tune to your tapping style (shallow for light tappers, deeper if you rest your fingers on the keys). A dedicated pad also lets you place the keys wherever your hand actually sits.
- **What it doesn't buy:** reading, aim, stamina, or finger control. It also invites its own mistake: set the actuation too shallow and resting fingers trigger stray taps, which looks exactly like poor finger control.

FACT CHECK

- **By the numbers.** A keyboard polled at 125 Hz, the old USB default, adds 4 ms of delay on average (up to 8 ms) and about 2.3 ms of random timing spread; for a player at UR 100 (10 ms spread) that works out to about UR 103. At 1,000 Hz the added spread is 0.3 ms, and at 8,000 Hz the average delay is 0.06 ms against 0.5 ms at 1,000. Polling is worth fixing once; after that it isn't your bottleneck. [7]
- **Nuance.** Rapid trigger matters most in games where you re-press a key before it resets. Alternating at 240 BPM gives each finger about 125 ms per press-and-release cycle, far longer than any switch needs, so the gain in osu! comes from shorter travel and tuning, not from winning a race against the switch.
- **Real-world data.** The polling and actuation figures above are manufacturer specifications, not independent measurements, and no published study has tested Hall effect switches in a rhythm game. [88, 89]

STONEHH'S TAKE

- **Keyboards aren't what's holding you back. Supported.** He points to a top score set on laptop keys; Korilak, who credits his mechanical keyboard for his stream technique, still says you don't need one below the top 100K. The arithmetic above agrees: switch upgrades change milliseconds, while the gap between players is tens of milliseconds wide. [7, 31]

TAKE: R/OSUGAME GUIDE: DODEFMAW'S TIP

- **Keep your fingers low: tapping speed depends on both finger speed and travel distance, and distance is the easier one to cut. Supported.** Sound mechanically, and it's the same lever a Hall effect keyboard pulls in hardware, since a shallower actuation point means less travel per press. The difference is that you can train the technique for free. [39, 89]
- **Pair index and ring finger, because their linked tendons create a pivot that recycles one finger's return into the other's press. Not supported.** The anatomy points the other way: measured independence indices run about 0.81 for the index finger, 0.53 for the middle, and 0.48 for the ring, and the classic study found the middle and ring fingers the least individuated of all. Pairing index with ring puts your least controllable finger into the alternation. Individuation is trainable, as pianists show, so players who prefer that pairing aren't doing something impossible, just something the anatomy doesn't favor. [152, 153, 154]
- **Arm swing cuts the effort of running by about 20%, so limbs can feed each other energy. Not supported.** The measurement is 3% when runners hold their arms behind their backs, 9% across the chest, and 13% on the head, and the benefit comes from counterbalancing torso rotation rather than from passing energy between limbs. The author flagged the analogy as untested himself. [155]

Buying gear is the easiest way to feel like you're improving without improving. If a purchase is a reaction to a plateau rather than to a real discomfort, see Ch. 23 first.

18. Drivers, Firmware, and Polling

Drivers

- **OpenTabletDriver** is the current open-source, cross-platform driver most osu! players use. It replaced **Hawku's TabletDriver**, whose last release was v0.2.3. [84, 85]
- **Lazer** has tablet area adjustment built in; stable doesn't. [56]

STONEHH'S TAKE

- **The 2020 driver fix and buying advice. Dated.** His fix for a mouse that froze with drivers open edited a setting in Hawku's configuration, which OpenTabletDriver has replaced. He also warned in 2020 that a later revision of the XP-Pen G640 had a lower report rate (about 200 Hz instead of 266) and built-in smoothing, then reported the original revision back in production. Neither claim was re-checked for this book; check current reviews before buying. [22]

Custom firmware (2026)

In 2026, community developers released custom firmware that raises the report rate of several Wacom tablets, reportedly with AI help in the reverse engineering. BTMC flashed four tablets on stream. Using

OpenTabletDriver's debugger, he measured a stock CTL-472 at 133 Hz and flashed it to 200 Hz, took a CTL-4100 from 133 to 390 Hz, and pushed a CTH-480 to 700 Hz (position only, with no pen tip or buttons). He also took his Intuos Pro, rated at 300 Hz, to 1,000 Hz with pen, pressure, and buttons all working. [33]

- **Two sites.** Shaveet's site lists firmware for the PTK-470, PTK-670, PTK-870, CTL-472, and CTL-672, plus toggles that switch off the tablet's own smoothing without flashing anything. The video description lists a second site covering the CTL-472, CTH-480, and CTL-4110. [86, 87]
- **Trade-offs.** Higher rates can cost pen pressure, side buttons, or tip clicks; edges may report slower than the center (about 450 Hz on one 1,000 Hz build); hover height can change; and faster reporting lets in more noise, so smoothing may need to be added back in the driver.
- **Risk.** Flashing firmware can void a warranty or brick the tablet. The developers reported one brick in about 59,000 flashes at the time; the sites describe backup and recovery steps. Follow the site's instructions exactly, and don't flash a model it doesn't list.

FACT CHECK

- **By the numbers.** Polling adds, on average, half the report interval of delay. That's 3.8 ms at 133 Hz, 2.5 at 200, 1.3 at 390, 0.7 at 700, and 0.5 at 1,000. Going from 133 to 1,000 Hz saves about 3.3 ms on average and cuts the worst case from 7.5 ms to 1. See the polling table in Ch. 35.
- **By the numbers.** A 480 Hz monitor draws a new frame every 2.1 ms. The average gap between 700 and 1,000 Hz is 0.2 ms, far below what the screen can show, which fits BTMC finding the two indistinguishable on his 480 Hz display.
- **Nuance.** The developer says switching off the tablet's built-in smoothing saves about 8.3 ms, more than the entire polling gain. It wasn't independently measured here, but it suggests the smoothing toggle may matter more than the headline Hz. [33]
- **Confirmed.** Lazer handles input on its own thread at about 1,000 Hz, separate from drawing, and caps its "Basically Unlimited" frame limiter at 1,000 Hz. [80, 81]

BTMC'S TAKE

- **This changes osu! forever; tablets are now endgame. Partly supported.** The gain from a 133 Hz stock tablet is real, but the arithmetic shows diminishing returns past a few hundred Hz; the bigger win may be removing firmware smoothing. [33]
- **He could see and feel the difference from 133 to 200 Hz and beyond. Experience-based.** One player, not blinded, and he flagged a warm-up bias in his own comparison himself.
- **He plans to keep building an osu!-specific tablet. Experience-based.** The software layer is largely solved by OpenTabletDriver and firmware is moving fast, which leaves hardware as the unexplored layer.

19. Audio, Display, and Skin

Audio

- Use wired, low-latency audio and make hitsounds louder than the music. Tonehh uses 100% effects and 70% music, and khz recommends turning volume up in general. Keep some music: you're playing to a song, not a metronome. [5, 8]

FACT CHECK

- **Real-world data.** Measured Bluetooth headphone latency is about 170 ms with the common SBC and aptX codecs (about 34 ms with aptX Low Latency). That's several times wider than the whole 300 window at high OD (± 26 ms at OD 9), so wired headphones are the simple fix. [46, 164]

TAKE: COMMUNITY FORUMS

- **Sit like a pianist: back straight, and let the grip follow from that. Experience-based.** A forum guide that predates every video in this book puts posture first, before settings and skins, on the grounds that it decides how everything else feels. Nothing has measured it in *osu!*, but it costs nothing and the ergonomics evidence on wrist and forearm loading points the same way (Ch. 13). [70, 133]
- **Effects volume well above music, and don't chase a perfectly centred hit error bar until rhythm improvements have stalled. Agrees with Tonehh.** Same audio setup, and a sensible order of operations for offset (Ch. 7). [12, 70]

Display and frame rate

- **See the game first.** Wear your glasses if you need them, raise background dim, and turn off storyboards if they distract you. [42]
- In *lazer*, input runs separately from drawing, so frame rates beyond your monitor's refresh rate buy little; the developers capped the frame limiter at 1,000 Hz because uncapped rates caused stutters. [80, 81]

Skin

- Avoid distractions: bright hit lighting, combo bursts, busy backgrounds, oversized numbers. [42]
- If you're struggling and can't say why, a skin change is worth trying. Korilak switched skins while stuck on Hidden and Double Time maps and full-comboed them right away. [31]
- Dense followpoints help at very high AR (Ch. 8). Vivid, distinct combo colors help with Easy (Ch. 15).
- If you can't hover the results graph to see UR, your skin's ranking-graph image may be blocking it; deleting that image restores the tooltip. [12]

KORILAK'S TAKE

- **Sound and vision can be the problem when nothing physical is. Experience-based.** Worth checking before rebuilding technique. [31]

20. Hands, Eyes, and Health

This is the one chapter where being wrong costs more than a rank. Everything here appears elsewhere in the book next to the skill it belongs to; it is collected here so nobody has to assemble it from five chapters while their wrist hurts.

Strain is not pain

Every source in this book draws the same line, in almost the same words. **Strain burns.** It is the ordinary feeling of working muscles, it fades with rest, and it is where stamina comes from. **Pain aches, stabs, or**

tingles. Pins and needles, sharp pain, spasms, or cramping mean stop now, not push harder, and they mean the technique or the position is wrong. [1, 5, 36, 38]

FACT CHECK

- **Real-world data.** In a survey of 65 collegiate esports players practising 3 to 10 hours a day, 36% reported wrist pain, 32% hand pain, and 56% eye fatigue, and only 2% had sought medical attention. Pain among people who play this much is common and almost entirely untreated. [163]
- **Research.** Carpal tunnel pressure rises as the wrist bends back, climbing between about 15 and 30 degrees of extension, and pressing harder with the fingertip raises it further at every angle. Keep the hand flat and the taps light. Whether keyboard use causes carpal tunnel syndrome is still debated. [133, 134, 135]
- **Research.** Practising while fatigued impaired motor learning in a 2019 study, with effects carrying into later sessions, and training to failure isn't required for gains in the first place. Playing hurt is not just risky, it teaches you less. [131, 132]
- **Research.** A large review found strong evidence that strengthening programmes help prevent and manage upper-limb problems at work, and moderate evidence for stretching. Those are workplace studies, not osu! studies. [136]

Position

- **Wrists.** Don't rest a wrist on a hard desk edge; the sharp local pressure is the problem, not the resting. A wrist rest or a folded towel spreads it. [38]
- **Forearms.** Compressing your forearm against a hard surface loads the muscles that move your fingers. Rest the elbow instead, on a chair arm, towel, or cushion. [38]
- **Hand angle.** Keep the tapping hand fairly flat rather than tilted steeply upward. [5, 133]
- **Posture.** Back straight, the way a pianist sits, with grip and tapping form following from that rather than fighting it. [70]
- **Tension.** Hold tension only where and when it is needed. A tense hand misses targets that aren't moving, and tension is what nerves do to you first (Ch. 14). [5, 36]

Eyes

Eye fatigue was the single most reported complaint in that esports survey, above both wrist and hand pain. Raise the background dim, wear your glasses if you need them, and turn off storyboards that flash. If you can't see the map comfortably, no amount of aim training fixes the misses that follow. [42, 163]

Sleep and rest

Sleep is not time away from training. A night of sleep produced about a 20% speed gain on a practised finger sequence with no loss of accuracy, where the same hours awake gave about 2%. Spaced practice beats cramming, and every source here treats rest days as part of the plan rather than a lapse (Ch. 26). [102, 103]

Sweaty hands

Wash your hands and clean the pen and tablet before blaming your grip. If your hands sweat heavily regardless, that may be palmar hyperhidrosis, a recognized condition with a real treatment ladder from clinical-strength antiperspirants through tap-water iontophoresis to prescription options. That is a clinician's question, not a grip tape question. [38, 161, 162]

***When to stop and see someone.** Pain that persists after a day of rest, numbness or tingling in the fingers, weakness, or pain that wakes you up. None of these is a training problem, and this book is not a medical text. The one thing the evidence is unambiguous about is that players in this situation overwhelmingly do not seek help. [163]*

21. Playing on lazer

The book's values are for stable unless a box says otherwise, because stable is what most of the sources played on. lazer is where the game is going, and several of its differences change training rather than just presentation.

Difference	Why it matters for training
Unstable rate in real time	Since version 2023.1130.0 lazer measures UR in real time, so Double Time scores need no conversion. On stable you still divide a DT UR by 1.5 (Ch. 7) [51]
Difficulty adjustment built in	You can change AR, CS, OD, and speed without a third-party tool, which makes the isolation drills in Ch. 31 a menu option instead of a download [56]
Tablet area built in	Stable has no area settings of its own; lazer does (Ch. 16) [56]
Mod presets	Saved mod combinations, useful when a program calls for the same settings every session [56]
Slider judgement	Slider heads count toward accuracy, and tails are looser: on fast sliders you need only be tracking in the final 36 ms (Ch. 10) [55]
Input and frame rate	Input runs on its own thread at about 1,000 Hz, and the frame limiter caps there too, so frame rates beyond your monitor buy little (Ch. 18) [80, 81]
Score multipliers	Mod multipliers differ from stable's, so don't compare scores across clients (Ch. 35) [62]
Daily challenge	A rotating daily map with its own ranking. Whatever it picks is variety you didn't choose, which is exactly what Ch. 23 recommends [61]

lazer changes faster than this book does. Where it and the wiki disagree with a value here, believe them.

Mindset

22. “Play More,” Decoded

“Play more” is the stock answer to every improvement question. Korilak’s 2016 guide opens by attacking it: it doesn’t tell you *what* to play, and it doesn’t separate good practice from bad. Tonehh’s answer, years later, is that the phrase is right but compressed: it stands for the whole improvement process, which he unpacks into five connected principles. [4, 31]

Tonehh’s five principles

1. **Play consistently, and take breaks.** Keep accumulating hours over weeks and months instead of cramming: a few solid sessions every few days beat occasional binges or 30-minute dabbles. Stop when your fingers, hand, or eyes hurt. Bad days are short-term noise.
2. **Play around your level, and push past your comfort zone in moderation.** Raise the star rating, try mods, turn on No Fail, and accept B and C ranks, but don’t live above your level either, or you never reinforce the basics.
3. **Play a variety of skill sets, one at a time.** Only one kind of map makes you good at only that kind, but trying everything at once reinforces nothing. Focus on one skill set for weeks or months, then rotate. Skills you set aside get rusty but come back quickly.
4. **Be intrinsically motivated.** Notice small, concrete gains (a pass, a longer combo, fewer misses, better accuracy, a new mod) instead of waiting for rank and pp to tell you you’re improving. Chasing rank is fine, but secondary.
5. **Enjoy the game for its own sake.** Genuine enjoyment produces the other four naturally: steady play, breaks when it stops being fun, curiosity to experiment, and flow, the state of full absorption where self-consciousness fades and time flies.

His closing point: *osu!* is almost pure mechanics, with no strategic theory to study the way team games have. Improvement content, his own included, is reflection after the fact, and top players often can’t explain how they improved beyond having kept playing.

STONEHILL'S TAKE: PRACTICE HABITS

- **Play consistently, but don't cram. Supported.** Spaced practice and sleep both improve motor learning. Nuance: his example compares two-hour sessions every few days with 30 minutes daily, which also changes total practice time, while the spacing research holds total practice equal. [102, 103]
- **Push past your comfort zone, in moderation. Supported.** It's the challenge point framework in plain words. [108, 109]
- **Use No Fail to practice above your level. Supported.** It keeps you playing whole maps you can't pass yet; since January 2021 it costs pp only through misses, capped at 10%. [60]
- **One skill set for weeks rather than everything at once. Nuance.** Lab studies often find that mixing tasks feels worse during practice but improves retention; many sport studies find the benefit small or absent. Those studies vary tasks within sessions, not across weeks. A middle ground: one main skill set for a stretch, with some variety in each session. [117, 118, 119]
- **Skills you set aside come back quickly. Supported.** Relearning a motor skill is faster than learning it the first time, and physical and speed-based skills fade less with disuse than cognitive or accuracy-based ones; skills do still decay, substantially after a year or more. [120, 121, 122]

STONEHILL'S TAKE: MINDSET

- **Intrinsic motivation first; rank goals are fine but secondary. Supported.** A 40-year meta-analysis found that intrinsic motivation predicts performance and that external incentives can coexist with it. [123]
- **pp reworks happen every few months. Nuance.** Recent official updates came in September 2024, March 2025, October 2025, and July 2026, roughly six to eight months apart. [76, 77, 78, 79]
- **Being hardstuck is an illusion. Partly supported.** Practice curves show big early gains that shrink over time, and individual curves often show plateaus that break when the learner changes approach. But gains do slow toward imperceptible rates. [124, 125, 126]
- **Enjoyment and flow drive the best play. Partly supported.** Flow's features match his description, and a meta-analysis found a medium-sized link between flow and performance, without settling which causes which. [127, 128]
- **Enjoying the game and being hooked on it are different. Supported.** The WHO defines gaming disorder by impaired control, gaming taking priority over the rest of life, and continuing despite harm, usually for at least 12 months. [168]
- **Theory is an afterthought. Partly supported.** Skills are built by doing, and rule-heavy learning can break down under stress, but how you practice (difficulty, spacing, sleep) changes how much you learn. That's the fair role for a book like this: shaping practice and diagnosing problems, not replacing play. [103, 108, 129, 130]

SCARLETSTORY'S TAKE

- **Playing purely to get better is a reason to quit. Supported.** His first entry is not mechanical: players who chase skill by force of will, rather than by enjoying the game, burn out when improvement turns out to be slow. Let skill come to you. Intrinsic motivation predicts performance, and the former world number one's entire advice to new players was two words (Ch. 25). [24, 72, 123]
- **The only person worth impressing is yourself. Agrees with the top players.** The same conclusion the 2026 interviews reach from the other end of the leaderboard (Ch. 24). [40, 72]
- **Practising a mistake makes you better at the mistake. Supported.** Repeating a movement biases later movements toward it, which is the mechanism behind finger lock and behind every habit this book asks you to fix early rather than late (Ch. 6). His rule: learn it right the first time, even when right is harder. [72, 111, 112]

KORILAK'S TAKE

- **"Play more" doesn't distinguish good practice from bad; routines and strategies make practice efficient. Supported.** Accumulated practice explains about a quarter of skill differences in games in one large meta-analysis (critics say more), and how practice is structured changes how much it teaches. [31, 108, 150, 151]

BLOO'S TAKE

- **"Play more" mostly fits new players; after that, practice your specific weaknesses. Agrees with the chart.** For any skill, his answer is the tennis one: to get better at tennis, play tennis. [14]
- **A new skill feels awful at first; top players push through it anyway. Supported.** Performance drops when practice gets harder, even while learning improves. He learned Easy from a point where he couldn't read AR 8, after a summer of improvement podcasts hosted by Happystick. [108]

TONEHH'S TAKE

- **Practicing one skill set indirectly trains others. Partly supported.** His speed training stalled for two months until a few weeks of nomod streams, which trained stamina, flow aim, and finger control, broke the wall. RyuK makes the same point about deathstream stamina carrying over to burst and stream speed. Related skills share components, as the chart's arrows show, but no study has measured this in osu!. [11]

23. Plateaus, Confidence, and Goals

Almost everyone's rank graph flattens at some point. The plateau video argues that raw hours matter less at that stage than mindset, and offers four fixes: play with confidence, keep a collection of maps you have even a 1% chance to full combo, count any score that enters your top 100 as progress, and notice beliefs that stop you from even trying. [43]

TAKE: PLATEAU VIDEO

- **Improvement slows as you get better; the “intermediate plateau” is normal. Supported.** Practice curves flatten over time, and improvement often resumes with a change of approach. [124, 125]
- **Your skill curve is not your score curve. Supported.** Weeks can pass with the same pp, accuracy, and top plays while reading, control, or stamina are still improving, and then several maps get easier at once. Individual learning curves show exactly that shape: smooth gains inside one approach, punctuated by discrete jumps. The absence of a new top play is not evidence that training failed, which is what the retest in Ch. 28 is for. [124, 125]
- **If you believe you can't, you can't. Partly supported.** Self-efficacy, belief in your ability at a specific task, correlates with sports performance (an average r of .38 across 45 studies) and is both a cause and an effect of performance. A 2023 meta-analysis found the link moderate but variable, sometimes even negative, so confidence helps most when it's grounded in past success. [147]
- **Keep a collection of maps you have even a 1% chance to full combo. Partly supported.** Specific, difficult goals beat “do your best” in goal-setting research (effect sizes .42 to .80), as long as you're committed and the goal is within your ability; performance levels off or drops at the limits of ability. [148]
- **Chase any score that lands in your top 100, not just top-10 plays. Supported.** Each place in your top 100 counts about 5% less than the one above it, so a new 31st-best score is weighted at about 21%, a 50th at 8%, and an 85th at 1%. Those scores barely move your rank, which is the point: they raise your own standard. [59]
- **Irrational “I can't” beliefs block attempts (long maps, Hidden, Hard Rock). Partly supported.** People low in self-efficacy tend to avoid difficult tasks, which starves them of the practice that would build it. [147]

FERRET_IRL'S TAKE

- **Improvement arrives in leaps, not steps, so your perception of your skill is always out of date. Supported.** Either your skill jumps and perception catches up, or perception runs ahead during a flat stretch and you conclude you're stuck. Individual learning curves show exactly that punctuated shape. [38, 125]
- **osu! is not a decision-making game; it's a mechanical skill built by repetition. Agrees with Tonehh.** You can't know your way to improvement, and a player with 200 plays a month who wonders why nothing changes has answered their own question. [4, 150]
- **Blaming genetics is both wrong and an obstacle. Partly supported.** As an excuse it's unfounded and it removes the reason to practise, and he points to players succeeding despite real physical barriers. The honest qualification: accumulated practice explained about 26% of performance differences in games in one meta-analysis, so individual differences are real, even though they are nobody's ceiling at the level most players are stuck at. [150, 151]
- **Believe you're good while knowing you're not there yet. Partly supported.** His “placebo yourself until it isn't placebo” is self-efficacy in blunter language: belief tracks performance in both directions, and it is built mostly from past mastery rather than from decision. [147]

When focus turns into tunnel vision

Hyperfocusing on one map, one skill, or one number is the most common way a plateau gets locked in. It looks like dedication and behaves like a stall: the same map for hours, a play count climbing faster than the score, a refusal to move on until it's perfect, a rank graph checked between attempts.

A coach's video on the subject makes the sharper version of the argument, drawing on his own 2019: a year spent almost entirely on Double Time speed maps left him able to burst 300 BPM while struggling to stream 180, with his reading so narrow that anything below about AR 10.3 felt slow. Sessions swung between good days and weeks of finger locking and missing, and the frustration eventually forced a long break. His diagnosis wasn't too little practice; it was no balance. [44]

TAKE: HYPERFOCUS VIDEO

- **Find your weakness, then don't play only that. Partly supported.** Two costs stack up: the skills you already had decay while you grind one, and playing badly for two hours at a time drains the motivation that keeps you playing at all. Skill-decay research confirms the first, and intrinsic motivation is the strongest predictor of the steady practice everything else depends on. [122, 123]
- **One-tricking a mod narrows your reading without you noticing. Agrees with Tonehh.** His AR 10.3 problem is the Double Time version of the Hard Rock one-trick in Ch. 15: you only ever train the settings your mod gives you. [13]
- **Play as many different kinds of map as you can, every session. Partly supported; differs from Tonehh.** Lab studies find that mixing tasks improves retention, while sport studies find the effect small or absent, and neither tests Tonehh's week-scale blocks against this video's session-scale mixing. Both agree that a narrow diet produces a narrow player. [4, 118, 119]
- **Tournament mappools are ready-made variety. Experience-based.** They're published for every rank range and built to test every skill, which is his explanation for why tournament players are all-rounders. Downloading one as a collection is the least effortful way to stop playing the same three maps.
- **A weakness deserves a session or two, not a month; introduce a neglected skill slowly and in a form you enjoy. Nuance.** This is the practical middle ground between his position and Tonehh's, and it's the shape this book recommends in Ch. 30: one focus block, variety in every session.

His closing example is a returning top player, Shigetora, whose derust sessions mix low BPM, reading, jumps, streams, and speed rather than grinding any one of them. [44]

The rest of the countermeasures are the same shape across every source, and the evidence agrees:

- **Cap retries and come back later.** Two or three tries, or Korilak's three strikes, then move on; return after a few hours or the next day. Spaced repetitions beat massed ones, and hammering a map invites mindblock, where you play your memory of it instead of reading it. The case for a hard retry limit is weaker than it sounds, though: see Ch. 30. [31, 42, 103]
- **Switch category when nothing lands.** Korilak's rotation: if single-tapping won't come, play Hard Rock; if aim won't, lower-BPM Double Time; if neither, streams; if nothing, stop. [31]
- **Rotate the focus skill on a scale of weeks, not hours,** so one-tricking stays deliberate rather than compulsive. [4, 6]
- **Take the day off.** Korilak came back stronger after three or four days away; sleep and spacing do part of the training, and practicing while fatigued measurably impairs learning. [31, 102, 103, 132]
- **Stop watching the graph.** Tonehh's derusting rule is that pressure on speed of progress produces tunnel vision and shortcuts; measure in small objective wins instead. [16]

24. Rank, pp, and Comparison

- **pp is not skill.** Farm maps pay more than harder, broader maps; rank goals are fine, but improvement shows up in smaller ways first. [14]

- **There's no single right path.** osu! has no matchmaking and no shared objective, so everyone's journey is different, and there's no step-by-step guide that fits everyone. [14]
- **Don't compare yourself to everyone.** Friendly rivalries help; measuring yourself against the whole player base doesn't. Aim to be better than yesterday. [14]
- **Remember what you're seeing.** People share their full combos and hide their chokes, so everyone else's progress looks smoother than it was. [41]
- **Build consistency below your peak.** Korilak targeted plays worth about 80% of his best pp score while working on consistency. [31]

What the 2026 system actually measures

The July 2026 update is worth knowing in outline, because it changed which skills pp rewards and it moved the model closer to the chart this book is built on. [79]

- **Reading is now its own skill.** The old static bonuses for high AR and Hidden were replaced by a Reading skill that scales with note density and angles. Very high-ranked players lost pp that high AR had been handing them for free, while low-AR scores were buffed substantially. A model that pays for reading density rather than for the AR number is closer to what Ch. 8 argues reading actually is.
- **Aim is split into snap and flow.** Flow aim used to be a distance bonus attached to the *tapping* skill; it is now evaluated inside Aim, using velocity and angle changes. The chart made that distinction years earlier (Ch. 10).
- **Spacing and BPM count more equally.** Aim evaluation used to favour high BPM with small spacing over slow, wide jumps. That gap was narrowed, so wide spacing and slower jumps gained while tight fast patterns lost. It isn't a full fix, and the update says so.
- **Speed uses a harmonic sum, so every note contributes** and the old length bonus is gone. Padding a map with easy notes now pays less than the same object count of hard ones.
- **Difficulty chunks follow the objects.** Star rating no longer shifts when a map's offset or a rate change moves notes across fixed 400 ms windows.

FACT CHECK

- **Confirmed.** All five changes above come from the official update post, along with a warning worth repeating: individual players' totals could move sharply in either direction, because a score losing pp means it had been overweighted until now. [79]
- **Nuance.** This is the fifth reworking of the system since 2021 (Ch. 22). Train the skills; the numbers will keep moving underneath them. [75, 76, 77, 78, 79]

TAKE: TONEHH AND BLOO

- **pp and rank don't reflect skill. Partly supported.** pp models aim, speed, and accuracy, and since July 2026 reading, per third-party summaries, but the osu! team's own 2021 notes show it favored maps with short difficulty spikes. [59, 75, 166, 167]
- **Stop asking whether you're good for your rank. Experience-based.** No one's expectations matter but yours.

KORILAK'S TAKE

- **Never seriously practice what you know you can't do. Partly supported.** Practice beyond your level teaches little (challenge point), but Tonehh and bloo recommend occasional attempts above your level. Both fit if you separate practice from exploration. [14, 31, 108]
- **If it's not working today, switch: Hard Rock when single-tapping won't come, lower-BPM Double Time when aim or high-OD accuracy won't, streams when neither mod works, and nothing at all on the worst days. Experience-based.** [31]

TAKE: R/OSUGAME GUIDE

- **Take a month off pp farming to train, because once you start farming it's hard to stop. Agrees with Tonehh.** Farming can train consistency depending on what you farm, but it crowds out everything else; the top players' version of the same point is that farming works in moderation, alongside other skill sets (Ch. 32). [39, 40]
- **Improvement is slow, invisible while it happens, and felt later. Supported.** Practice curves flatten as you get better, which is exactly what makes real progress hard to perceive from the inside. [124, 126]
- **Don't compare yourself to others; be good rather than highly ranked. Agrees with everyone.** The oldest source in this book and the newest make the same point a decade apart. [14, 40]
- **Play new maps you've never seen rather than the same one repeatedly (Zinkon's tip). Agrees with the hyperfocus video.** Sightreading unfamiliar patterns is what the chart calls pattern processing, and variety is the one thing every source in this book recommends. [1, 44]

TAKE: TOP PLAYERS

- **Push from where you are today, not from your peak. Supported.** One of them streams 210 on a good day and 200 on an ordinary one, and on ordinary days practises at 200 rather than 215. Performance varies with sleep, recent practice, and everything else; the challenge point sits relative to today's level, not your best week. [40, 108]
- **Quitting before you submit anything is how players stay stuck. Agrees with Tonehh.** If you restart every run that isn't perfect, you never get a score to measure against, so there's nothing to beat next session and no evidence about where you actually are. [16, 40]
- **Breaking the ego loop starts with deciding what you actually want. Partly supported.** Their question is whether you want to keep B-ranking a map far above you or to full combo something you can master; one of them dropped to 2-star maps to relearn the game on a mouse after playing at World Cup level. Mastery experiences are the strongest source of the confidence that keeps people practising, which is the mechanism behind their advice. [40, 147]
- **Comparing yourself to other players is a choice you can drop. Experience-based.** The player who was his country's number one before being overtaken says the fix was simply ceasing to care, and he can't teach it; what he can point to is that the player who passed him did it by drilling basics from the ground up. It fits the book's evidence on intrinsic motivation, but nobody has shown how to install that attitude. [40, 123]

25. Advice From the Top

osu!'s own news team runs an interview series, The Followpoint, which has put the same question to several of the game's best players: what would you tell someone starting out? The answers are shorter than you'd expect, and they don't agree with the internet's idea of what top players think. Two of the interviews below were written up with the help of DigitalHypno, whose chart this book is built on. [23]

mrekk

Rank 1 for three years at the time of the interview, and still there as of this edition's ranking check. [61]

MREKK'S TAKE

- **Don't let top players demotivate you. Supported.** His first piece of advice, and the one he puts above technique: believing you can never reach that level is itself what stops the improvement that would take you there. Self-efficacy tracks performance in both directions, and low self-efficacy predicts avoiding the difficult tasks that build it (Ch. 23). [23, 147]
- **Don't overthink anything: setup, pp, any of it. Agrees with everyone in this book.** Overthinking moves your attention onto numbers instead of the game. He adds that as a 5-digit player he barely knew what pp was and simply played and full-comboed things for fun. Conscious monitoring of a well-learned skill is a known route to choking, and intrinsic motivation predicts performance better than chasing external markers. [23, 106, 123]
- **Do wrist and hand stretches between sessions and between maps. Partly supported.** He raises RSI and carpal tunnel unprompted as the thing that could end his own playing. Workplace reviews find strong evidence for strengthening programmes and moderate evidence for stretching against upper-limb problems; no osu!-specific routine has been tested (Ch. 20). [23, 136]
- **Breaks bring motivation back. Agrees with Korilak and Tonehh.** He describes finding bursts of motivation whenever he tries to take a break, which is the same pattern Korilak reports after three or four days off. [4, 23, 31]
- **On talent. Nuance.** He is candid that his improvement was unusually fast, to the point of being accused of cheating and having to prove himself with hand cams. That is worth holding next to the argument in Ch. 23 that genetics are an excuse: individual differences are real and the best player in the world says so, but they are not what is stopping a player who practises badly.

WhiteCat

Former rank 1, asked the same question about advice for people just starting out. His complete answer was two words: enjoy game. [24]

That is not a joke answer, and it's the single most-repeated claim in this book. Tonehh's fifth principle of "play more" is enjoyment, and he argues the other four follow from it. bloo says the same. A 2012 forum reply, buried in the thread that produced half of Ch. 11, answers the how-to-improve question with "having fun". A 40-year meta-analysis finds intrinsic motivation predicts performance, and flow, which requires a challenge matched to your skill, is linked to better performance across sport and gaming tasks. Asked separately whether mindset can stop you playing, WhiteCat's answer was that mindset is everything, and that you have to at least have yourself on your side. [4, 14, 24, 66, 123, 127]

xootynator

Eleven years playing, a World Cup regular, and the game's best-known full-area player.

XOOTYNATOR'S TAKE

- **Full area works at the top. Supported by example.** The book's position on area is that it is preference within a broad range (Ch. 16), and a top-level player using the entire tablet is the clearest evidence that the range really is broad. [25, 139]
- **She has used two tablets in eleven years, and changed once for a concrete reason. Agrees with everyone.** She switched because hover height suited her better, not because she was stuck, and expects to keep the current one for a long time. That is the whole "experiment, then stabilize" rule as a biography (Ch. 28). [25]

Azer

A decade of World Cup play, captaincy, and organising, and the source of the most useful nerves material in any of these interviews.

AZER'S TAKE

- **He meditated in the minutes before a tiebreaker, then full-comboed it to win the match. Experience-based.** One instance, not a method, but it belongs next to the nerve-control research: what he describes is deliberately composing himself rather than trying to want it more. [26, 104]
- **Expecting to lose made his team play well. Supported.** As captain he deliberately spent a first pick his team expected to lose, on the theory that tournament nerves peak at match start. His summary is that playing with no nerves and no expectation of winning produced good play anyway. That is the outcome-versus-process mechanism in Ch. 14 tested in a live match: nerves come from attention on the result, and removing the result removes them. [26, 106, 107]

Flaro, Predominador, and BTMC

FLARO'S TAKE

- **A skill set can be added deliberately, years in. Agrees with Tonehh.** She played almost exclusively low-BPM flow aim and jumps until 2022, then committed to grinding speed for one specific score, and is now known for it. Skills you have never trained are missing, not impossible, and the rotation in Ch. 22 is how they get added. [4, 27]
- **Speed is overweighted in the current system. Dated by design.** She said so in 2024 while hoping a rework would rebalance it, and reworks have landed since (Ch. 24). It is a useful reminder that what pays pp is a moving target and a bad basis for choosing what to train. [27, 79]

PREDOMINADOR'S TAKE

- **Break a long goal into sections and think only about the next one. Supported.** His rule for a six-figure grind: set the far goal, then look no further than the next thousand, because dwelling on the total is what demotivates. That is ferret_irl's small-goal method arrived at independently, and it matches the goal-setting research on specific proximal goals with visible progress (Ch. 28). [28, 38, 148]
- **If your goal needs long maps, play long maps from the start. Supported.** Otherwise you spend the end of the grind with nothing but the maps you avoided. It is the specificity point in plain terms, and the same reason Ch. 14 builds length gradually instead of all at once. [28]

BTMC'S TAKE

- **Every failure inosu! is yours, and so is every score. Partly supported.** He contrasts it with team games: nobody else can lose your run, and if you set a score once, you know you can set it again. The second half is the stronger half, because past mastery is the most reliable source of the confidence that carries you through a hard attempt (Ch. 23). [29, 147]

The pattern across seven interviews is worth noticing. Not one of them answers the improvement question with a technique, a setting, or a routine. They answer it with attention, enjoyment, patience, goal-setting, and not hurting yourself.

26. Busy Lives and Comebacks

Training with a busy life

Tonehh now works a nine-to-five, plays four to six hours a week, and still sets top plays, often by accident. His system: [6]

- **Reserve a time slot, not an hours quota.** He keeps his evenings free for osu! but lets each session be as long as it turns out to be. Quotas make the game feel like a job.
- **Match the session to the time you have.** With 30 minutes, play your weakest skill set, where improvement comes fastest; for him that's Hidden or Easy.
- **Make room for some long sessions.** About two hours is where real improvement happens, after a 10 to 13 minute warm-up.
- **Treat days off as a feature.** Rest resets the body and gives the brain time to adapt.
- **One-trick, then rotate.** Spend most of your playtime on one skill set for a week or a month, then move on when you get bored.

TONEHH'S TAKE

- **Reserve a time slot instead of setting hour targets. Supported.** Habits form through repetition in a consistent context, and missing a single day didn't materially slow habit formation in a real-world study (median 66 days to automaticity, with a range of 18 to 254). [6, 149]
- **Short sessions go to your weakest skill. Supported.** Practice curves are steepest early, so the least-trained skill improves fastest per minute. [124]
- **Real improvement needs some sessions of about two hours. Experience-based.** His warm-up estimates vary between videos (10 to 13 minutes here, about 30 in his derusting guide); research suggests the post-rest dip clears with a short block of task-specific play. [16, 144]
- **Days off help. Supported.** Sleep consolidates motor skills, and spaced practice beats massed. [102, 103]

Derusting

After four years away, Tonehh fell from about 6,000 to 22,000 and regained most of his skill in weeks while playing less than before. His process: [16]

1. Get comfortable with your current setup first, especially if your desk, chair, or peripherals changed.
2. Accept that you'll be worse for a while, and drop to a star rating you can read, aim, and tap properly, ideally one where a full combo takes only a couple of tries. He dropped from high 6 and low 7 stars to low 5, under 200 BPM.
3. Read intentionally; lazy habits formed now become long-term problems.
4. Play for full combos again; the hunger to remove misses is a skill in itself.
5. Sightread new maps, including unranked ones, instead of replaying old favorites.
6. Don't try to derust fast. Watching your speed adds pressure and tempts shortcuts like pp farming.
7. Set a direction: goals, favorite players, maps you want.
8. Count small objective gains: a B becoming an A, a first pass, a higher comfortable BPM.
9. Use the reset to learn new things and fix old habits while your muscle memory is fresh.

TONEHH'S TAKE

- **Derusting is fast because part of your skill never leaves. Supported.** Relearning shows savings, and physical and speed skills decay less than cognitive or accuracy skills. [120, 122]
- **The less you think about derusting fast, the faster you derust. Experience-based.** It fits his broader rule that pressure and tunnel vision slow improvement.

TONEHH'S TAKE

- **The greats started with fundamentals. Experience-based.** In his 2026 return video he notes that several all-time great players' early top plays were mostly nomod consistency maps and TV-size jump maps harder than today's, with early experiments in mods; one started out playing only Hidden. [17]

The Trainer

27. Diagnose Before You Drill

The chart's real use is diagnostic: find the symptom, check the skills that feed it, and train the weakest one. Run the test in the third column before committing weeks to a program.

Symptom	Likely cause	Quick test	Go to
Misses you can't explain	Pattern processing or focus	After a miss, can you describe what the pattern actually was?	Ch. 6, Ch. 8
You miss the same way every time	Cursor control	You can see exactly how you misaimed	Ch. 6
100s everywhere, UR under 100	Offset or audio latency	Is your average hit error clearly early or late?	Ch. 7, Ch. 19
100s everywhere, UR high	Rhythm sense, finger control, or a map above your level	Does the same map one star lower give 98%?	Ch. 7, Ch. 31
Bursts come out as mash; fingers lock	Finger control	Can you alternate, and start on either finger, at 150 BPM?	Ch. 6, Ch. 32
Streams die after about ten notes	Tapping stamina or technique	Can you hold a 150 BPM long stream map to the end?	Ch. 13, Ch. 31
Tapping is fine but you still miss streams	Flow aim or tap-aim coordination	Slow the map down: do the misses disappear?	Ch. 12
Great sightread, worse on retries	Mindblock	Attempt 5 is worse than attempt 1	Ch. 8, Ch. 14
Fine in practice, shaky in a real run	Nerves	It falls apart once the combo gets big	Ch. 14
Comfortable at AR 10, lost at AR 8 or 9	Reading density, often a mod crutch	Can you read a nomod AR 9 map at your star rating?	Ch. 8, Ch. 15
Clears hard maps but drops combo on easy ones	Reading and accuracy skipped on the way up	Can you full combo an AR 9 map at your star rating at 98%?	Ch. 8, Ch. 7
SS-ing everything, stuck for years	Never leaving your comfort zone	Are nearly all your recent scores 99% or better?	Ch. 5, Ch. 22
Flat for weeks	Too comfortable, or a narrow diet of maps	Are your recent scores nearly all 99% on one map type?	Ch. 22, Ch. 23

Symptom	Likely cause	Quick test	Go to
Wrist, hand, or forearm pain	Overuse	Does it persist after a day of rest?	Stop playing and see a professional (Ch. 13)

One symptom at a time. Fixing the weakest feeder usually improves three other things you weren't working on.

The failure chain

Every miss passes through the same sequence, and the useful question is which link broke first. The aim version of this is in Ch. 10; it generalizes to everything.

1. **Did you see it?** No: reading speed, focus, or your screen (Ch. 8, Ch. 20).
2. **Did you understand the pattern?** No: pattern processing (Ch. 11).
3. **Did you go to the right place?** No: still processing, not aim.
4. **Did you travel the right distance?** No: cursor control (Ch. 6).
5. **Did you arrive at the right time?** No: coordination between hands (Ch. 12).
6. **Did the tap come out right?** No: finger control or rhythm (Ch. 6, Ch. 7).
7. **Did it hold up?** No: stamina, tension, or nerves (Ch. 13, Ch. 14).

TAKE: COMMUNITY FORUMS: USING THE AUTOMATION MODS TO DIAGNOSE

- **One run with Relax and one with Autopilot will tell you whether a map is failing on aim or on tapping. Partly supported.** Relax taps for you, so what's left is your cursor; Autopilot aims for you, so what's left is your rhythm. As a ten-minute diagnostic that is sound, and it answers link four versus link six above faster than guessing does. As *practice* it is a bad idea, and the book's position is unchanged: aim and tapping are tightly coupled, so training them apart is exactly what the whole-versus-part evidence argues against, and Korilak's rule against practising timing on Autopilot still stands (Ch. 7). Diagnose with them; don't train with them. [31, 62, 68, 143]
- **If your hit errors are scattered rather than leaning one way, that's accuracy, not offset. Agrees with the chart.** The suggested drill is to take an easy map with obvious rhythms, raise OD, and work on unstable rate where nothing else is hard, which is low-star isolation applied to timing (Ch. 7). [1, 68]

DRILL: STRAIGHT LINES

- Pick a jump-heavy map at a comfortable level and play it thinking about one thing only: moving in straight lines between objects.
- Ignore your accuracy and score entirely for these runs. You are training cursor paths, not results (Ch. 30).
- Then check a replay. Rounded, looping paths between jumps are over-aiming; straight paths that stop on the circle are the target (Ch. 29). [1, 68]

Train the earliest link that failed. Aim drills do nothing for a pattern you never read, and reading drills do nothing for a jump you read correctly and undershot. Most wasted practice is spent on link four when the chain broke at link two.

Be specific before you pick a program. "I can't stream 180" is four questions, not one: BPM, object count, spacing, and pattern complexity (Ch. 12). The answer changes depending on which of them actually breaks. [34]

28. Measure, Drill, Retest

Diagnosis tells you what to work on. This chapter is the loop that tells you whether the work did anything, which is the part most practice skips.

Where this chapter comes from. The small-goal method and the baseline that makes it work are ferret_irl's. The skill-cap and consistency split is the community's, stated plainly in a forum reply years earlier. The rest of the loop is this book's synthesis of both with the measurement habits in Ch. 33. An earlier draft credited the whole five-question framework to ferret_irl on the strength of a second-hand summary; his post doesn't contain it, and this one says so. [38, 69]

Five questions a session can answer

Sessions go wrong when they try to answer all of these at once. Pick one.

Question	What you are training	Where the chart puts it
Skill cap	Patterns just past what you can currently play, roughly where accuracy falls to the high 80s or low 90s	The challenge point: difficulty high enough to inform, low enough to execute [69, 108]
Consistency	Reliable execution of what you can already do	Consistency, built from the three control skills (Ch. 6)
Technique	The physical method: grip, tapping, movement economy	Technique efficiency (Ch. 13)
Reading	Understanding the pattern rather than recognizing it	Pattern processing and rhythm sense (Ch. 8)
Performance	Executing when the score matters	Nerve control (Ch. 14)

A map that fails you on three of these at once teaches you very little, because you can't tell which one moved. Pick maps where your target question is the hard part and the rest is comfortable.

The loop

DRILL: BASELINE, DRILL, RETEST

1. **Question.** One sentence, answerable: "can I hold aim through 180 BPM spaced streams?"
2. **Baseline.** Three maps that ask that question, played warmed up, scores recorded. This is the step people skip, and without it nothing later means anything.
3. **Drill.** 15 to 30 minutes on the specific failure, at the hardest level where your technique stays controlled.
4. **Retest.** The same three maps, same conditions, same warm-up.
5. **Record.** Misses, accuracy, UR, combo, and where in the map the misses happened. The last one matters most.
6. **Adjust.** Better numbers: raise one difficulty variable. Unchanged numbers after a fair trial: change the drill, not the map. [38, 69, 148]

FACT CHECK

- **Research.** Goals work when you can tell whether you met them: specific, difficult goals outperform “do your best” by a clear margin, and feedback on progress is one of the conditions that makes them work. A baseline is what turns “get better at streams” into a goal at all. [148]
- **Nuance.** “Small goal” doesn’t mean easy goal. The research favors goals that are demanding as well as specific; performance only levels off when a goal passes the limits of current ability. Small here means **measurable**, not comfortable. [148]
- **Research.** Expect the retest to look worse before it looks better when you have just raised difficulty; that dip is what the challenge point framework predicts, not evidence the drill failed. [108, 110]

Goals small enough to check

Instead of	Use
Get better at aim	Cut misses in this jump section from 5 to 2
Become a speed player	Hold 190 BPM bursts for 10 notes instead of 6
Reach 5,000 pp	Raise this map from 96% to 97.5%
Get more consistent	Keep UR under 100 on three attempts in a row
Fix my fingerlock	Play this burst pattern twice without locking

TAKE: COMMUNITY FORUMS

- **Train skill cap and consistency on purpose, and mix them. Supported.** Skill cap means playing above your comfort zone, around 87 to 95% accuracy for the player who wrote it down; consistency means high accuracy and low miss counts inside it. Only skill cap and you skip fundamentals; only consistency and you stay at the same star rating. Both halves of that warning are what this book has been arguing from the chart. [69, 108]
- **Both extremes are wrong for beginners too. Agrees with Korilak.** Advice given to a new player in another thread: SS-ing everything is too safe and pass-hunting is too loose; full combo with good accuracy and move up. One reply adds a caveat worth keeping: don’t force 98% while your tapping is still forming. [31, 71]

FERRET_IRL'S TAKE

- **If you think your goal is small enough, it isn't; if you think it's focused enough, it isn't either. Supported, with a caveat.** His test: a goal should name a map and a number you can compare against a score you already have, like cutting a play from 26 hundreds to 20. Goal-setting research agrees that specific goals with feedback beat vague ones, and adds the caveat that goals should stay demanding: small means measurable, not easy. [38, 148]
- **Big milestone goals mindblock you through the hype you attach to them. Supported.** A first 500 pp play is an outcome goal with an audience attached, and attention on the outcome is exactly what the choking research identifies as the mechanism behind falling apart under pressure (Ch. 14). [106, 107]
- **Without a comparison score, play once for a baseline and build the goal from there. Agrees with the top players.** Same habit as beating your own locals, stated as a rule. [40]

Every goal on the right has a number you can read off the results screen, which means training either moved it or didn't. That's also what makes the collections system in Ch. 33 work: the collection is the record.

Change one thing at a time

The same discipline applies to your setup. A player who changes area, grip, tapping style, skin, mods, and practice routine in one week has learned nothing about any of them, because there's no way to attribute the result. Change one variable, give it enough sessions to adapt, compare against your baseline, then keep it or revert it.

Two things get confused here, and it's worth separating them. **Thrashing** is changing your area, grip, skin, and practice routine at once because nothing is working; it destroys attribution and it's what every osu! source in this book warns against. **Deliberate variation** is changing one parameter slightly, on purpose, between practice sessions, and the evidence favours it: a second session with subtly altered force requirements nearly doubled learning compared with repeating the identical task, while skipping the extra session was about 25% worse. The same study is clear that the alteration has to be small. Vary your practice; don't thrash your setup. [35, 159]

DRILL: DELIBERATE VARIATION

1. Keep your normal setup for anything you want to score on. This is the performance condition and it doesn't change.
2. In training only, alter **one** parameter slightly: a few millimetres of area, a small BPM change with osu! trainer, one step of CS or AR, or a map you know played at a different speed.
3. Run the drill at the altered setting, then return to normal for the retest in the loop above. The point is the adaptation, not the altered score.
4. Keep the change subtle. Doubling your area or jumping 40 BPM is a different task, not a variation, and the research says the benefit disappears at that point. [35, 83, 159]

TAKE: TOP PLAYERS

- **A setup can't be evaluated while it's changing. Agrees with Tonehh.** One of them copied a top player's area years ago and has moved about 5 mm since; the failure they describe is never letting any configuration run long enough to judge. It's the same rule BTMC applies to stream variables and the same rule this loop applies to drills. [19, 34, 40]

Speed should expose weaknesses, not hide them

If you can't play a lower BPM cleanly, jumping to a much higher one rarely fixes what's wrong; it usually buries it under noise. When you're diagnosing tapping rather than training it:

- Drop the BPM until every tap is deliberate and you can feel which finger is failing.
- Take off anything that smooths over bad inputs while you diagnose. On a Hall effect keyboard that means raising the actuation point or switching rapid trigger off for the session: a key that fires at 0.1 mm will register a mash that a normal switch would have swallowed, which is convenient in play and unhelpful when you're trying to see your own technique (Ch. 17).
- Rebuild control at the lower speed, then climb again in steps.

This isn't an argument against rapid trigger or against playing fast. It's the chart's control-before-speed rule applied to the one piece of hardware that can disguise whether you have the control yet.

29. Watch Your Own Replay

Ch. 28 asks you to record *where* the misses happened. This chapter is how you find out, because the results screen tells you what went wrong and only the replay tells you why.

What the results screen already gives you

- **Unstable rate**, the standard deviation of your hit errors times ten, available by hovering the performance graph immediately after a play or while watching the replay. It measures spread, not correctness. [51]
- **Average early and late error**, the two numbers beside it. A large early average with a low UR is an offset or latency problem, not an accuracy problem (Ch. 7). [57]
- **Where in the map your accuracy fell apart**, from the graph's shape. A collapse two-thirds through is stamina; scattered dips are pattern-specific.

What only the replay gives you

DRILL: REPLAY REVIEW, TEN MINUTES

1. Play the map once without stopping, then watch that replay straight through once, doing nothing but noting the timestamps of every miss and every combo break.
2. Watch it a second time and, at each timestamp, answer one question: was the cursor in the wrong place, in the right place at the wrong time, or in the right place with the wrong finger? Those are three different chapters (Ch. 10, Ch. 7, Ch. 6).
3. Look at your cursor path between the misses, not at the misses. Over-aiming past the note, rounding off a square into a curve, or drifting off a stream's line all show up in the path and never show up in the score (Ch. 11).
4. Write one sentence: the pattern type, the failure mode, the fix. That sentence is the goal for your next session (Ch. 28).
5. Re-watch the same replay a week later against a new one on the same map. This is the cheapest progress measure in the game. [38, 51]

The community renders replays as video through services like [ordr](#), which is useful for sharing a run for a second opinion but shows you nothing your own client doesn't. Tools that analyse replays statistically exist too; none was tested for this book. [37]

FACT CHECK

- **Nuance.** A top player of the 2014 era pushed back on replay review as general advice: he found it useful mainly when trying to full combo a specific hard section and not knowing *how* he was missing it. That is precisely the use this chapter describes, and it is not a substitute for playing. [72]
- **Research.** Reviewing your own performance is feedback, and feedback is the condition that makes specific goals work at all: people shown the size and direction of their timing errors cut their early lean sharply, while goals without progress information underperform. [97, 148]
- **Nuance.** Watching yourself is not the same as watching a top player. Observation helps movement form far more than outcomes, and a replay hides the hands, which is where form lives (Ch. 37). Your own replay is for diagnosis; a handcam is for technique. [156]

30. Build a Session

Every source structures a session the same way: warm up, work on one thing, then play for fun or for scores. What they argue about is length.

DRILL: THE STANDARD SESSION

- **Warm up (10 to 20 minutes).** Korilak's method: a fixed set-list of maps, in order, ending with one you can barely pass. A long low-BPM stream map, then an aim and reading map slightly faster, then your "final boss". His rule is not to start real practice until you've passed all of them. [31]
- **Focus block (40 to 60 minutes).** One skill, from Ch. 27, run as one of the programs below. Cap retries at two or three per map, or Korilak's three strikes, then move on and come back later. [42]
- **Variety (15 minutes).** Something else entirely, so one-tricking doesn't narrow you. Tournament mappools, published for every rank range and built to test every skill, are the easiest ready-made variety: download one as a collection and rotate through it. [4, 44]
- **Finish (10 to 20 minutes).** Comfortable full combo attempts or maps you simply enjoy. Don't chase fast maps right after stamina work; tired fingers rehearse sloppy movement. [31, 132]
- **Stop at pain, not at strain.** Burning forearms are ordinary; anything sharp, or pain that persists after rest, ends the session. [5, 163]

FACT CHECK

- **Research.** Skill dips after a break and returns within a short block of practice, an effect called warm-up decrement. Field studies found that task-specific activity, practicing the skill itself, removed it best, which supports Korilak's in-game set-list over generic hand exercises. [144, 145]
- **Real-world data.** In a 2025 study of 16 Counter-Strike 2 and Valorant players, physical warm-ups produced no statistically significant change in aiming performance, though the no-warm-up condition produced the fewest best results. Warm up with the game. [146]
- **Nuance.** Korilak recommends an hour or more of warm-ups before serious play; Tonehh uses 10 to 13 minutes on a work night and about 30 when derusting. The evidence supports a warm-up, not any particular length. [6, 16, 31]
- **Nuance.** Two of the three top players interviewed barely warm up at all, and one argues that an elaborate routine buys 1 to 2% while costing playing time; the third says players who skip it spend the first stretch of every session wondering what's wrong. Warm up enough to clear the dip, then stop optimizing it. [40]

Two kinds of session

A session that produces no new top play can be a complete success, as long as you know which kind of session it was. Deciding before you start is what stops you judging one by the other's measure.

	Skill session	Score session
Objective	Adaptation: change what you can do	Execution: get the most out of what you can already do
What you play	Uncomfortable BPM, unfamiliar maps, low AR, your weakest patterns, adjusted difficulty	Maps inside or slightly above your established range
Expected scores	Bad, and that's fine	Your best available

	Skill session	Score session
Success looks like	Fewer finger locks, a longer clean stream, cleaner transitions, one fewer miss on the target pattern	A full combo, an accuracy record, a new top play
Failure looks like	Playing it safe and scoring well	Grinding a map far above you and learning nothing

Both are legitimate and both are needed. The mistake is mixing them without noticing: farming comfortable maps all week and calling it training, or playing nothing but your skill ceiling and wondering why your scores went backwards. The plateau in Ch. 23 is usually one of those two, run for a month.

Session length. Tonehh's floor for real improvement is about two hours, with shorter sessions spent on your weakest skill where gains come fastest; Korilak warns against playing at all on days when nothing works. Spacing research favors regular moderate sessions over marathons, and sleep does part of the work for you. [6, 31, 102, 103]

How much should you retry?

Three pieces of advice have circulated in osu! for over a decade, usually stated together: play more, push your limits on hard maps, and play variety without spamming retry. The first two are in every source in this book. The third is the shakiest, and it is worth knowing why. [65]

The no-retry rule is newer than it sounds. The two most-read improvement guides of the early 2010s don't mention retrying at all; the rule spread around 2016 from one top player's advice and streams, and other top players repeated it. Two arguments then collided: that retrying costs you the variety that builds consistency, and the opposite, that moving on after a mistake leaves the mistake in your muscle memory while fixing it requires playing the thing again. [65, 66, 72]

FACT CHECK: THE RETRY DEBATE

- **Real-world data.** A 2017 analysis of the top 10,000 players plotted a rough improvement rate (pp per hit) against average play length (hits per play, standing in for how much people retry). The trend ran the other way from the rule: players with shorter average plays gained pp slightly faster. A 2020 reanalysis with a better-defined improvement measure found the same direction at $r = -0.117$ across 10,000 players: statistically significant at that sample size, and practically tiny. [65]
- **Nuance.** Both analyses measure pp, which rewards farm maps, so they arguably show that retrying farm maps farms pp faster, which nobody disputes. Average play length is also confounded by map choice: a player who prefers marathons looks like someone who never retries. The strong version of the anti-retry claim, that heavy retrying narrows you to a small set of maps, isn't measurable in this data at all. [65]
- **Nuance.** The advice is normally given to newer players, while the data covers the top 10,000, whose skill sets are already broad. Critics in the same thread make both points, and the author's own conclusion is modest: whichever side is right, the effect is probably small.
- **Research.** What does hold up is spacing: repetitions spread out beat repetitions massed together, which is an argument for returning to a map later rather than for never replaying it. [103]

So the honest version of the rule is narrower than the slogan. Nothing shows that retrying as such slows you down. What the coaches in this book actually object to is a specific pattern: restarting the first twenty seconds of a farm map, never submitting a score, never finishing a map, and hammering one section until

you're playing it from memory. Cap your retries if the cap keeps you moving through varied maps; don't adopt a retry rule that makes you miserable in the hope of a benefit the data can't find. [31, 42, 65]

31. The Programs

Each program below is one creator's routine, condensed. Run one at a time. Where two programs target the same skill, pick by temperament: some people like ladders, some like maps they enjoy.

Before any of them, the method the top players interviewed name when asked how to train a skill set at all:

DRILL: BEAT YOUR OWN LOCALS

1. Pick a handful of maps that sit under one skill umbrella and are hard for that skill only. A map that tests aim, tapping, and reading at once takes far longer to improve on than one where only your target skill is the problem; one to two skills at a time is their limit.
2. Play them without expectations the first time, to set a baseline score rather than a target.
3. Return every day or two and beat your own local score: one fewer miss, one percent more accuracy, a longer combo. That is the progress report.
4. Keep the set for weeks. One of them spent five years unable to stream 220 BPM, then played one map at that speed about a hundred times and could. [40]

Beginner path: build the base

Tonehh and bloo put the first hundreds of hours in the low 3 to low 5 star range, playing nomod, chasing full combos rather than pp, and adding one new skill at a time. Tonehh's rough map of where each skill first appears is a useful compass, not a rule. [3, 14]

Skill	First appears around	Peaks (fundamental form) around
Jumps	4 stars	Mid 5 stars
Bursts	High 3 stars	—
Prolonged bursts	High 4 stars	—
Streams	Low to mid 5 stars	Low 6 stars
Cross-screen jumps and spaced, curvy streams	Mid 7 stars and up	—

DRILL: LOW-STAR ISOLATION (DIGITALHYPNO)

- Pick a 1 to 2 star difficulty of a song you like. The map should be easy enough that nothing except your chosen skill is hard.
- Play it three times, each with one instruction: **alternate every note**, then **start every pattern on your other finger**, then **put the cursor exactly in the center of every circle**.
- Move up a level only when your comfortable range gives full combos at 97 to 98% within a few tries. [1, 3]

DRILL: THE APPROACH-RATE LADDER

1. Decide the AR you want to read, then practise one step below it: dense, consistent AR 8 maps to build AR 9, AR 10 to build AR 10.3. Convert maps down with osu! trainer or lazer's difficulty adjustment if you need more of them.
2. Give it a full day, or a week, and play nothing else in that block. An hour of AR 9 followed by an evening of AR 10 teaches neither.
3. Come back to your old AR periodically so it doesn't decay; what you've played a lot of sticks around.
4. Expect flat progress and then a sudden step. Don't jump two steps at once. [39, 83]

Streams, route A: bursts up the star ratings (Tonehh)

DRILL: THE BURST LADDER

1. Start at low 4 stars (3 if bursts still turn into mash), on older maps with plenty of bursts.
2. Alternate every burst deliberately, even when mashing would pass. If you lock up, drop a star rating and 10 to 20 BPM.
3. Full combo each level at 97 to 98% before moving up: low 4, mid 4, high 4, low 5.
4. When bursts are clean, extend them: prolonged bursts around high 4 stars, first streams from high 4 to mid 5.
5. Check your hit error graph for over- or under-streaming and adjust consciously. [3, 7]

DRILL: ONE VARIABLE AT A TIME (BTMC)

1. Write your current clean stream down as three numbers: BPM, object count, and spacing (stacked, moderate, or spaced).
2. Raise one and hold the other two. Drop 5 BPM and add two objects; or add 5 to 10 BPM and cut the count; or keep both and widen the spacing.
3. Full combo it, then push a different variable next time. Rotate which dial you turn.
4. When a level stops working, lower the variable you last raised rather than dropping everything at once. [34]

Streams, route E: the foundation course (Almost)

The most staged of the routes, and the one aimed squarely at a player who cannot yet use their second finger. Expect roughly four months, and treat taking longer as fine. [67]

DRILL: ZERO TO DEATHSTREAM

1. **Triples, stacked.** From about 3 stars, find maps with triples on a single spot so no aiming is involved, and learn the zxz movement. Alternators should practise starting triples on the weaker finger now; it is harder at first and much harder later (Ch. 6).
2. **Five-note bursts, stacked.** Same idea, longer. Then extend toward ten notes, and start caring about accuracy on them. Set up hitsounds you can hear, and watch the hit error bar for over- and under-streaming (Ch. 7).
3. **Add movement.** Bursts and triples spaced half a note or less, in straight lines or shallow arcs. Read each circle individually.
4. **Short streams at 4 stars.** Ten to twenty notes, spacing still under half a note, chasing accuracy rather than length.
5. **The gate.** A full combo at 97% or better on a long stream map you have chosen as your benchmark. Keep everything in this course under 180 BPM.
6. **Consistency, not one-offs.** A single 100% run doesn't clear a stage; being able to repeat it does. [67]

ALMOST'S TAKE

- **Slow everything down to train technique. Agrees with the chart.** He edits high-BPM maps down to about 150 BPM and lowers AR, which is Half Time with control over each variable, using osu! trainer or McOsu. Get the movement right slowly, then speed it back up. [1, 67, 82, 83]
- **Stamina maps have an entry requirement. Supported in spirit.** His gate for long monotonous stream maps is 99% accuracy across the first hundred circles; below that, shorter streams are the better use of the session. Play them at most once a day and at the end of a session, since that is fatigue work and fatigue impairs what you learn next (Ch. 30). [67, 132]
- **Raise one axis at a time: OD, then BPM, then length. Agrees with khz and Korilak.** Same ladder logic all three routes use, applied to three separate dials rather than one. [5, 31, 67]

Streams, route B: the deathstream ladder (khz)

khz builds streams directly on long practice maps, starting slow and climbing 10 BPM at a time. Tonehh, who had warned against grinding those maps, concedes in their video that more than one road works. Both stress that the method is gym-like, boring, and not for everyone. [5]

DRILL: KHZ'S PHASES

1. **Phase 1, finger control (140 to 160 BPM).** Play a long stream practice map three times at the start and three times at the end of each session, with No Fail if you need it. Full combo it at 95% or better, then move up 10 BPM. Clear 140, 150, and 160 before moving on.
 2. **Phase 2, stamina (170 to 180 BPM).** Same routine where the arm starts to strain. Tapping lighter and relaxing the hand lets you recover mid-stream. Strain is expected; pain is the signal to stop.
 3. **Phase 2.5, optional.** Keep climbing if you enjoy it. khz considers 180 BPM deathstream stamina enough to stream much faster.
 4. **Phase 3, speed.** Play maps above your comfortable BPM and adapt, using osu! trainer to change speed. Keep OD between 8 and 10 so you don't train sloppy timing.
- **Safety:** stop at pain, do hand exercises daily, keep the tapping hand flat rather than tilted steeply upward, and treat hours away from the game as recovery. [5, 83]

KHZ'S TAKE

- **There's more than one road to streaming. Supported.** Challenge point research ties the best practice difficulty to the learner, not to one universal path, and both routes share the order control, stamina, speed. [108, 109]
- **Climb 10 BPM at a time, only after a 95% full combo. Supported.** Small, mastery-gated steps are progressive overload, and expecting scores to dip after each step is what the framework predicts. The exact figures are rules of thumb. [108, 110]
- **140 BPM is finger-control territory. Agrees with the chart.** That's 9.3 notes per second, about 4.7 per finger when alternating, so it builds alternation without maxing either finger; at 170 BPM each finger needs about 5.7, at the top of the single-finger range. [116]
- **Push through strain like the last reps at the gym. Nuance.** Going to failure isn't needed for gains, and practicing while fatigued impaired learning in a 2019 study. Treat end-of-session runs as stamina work and keep precise technique for when you're fresh. [131, 132]
- **Keep the hand flat; a steep upward tilt invites carpal tunnel trouble. Supported.** Carpal tunnel pressure rises as the wrist bends back, climbing between 15 and 30 degrees of extension, and pressing harder raises it further at every angle. Whether keyboard use causes carpal tunnel syndrome is still debated. [133, 134, 135]
- **Daily hand exercises prevent injury. Partly supported.** A large review found strong evidence for strengthening programs and moderate evidence for stretching in preventing upper-limb problems at work; his specific routine hasn't been tested, and his two injury-free years are one person's experience. [136]

Streams, route C: Korilak's sets

DRILL: KORILAK'S STREAM SETS

1. Start on a long stream practice map at 150 BPM. Aim for a full combo; accuracy matters less at first, but 97% or better is the signal to move up 10 BPM.
2. Play it five times back to back, no breaks. Then rest five minutes.
3. Repeat for three rounds. You can move up mid-session if a level full combos early.
4. Step back down a level, or stop for the day, if a higher BPM stops working.
5. Test progress occasionally on a long deathstream marathon: getting further means it's working.
6. Don't play anything fast afterwards, and stop at any irregular pain in the arm, wrist, or fingers. [31]

Korilak went from 150 BPM long streams in March 2016 to reaching halfway through a 200 BPM long stream map by August. Five months, one skill. Expect that pace, not a breakthrough week. [31]

Streams, route D: cut the map down (We Luv Lama method)

Tonehh's third streaming video takes a long deathstream map and rebuilds it shorter in the editor, so the load grows in controlled steps instead of all at once. [9]

DRILL: PROGRESSIVE CUTS

1. Open a long stream map in the editor and save copies that stop after 100, 150, 200 notes, and so on.
2. Work out where to cut with arithmetic: the gap between 1/4 notes is $15,000 \div \text{BPM}$ milliseconds, so at 210 BPM notes are 71 ms apart and 100 of them take about 7 seconds. A 1,025-note stream at that speed runs about 73 seconds.
3. Full combo the short version cleanly, then move to the next length. Add BPM with osu! trainer instead of length once the map is long enough.
4. Keep OD at 8 or above so speed practice doesn't train loose timing.
5. Soreness is expected; sharp pain is not. Take days off and accept that progress is slow. [9, 83]

Hard Rock

Three routes, all gradual. Korilak's is the most structured; the precision video's is the most map-driven; BTMC's is the most brutal.

DRILL: KORILAK'S COLLECTION LADDER

1. Make four collections: **HR**, **HR Passed**, **HR Consistent**, **HR FC**.
2. Fill **HR** with AR 10 maps you have already full comboed without mods, around one star below your comfortable nomod level.
3. Give each map three attempts with Hard Rock. Pass it and it moves to **HR Passed**; fail three times and you move on to the next map. Don't replay a map the same day.
4. Pass a map in **HR Passed** three times (on separate sittings) and it moves to **HR Consistent**, where you get one attempt per visit. Fail and it drops back.
5. Full combo a **HR Consistent** map and it moves to **HR FC**, where the target is one attempt at 99% or better.
6. Korilak spent about two weeks with 80% of his playtime on this, learning Hard Rock without Hidden. [31]

KORILAK'S TAKE

- **The three-strike ladder. Supported.** Spaced repetitions beat massed ones, and each promotion raises difficulty only after mastery, which is what the challenge point framework recommends. The specific numbers are his. [103, 108]
- **Timing built without mods is what carries Hard Rock. Supported.** Hard Rock raises OD by 40%, so the same hit error yields worse judgements; at OD 10 the 300 window is 19.5 ms either side. [46, 49]

DRILL: THE ISOLATE-THEN-IMMERSE ROUTE (BTMC AND THE PRECISION VIDEO)

1. Train each Hard Rock ingredient separately first: small circles (CS 5 and up), tight timing (OD 9 to 10), and fast reading (AR 10), using nomod maps or lazer's difficulty adjustment. Find which one actually fails.
2. If isolation alone doesn't transfer, do what BTMC did: play nothing but Hard Rock for about two weeks, starting on maps you know.
3. After a few weeks on known maps, start sightreading with Hard Rock; mixing nomod back in shows how much has carried over.
4. Don't take on two reading styles at once: nomod players learn Hard Rock alone, Hidden players learn it with Hidden. [1, 32, 41, 56]

Double Time

DRILL: THE DT ON-RAMP

1. **Prerequisite:** comfortable across a variety of mid 5 star nomod maps, and ideally Hard Rock first, so AR 10 is already familiar. AR 8 with DT is effectively AR 9.67, just under it.
2. Start on AR 8 maps that stay under about 220 BPM with DT, or on maps that are high 3 stars nomod (about low 5 stars with DT).
3. Play the map without mods first to learn its patterns, then add DT. The patterns are identical, just faster.
4. Progress along one axis at a time: higher BPM, then higher AR (AR 9 maps become 10.33 with DT), then longer maps.
5. Expect reading, not stamina, to be the wall at high AR: at AR 10 with DT an object is on screen for 300 ms. [13, 14, 31, 32, 47]

Speed and single-tapping

DRILL: KORILAK'S SINGLE-TAP PRACTICE

1. **Prerequisite:** you can play DT comfortably around 220 BPM. Before that, this is just a way to hurt yourself.
 2. Warm up with a slow map played entirely with one finger, around 130 BPM.
 3. Cycle a handful of AR 8 maps in the 250 to 265 BPM range, no Hidden: this is speed and endurance work, not reading practice.
 4. Repeat the cycle until performance stops improving that session, then stop. It uses more of the arm than streaming does. [31]
- The gentler version of the same idea: play burst-heavy maps about 10 to 15 BPM above your comfortable speed, or raise a map's BPM in osu! trainer, and let control catch up before you climb again. [5, 42]
 - Speed built this way still needs stamina and finger control underneath it, which is why Tonehh's speed stalled for two months until he trained streams instead. [11]

Consistency and long maps

DRILL: LENGTH AND PRESSURE

1. Pick a map you can pass, then add about 30 seconds of length every time the current length becomes comfortable. [8]
2. Give each attempt at a target map two or three tries, then move on; come back hours later or the next day. [31, 42]
3. When you miss mid-map, finish the map anyway. Learning the second half is worth more than a fresh retry.
4. For a section that fails every time, cut a practice difficulty of just that section in the editor and drill it, then put it back in context.
5. Hide the HUD with Shift+Tab when the combo counter is what makes you tense. [8, 58]

32. The Jump-Map Trap

Tonehh's most-watched warning targets newer players whose profiles are full of short, pp-oriented jump maps played at low accuracy. In his experience reviewing profiles, those players hit the same three walls: accuracy that won't improve, an inability to stream or hold prolonged bursts, and finger lock. [3]

Warning signs

- Low overall accuracy despite many hours, with lots of 50s and misses in top plays.
- Top plays dominated by short (around 30-second) jump maps, often far above the player's level.
- A very high play count for the hours played, which he reads as constant retrying.
- Most-played maps at star ratings the player can't realistically clear yet.

Why it happens

- Farm maps are built for pp: long stretches of easy sliders, then a short spike of predictable jumps, with few or no bursts.
- Hitting those jumps at poor accuracy is memorizing and flicking, not reading, so reading doesn't grow.
- When a burst appears, players mash through it, and repeating that mash trains finger lock.
- Short maps with the retry button always at hand don't build consistency.

The rehab plan

1. Stop playing short pp-farm jump maps for the whole rehab period, and step down from high star ratings.
2. Start around low 4 stars, or 3 if needed, favoring older maps with plenty of bursts.
3. Full combo each level at about 97 to 98% before moving up: low 4, mid 4, high 4, low 5.
4. If finger lock persists, drop further in star rating and BPM and alternate deliberately on every burst.
5. Expect weeks or months, and don't slide back to farm maps halfway through.

tonehh's take: the diagnosis

- **osu! is a rhythm game first. Supported.** It's classified as one, and its pp model treats aim as one value among speed and accuracy, not the whole picture. [59, 165]
- **Farm maps pack their difficulty into short spikes. Supported.** The osu! team's 2021 explanation backs the mechanism: star rating weighted a map's hardest few sections so heavily that short strain spikes paid above a map's average difficulty. That update added damping. [59, 75]
- **That's how pp works today. Dated.** The video reflects the 2020 system. Since then the 2021 update damped short strain spikes, and the July 2026 update removed Speed's length bonus in favour of a harmonic sum, so padding a map with easy notes pays less than the same number of hard ones. It also rebalanced aim toward wide spacing and slower jumps and away from tight fast patterns, which is close to the opposite of what the farm maps in this chapter were built around. Which maps pay most has shifted; his training logic never depended on pp. [75, 79]
- **Lots of 50s means you aren't ready for the map. Supported.** At OD 8 a 50 means your hit landed more than 76 ms off, nearly the whole 83 ms gap between 1/4 notes at 180 BPM. One caveat: hits consistently off in the same direction can also be offset or audio latency. [46]
- **At low ranks, top plays show what you actually play. Supported.** Each score counts about 5% less than the one above it, so for a player with a few dozen ranked scores nearly all of them matter. Top plays hide the retries behind them, though. [59]
- **3,510 plays in 29 hours means retry spam. Experience-based.** That's one play every 30 seconds on average, which supports his reading, though no study has measured whether retry spam hurts consistency.
- **Jump farming causes accuracy, streaming, and finger-lock problems. Partly supported.** The mechanism is plausible (repetition biases future movement; unpracticed skills don't develop), but his evidence comes from players who came to him with problems, a self-selected group. [111, 112]
- **It's not your keyboard, skin, or fingers. Experience-based.** Reasonable for technique problems, with one exception: persistent pain deserves medical attention, not more practice. [163]

take: top players: the counterpoint

- **Farming is fine in moderation, and it does train aim. Partly supported; differs from Tonehh.** All three players interviewed farm deliberately: aim is the skill every map needs, and pp and star rating give you numbers to push against. Their conditions matter, though, and they are exactly what the trap lacks: chase full combos instead of 10-miss pp scores, and keep other skill sets in the rotation. Farm for a miss count you keep lowering and you are doing the drill above; farm for a score you post once and abandon and you are not. [40]
- **What the two positions actually disagree about. Nuance.** Tonehh's warning is aimed at players whose entire profile is short farm maps at low accuracy; the top players are describing farm maps as one component of a varied diet. Both agree that a farm-only diet at low accuracy produces the same three walls. [3]

TONEHH'S TAKE: THE REHAB PLAN

- **Rebuild at 3 to 4 stars with burst-heavy maps. Differs from the chart.** Same principle as fundamentals-first, different starting line: he aims where bursts appear, the chart isolates at 2 stars. Challenge point research supports moving each skill up from wherever it stands. [108, 109]
- **Hit 97 to 98% full combos before moving up. Experience-based.** A concrete benchmark rather than a researched threshold: with no 50s or misses, 98% means about 3 of every 100 objects were 100s. [63]
- **Older maps make better practice. Agrees with the chart.** DigitalHypno also recommends older maps for their unusual patterns; the claim that pre-2014 maps have more bursts is Tonehh's read of mapping history.
- **Streams need real alternation, so learn it slowly. Supported.** One finger tops out near 5 to 7 taps per second while a 180 BPM stream needs 12, and alternation destabilizes as speed rises. [114, 116]
- **Expect weeks to months. Experience-based.** No study gives a timeline for undoing an osu! habit, but spacing and sleep both favor steady daily sessions over catch-up days. [102, 103]

33. Weekly Templates and Tracking

The templates below are this book's synthesis of the creators' advice, not any one person's routine. Treat them as starting shapes and bend them to your week.

Week	Shape	Notes
Busy (4 to 6 hours)	Two sessions of about two hours, plus one or two 30-minute sessions	Long sessions carry the focus block; short ones go to your weakest skill, where gains come fastest. Reserve a time slot rather than an hours target. [6]
Committed (8 to 12 hours)	Four sessions of about two hours, plus one rest day or more	Keep one focus skill for the week or month, but never a whole session of nothing else: a mappool or mixed collection in every session is what keeps the rest of your skill set from sliding. [4, 44]
Rehab or derust	Daily sessions of 45 to 90 minutes at a level you can full combo in a couple of tries	Star rating stays down until accuracy and bursts are clean; no farm maps for the duration. [3, 16]

What to track

- **Collections as a training log.** Korilak keeps categories for warm-ups, each mod ladder, streams, single-tap practice, maps in progress, and full combos achieved. Being able to see a map climb the ladder is the progress report. [31]
- **Local scores.** Playing the same practice maps repeatedly makes your own score history the cleanest measure you have.
- **A 1% collection.** Maps you have even a small chance to full combo, from the plateau video: goals that are hard but attempted. [43]
- **Small objective wins.** A B becoming an A, a first pass, a longer combo, a higher comfortable BPM. Tonehh's counter to rank-watching. [16]

- **Hit error and UR**, checked occasionally rather than chased. [12]
- **A photo of your grip**, and a note of your area, so a good setup can be rebuilt after a bad week. [21]

DRILL: THE MONTHLY BENCHMARK

- Pick four fixed maps: a long stream map at your current BPM, a burst-heavy map, a jump map at your comfortable star rating, and one Hard Rock or Double Time map.
- Play each once a month, warmed up, and record score, accuracy, UR, and how far you got.
- Change nothing else about them: the point is a fixed ruler. Korilak used a deathstream marathon this way, khz used six timed runs a session. [5, 31]

34. Playing in Tournaments

Tournaments are where the rest of this book gets tested: a mappool you didn't choose, one attempt per map, a clock, and an audience. Most players never enter one. The preparation is still worth knowing, because it is the clearest example of training for a performance rather than for a score, and because mappools are the best variety source in the game even if you never play a match (Ch. 23).

What tournaments actually select for

Teams are not built out of eight all-rounders. BTMC describes the structure of a strong national team as a core of players who play every map, plus specialists brought in for the skills the core lacks. That has two implications: a narrow, excellent skill is a real route in, and the players who advance furthest are generally the ones who removed their weaknesses rather than deepened one strength. [29]

Preparing a mappool

1. **Sort the pool by what each map asks**, not by star rating: the aim maps, the speed maps, the tech maps, the long ones (Ch. 11).
2. **Baseline every map once**, warmed up, without retries. That is your ranking of which maps you can already play and which need work (Ch. 28).
3. **Spend your time on the maps you'd be picked for**, not the ones you enjoy. A map you cannot pass is not your map; a map you pass unreliably is where practice pays.
4. **Practise the maps whole**. Tournament play is one attempt from start to finish, and length is its own skill (Ch. 14).
5. **Play the pool under match conditions** at least once each: no retries, HUD as you'll have it, warm-up first (Ch. 30).

Nerves, which are the actual opponent

AZER'S TAKE

- **Expect to lose the first pick. Supported.** As captain he deliberately spent a first pick his team expected to lose, on the reasoning that nerves peak at the start of a match, and found they played well precisely because nothing was riding on it. That is the outcome-focus mechanism from Ch. 14: attention on the result is what produces the shake, so removing the result removes it. [26, 106]
- **Compose yourself deliberately before a decisive map. Experience-based.** He meditated in the minutes before a tiebreaker and then full-comboed it. One instance rather than a method, but it points the same way as the research: practising under pressure, and arriving at the map already settled, beats trying to want it more. [26, 104]
- **Train under the pressure you'll face.** Expert athletes who practised under induced anxiety held their performance when it counted; those who trained calm did not (Ch. 14). Scrims and one-attempt runs are the osu! version. [104, 105]
- **Tell yourself what to do, not what to avoid.** Negative instructions under pressure measurably worsened accuracy in dart throwing. "Hit the first note of each line" beats "don't choke the stream". [107]
- **Warm up before the match, with the game.** The post-rest dip clears with a short block of task-specific play, which is what every warm-up set-list in Ch. 30 is for. [31, 144]
- **Don't change anything on match day.** No new area, no new skin, no new keyboard. Whatever you changed, you have not adapted to it yet (Ch. 28). [40, 159]

If you never enter a tournament, take the mappools anyway. They are assembled by people whose job is to test every skill in the game, published for every rank range, and free. [44]

Reference

35. Reference Tables

Computed from the osu! wiki formulas for the stable client; lazer differs in places. [46, 47, 48]

Hit windows by OD

How far off, early or late, a hit can be and still earn each judgement.

OD	300	100	50
5	±50 ms	±100 ms	±150 ms
7	±38 ms	±84 ms	±130 ms
8	±32 ms	±76 ms	±120 ms
9	±26 ms	±68 ms	±110 ms
10	±20 ms	±60 ms	±100 ms

Stable counts a hit only if the error is below the rounded window, so each is effectively half a millisecond narrower (±19.5 ms at OD 10). Hard Rock multiplies OD by 1.4 (maximum 10). Double Time keeps the listed OD, but every window is a third shorter in real time. [46]

How long objects stay visible (AR)

Approach rate	Visible for	With Double Time
AR 5	1,200 ms	800 ms
AR 7	900 ms	600 ms
AR 8	750 ms	500 ms
AR 9	600 ms	400 ms
AR 10	450 ms	300 ms

Objects fade in over the first two-thirds of this time. Hard Rock multiplies AR by 1.4 (maximum 10); Easy halves it. [47]

Mods at a glance

Mod	What changes	Score multiplier
Easy	CS, AR, OD, and HP halved	0.50×
No Fail	You can't fail; pp reduced 2% per miss, capped at 10%	0.50×
Half Time	0.75× speed; hit windows and visible time a third longer	0.30×
Hidden	No approach circles; objects fade out after appearing	1.06×
Hard Rock	CS × 1.3; AR, OD, HP × 1.4 (max 10); map mirrored top to bottom	1.06×

Mod	What changes	Score multiplier
Double Time	1.5× speed; hit windows and visible time a third shorter	1.12×

Lazer uses different multipliers. Relax taps for you and Autopilot aims for you; neither is ranked. [60, 62]

What mods do to a setting

Setting	With Hard Rock	With Double Time
AR 7.2	AR 10 (7.2×1.4 , capped)	Visible time of about AR 8.5
AR 8	AR 10 (11.2, capped)	Effectively AR 9.67
AR 9	AR 10 (12.6, capped)	Effectively AR 10.33
CS 4	CS 5.2 (radius 31.1 instead of 36.5)	Unchanged
OD 8	OD 10 (11.2, capped)	300 window shrinks from ± 32 to about ± 21 ms in real time

Circle size and radius

CS	Radius (osu!pixels)	Note
3	41.0	Common on easier maps
4	36.5	The de facto default
5	32.0	Where precision starts to bite
5.2	31.1	CS 4 with Hard Rock
6	27.5	Precision maps
7.8	19.5	CS 6 with Hard Rock: about the smallest seen in tournaments
8	18.6	Half the radius, a quarter of the area, of CS 4

Stream speed

BPM (1/4 streams)	Notes per second	Per finger alternating	Gap between notes
140	9.3	4.7	107 ms
150	10.0	5.0	100 ms
160	10.7	5.3	94 ms
170	11.3	5.7	88 ms
180	12.0	6.0	83 ms
190	12.7	6.3	79 ms
200	13.3	6.7	75 ms
220	14.7	7.3	68 ms

BPM (1/4 streams)	Notes per second	Per finger alternating	Gap between notes
240	16.0	8.0	63 ms
260	17.3	8.7	58 ms
270	18.0	9.0	56 ms

A single finger tops out around 5 to 7 taps per second, which is why alternation is not optional above about 150 BPM. [116]

Accuracy targets

How many 100s each accuracy allows, assuming no 50s or misses: [63]

Accuracy	100s per 100 objects
99%	1.5
98%	3
97%	4.5
95%	7.5
90%	15

A 50 costs 1.25 times as much accuracy as a 100, and a miss 1.5 times as much.

Worked example: why centering your hits matters

A UR of 100 means a standard deviation of 10 ms. Treating hits as normally distributed (an assumption osu! developers have used when estimating UR), here is how often hits would fall outside the ± 32 ms window for a 300 at OD 8: [64]

UR	Outside the window if centered	If your average hit is 10 ms early
80	0.006%	0.30%
100	0.14%	1.39%
150	3.29%	7.38%

At UR 100, a 10 ms early lean produces about ten times as many non-300s as being centered. That gap is what offset, or retraining your timing, closes.

How your top plays are weighted

Each score in your top 100 counts about 5% less than the one above it. [59]

Position	Weight	Meaning
1st	100%	Your best play
10th	63%	Still most of its value
30th	23%	The top 30 hold about 79% of the total

Position	Weight	Meaning
50th	8%	Raises your standard, not your rank
85th	1.3%	Worth playing for, not for pp

Polling rates and input delay

Polling adds, on average, half the report interval.

Report rate	Interval	Average delay	Worst case
125 Hz	8.0 ms	4.0 ms	8.0 ms
133 Hz (stock on several Wacom tablets)	7.5 ms	3.8 ms	7.5 ms
200 Hz	5.0 ms	2.5 ms	5.0 ms
300 Hz	3.3 ms	1.7 ms	3.3 ms
390 Hz	2.6 ms	1.3 ms	2.6 ms
700 Hz	1.4 ms	0.7 ms	1.4 ms
1,000 Hz	1.0 ms	0.5 ms	1.0 ms
8,000 Hz	0.12 ms	0.06 ms	0.12 ms

For scale: a 480 Hz monitor draws a frame every 2.1 ms, and a player at UR 100 scatters hits with a 10 ms standard deviation. Fix a 125 or 133 Hz device; past a few hundred Hz you are optimizing below what you can perceive. [33]

36. Glossary

Term	Meaning
1/4, 1/2	Note spacing relative to the beat. 1/4 notes are streams; 1/2 notes are singletaps at half the rate
Alt (alternating)	Tapping two keys in turn, one note each; the basis of streaming
AR	Approach rate: how long objects are visible before they must be hit
Burst / stream / deathstream	Runs of 1/4 notes: roughly 5 to 8, 9 or more, and long enough that stamina dominates
CS	Circle size: larger CS means smaller circles
Derust	Regaining skill after a break
Digits	Rank bracket shorthand: 6-digit is ranks 100,000 and above, 4-digit is 1,000 to 9,999, and so on
Farm map	A map whose pp is high relative to its difficulty, usually short with a spike of jumps
FC	Full combo: no misses and no broken sliders
Finger lock	Fingers seizing or refusing to alternate, usually from mashing bursts

Term	Meaning
Flow aim / snap aim	Smooth continuous movement versus sharp point-to-point movement
HP	Drain rate: how fast the health bar empties
Lazer / stable	The new client and the classic client
Mindblock	Playing a pattern from memory instead of reading it, so it falls apart
Muscle memory	In players' usage, the automaticity that comes from motor learning. Physiologically the term means something else entirely (structural changes in muscle fibres that speed re-training after a layoff), and the gaming usage misleads: what you build is adaptable motor control, not a memorized distance (Ch. 17)
Notelock	Being unable to hit an object because a previous object's hit window is still open
OD	Overall difficulty: how tight the timing windows are
One-trick	Playing one skill set or mod almost exclusively
osu!pixel	The game's internal coordinate unit; circle sizes are measured in it
pp	Performance points: the score-weighted ranking currency
Practice difficulty	A copy of a map, usually cut short in the editor, made to drill one section
Singletap	Hitting consecutive notes with one finger
Sightread	Playing a map correctly the first time you see it
SS	A perfect-accuracy score (100%)
Star rating	The game's difficulty number for a map
TV size	A map of a roughly 90-second TV-edit song
UR	Unstable rate: the standard deviation of your hit errors, times 10

37. Resources

Practice maps and sets named by the creators

- **Long stream practice maps**, the sets khz's ladder is built on: <https://osu.ppy.sh/beatmapsets/72474#osu/207692> and <https://osu.ppy.sh/beatmapsets/76465#osu/403024> [5]
- **Stream practice maps, long stream practice maps, burst stream maps, square jump practice maps**, and a deathstream compilation used as a benchmark: the map lists in Korilak's guide, which range from 120 to 270 BPM. [31]
- **The maps shown in the skill chart video**, listed skill by skill in DigitalHypno's credits document. [2]
- **Tournament mappools**, published for every rank range on the osu! site and mirrored as ready-made collections: the widest variety per download, and the reason tournament players end up well rounded. [44]

Further reading

- **The two classic improvement guides of the early 2010s**, still the ancestors of most advice in circulation: jesse1412's <https://osu.ppy.sh/forum/t/99612> and Scarletstory's <https://osu.ppy.sh/forum/t/187364>. Neither was reviewed for this book. [66, 72]
- **The retry analysis thread**, worth reading with its critics rather than without them: <https://osu.ppy.sh/community/forums/topics/676392> [65]
- **ferret_irl's 2026 write-up**, the source of the small-goal method in Ch. 28 and the tapping advice in Ch. 6: https://www.reddit.com/r/osugame/comments/1qwl2le/8_real_tips_to_get_good_from_a_top_20_player/. Worth reading in full; it is funnier and blunter than any summary of it, including this one. [38]
- **The official rankings**, if you want to know who the current top players actually are before taking advice attributed to them: <https://osu.ppy.sh/rankings/osu/global> [61]

Tools

- **osu! trainer** — makes modified copies of maps (BPM, AR, CS, OD). The core tool for speed ladders: <https://github.com/FunOrange/osu-trainer> [83]
- **McOsu** — a standalone osu!-compatible client with practice features, including speed and difficulty overrides, used for slowed-down technique work (Ch. 31): <https://github.com/McKay42/McOsu> [82]
- **OpenTabletDriver** — the current open-source tablet driver: <https://github.com/OpenTabletDriver/OpenTabletDriver> [84]
- **Custom tablet firmware** — <https://files.shav.it/osu/tablet/> and the site listed in BTMC's description, <https://xstarry.dev/firmware>. Read Ch. 18 first: flashing can brick a tablet and void a warranty, and neither site was tested for this book. [86, 87]
- **khz's written stream guide** — the companion document to his video: https://docs.google.com/document/d/1xbNwH_vN4O3azBYwua-Z_3GOAI2d-kV_EeE96aiRLBU [30]

Who to watch, by skill set

Community picks from a 2026 thread, useful mainly as a map of who specializes in what. Read the caveat underneath before spending an evening on replays instead of playing. [37]

Skill set	Players named
Aim, low BPM	Hyeok
Aim, high BPM and Double Time	mrekk, with Plasma, byeok2044 / suyung, and WhiteCat named for nomod aim
Precision	Bonk
Aim control	Worst hr player
Flow aim	ASecretBox, mrekk, ezchamp, enri, WhiteCat
Bursts	Ivaxa
Finger control	Kama
Stamina	Roaz
Speed	cryshina, toro, Akolibed, NINERIK
Accuracy, low BPM	Kirby mix

Skill set	Players named
Accuracy, high BPM	cryshina
Technical maps	mrekk, MALISZEWSKI, FlyingTuna, Worst hr player
Easy mod, and rhythm reading	gn, badeu, ekoro, ttv_ufo
Hybrid	milosz, lifeline, mrekk

Several of these names sit in the current top 50 and some don't, because specialists and inactive players both show up in lists like this. Check the rankings rather than assuming. [61]

FACT CHECK: DOES WATCHING HELP?

- **Nuance.** The thread's own top reply says you can't improve much from watching, and recommends working on accuracy, pushing occasionally, and playing variety instead. As a statement about where improvement comes from, that's right; as a statement about observation having no value, it's too strong. [37]
- **Research.** A meta-analysis of observational modeling found a clear benefit over practice alone, but a lopsided one: the effect on movement dynamics, meaning how the movement is performed, was about 0.77, while the effect on movement outcome was about 0.17. Watching teaches form far more than it teaches results. [156]
- **Research.** Observation works best interleaved with your own practice rather than instead of it: observing an expert model between practice blocks improved movement planning more than extra practice trials did. Effects vary by task, and some studies find none. [157]
- **Nuance.** In osu! the mismatch is obvious: a replay shows the cursor and the score, which is the outcome channel, and hides the hands, which is the dynamics channel the research favors. For technique, look for handcam footage; for pattern reading and movement strategy, replays are fine.

The thread's two most useful lines for a reader of this book are not about who to watch. One: the skill that matters for learning a new skill set is finding maps you enjoy within it (Ch. 22). Two: be deliberate about technique, tapping above all (Ch. 6). [37]

Websites

Site	What it's for, and what to watch
osu.ppy.sh	The official site: rankings, beatmap search, and your own profile. Your top plays and most-played maps are the diagnostic you already own (Ch. 32). https://osu.ppy.sh
osu!Collector	Ready-made map collections you can download in one go, including practice ladders and tournament mappools. The fastest way to assemble both the sets the programs in Ch. 31 assume and the variety Ch. 23 calls for. https://osucollector.com
osu!Farmer	Finds high-pp maps for your level. Good at exactly that, and therefore risky as a diet: these are the optimized farm maps Ch. 32 is about. Use it to push a rank goal, not to train. https://www.osufarmer.com
osu!pps	Another pp-map finder, with maps and mappers ranked by mod. Same caution. https://osu-pps.com/#/osu/maps

Site	What it's for, and what to watch
osu! skillset analyzer	Graphs a skill profile from your plays. Useful as a second opinion on which skill is weakest; the weightings are one developer's model, not official, so read the shape rather than the numbers. https://osu-skillset-analyzer.vercel.app
osuck tools	Profile analysis and related utilities. https://tools.osuck.net/?category=profile_analyze
osu!track	Tracks rank, pp, and accuracy over time, with ladder statistics; the clearest picture of whether the last month did anything. https://ameobea.me/osutrack/ladder-stats

Third-party tools depend on the osu! API and on pp formulas that change every six to eight months (Ch. 24). When a tool and the game disagree, the game is right. [59]

38. Quick Answers

The questions people actually ask, and where the answer lives.

Question	Where to look
I'm brand new. What do I do?	Ch. 4, then Ch. 5
How do I improve?	Wrong question. Name the failure first: Ch. 27
Why is my accuracy bad?	Ch. 7. If hits are tightly grouped but early, it's offset, not accuracy
I can't stream at X BPM	That's four questions: Ch. 12, then a route in Ch. 31
My fingers lock up	Ch. 6, then the rehab plan in Ch. 32
I keep missing jumps	Usually reading, not aim: run the checklist in Ch. 10
Should I use a tablet?	It doesn't decide anything: Ch. 16
What tablet, keyboard, or keypad should I buy?	Ch. 17, after reading why it matters less than you think
Is my area or sensitivity wrong?	Ch. 16, and the variation drill in Ch. 28
When should I learn mods?	Ch. 15. Never to make a map easier to read
Is farming bad?	It depends entirely on how: Ch. 32
How many retries?	Fewer than the slogan says, for reasons in Ch. 30
I've been stuck for weeks	Ch. 23, then check you aren't hyperfocusing
I only have a few hours a week	Ch. 26
I came back after a long break	Ch. 26. Skill returns faster than it was built
Something hurts	Ch. 20. Stop playing first, read second
How do I know if I'm improving?	Ch. 28 and Ch. 33. Not pp
Should I play lazer or stable?	Ch. 21

39. About This Edition

September 2026. Built from the creators named in Ch. 1, community guides going back to 2012, the osu! wiki, and published research. The citation balance and how claims are weighted are described in How to Use This Book.

Corrections are welcome and expected. Three kinds are especially useful: a game value that has changed since this was checked, a claim attributed to a creator who didn't say it or meant something different, and a study cited for more than it actually shows. Mechanics change with almost every pp update, so anything in Ch. 35 has a shelf life.

On the creators. Everything here is summarized in this book's own words with attribution and links back to the original. Nothing is reproduced wholesale, and the intent is to send readers to the sources rather than replace them. If you are one of those creators and want a claim corrected, removed, or attributed differently, that request wins over anything written here.

40. Key Takeaways

From the chart. Diagnose weaknesses by checking the skills that feed them. Fundamentals first; low-star maps are the best isolation tool. Memorization is a legitimate tool, but keep actually reading. "Just play more" works because strong players absorb these ideas without noticing; spelling them out saves you from rediscovering them.

From the evidence. Sleep and spaced practice are part of training, not time off from it. Use wired, low-latency audio and check your hit error; leaning early is normal and fixable. Practice under some pressure on purpose, and tell yourself what to do rather than what not to do. Treat persistent wrist or hand pain as a reason to stop and get it checked. Practice at a difficulty that challenges without overwhelming, and treat consistent high-accuracy full combos as the signal to move up.

From the coaches. If your top plays are mostly short jump maps at low accuracy, rebuild with burst-heavy maps around 3 to 4 stars. Don't mash through bursts you can't alternate yet. Play regularly in solid sessions, warm up with the game itself, and cap your retries. Focus on one skill set for a stretch, then rotate; what you set aside comes back faster than it was learned. For streams, all four routes work as long as you go control, then stamina, then speed. Never add a mod to make a map easier to read. And buy gear for comfort, not for skill: the milliseconds it saves are smaller than the ones you scatter.

41. Sources

Checked September 2026. Game mechanics and pp change with updates; the osu! wiki is the authority for current values.

Every source carries a letter showing how far it can be trusted on its own. The letter rates **the source**, not whether a claim is true: a Tier D creator can be right and a Tier B study can be irrelevant to osu!. What the letter tells you is how much weight a claim carries when nothing else supports it.

	Tier	What it means
A	Official and primary	The osu! wiki, official news posts, the game's own code and rankings. Authoritative for mechanics and values, and dated the moment an update lands

	Tier	What it means
B	Peer-reviewed research	Published studies and meta-analyses. Strong for mechanisms, but almost none of it was done on osu!, so transfer is an argument this book has to make each time
C	Published community work	Forum guides with visible peer review, community data analyses, and osu!'s own edited interviews. Attributable and challengeable, not formally reviewed
D	Named creator experience	Video and written guides by identified players. The core of the coaching material: useful, specific, and unverifiable
E	Unverified	Unidentified authors, single stream clips, manufacturer specifications, sites not tested, and anything that reached the book second-hand. Used only where it is labelled as such
T	Tool	Software referenced for what it does, not as evidence for a claim

This edition: 26 sources at A, 75 at B, 19 at C, 30 at D, 15 at E, 3 tools. The research is the largest block, the creator material is the most cited, and every Tier E source in the book is flagged in the text where it is used.

Creators, players, and interviews

[1] D DigitalHypno (YouTube). osu! phd: a comprehensive introduction to every skill (the skill chart video). The map-credits page below links an address ending in Dc4PBq3Rga8, likely another upload of the same video. <https://www.youtube.com/watch?v=uc99yWeP1h4>

[2] D DigitalHypno. osu! phd video: map credits (the map and player shown in each section of the video). https://docs.google.com/document/d/e/2PACX-1vQhrzWfCkrcAHS6AJM4P9mXYH4HVuCcDrEopQouMvt0h_mSPjY8fM5PiH-ybsCFD7HohyShtB5yJNj/pub

[3] D Tonehh (YouTube). osu! HUGE Beginner Mistake in 2020!! | Can't get good accuracy, Can't stream, Keep fingerlocking. <https://www.youtube.com/watch?v=vhpkaIPOTq8>

[4] D Tonehh (YouTube). the only improvement guide you'll ever need. https://www.youtube.com/watch?v=QuXj7SHd_5I

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[10] D Tonehh (YouTube). osu! How to ACTUALLY improve your aim | A FULL Aim Guide, Part 1.

[11] D Tonehh (YouTube). osu! The Importance of a Diverse Skillset | Unblocking the Bottleneck.

[12] D Tonehh (YouTube). osu! Unstable Rate FULLY Explained.

[13] D Tonehh (YouTube). osu! When should you play mods | A FULL Fundamentals To Mods Guide.

[14] D Tonehh featuring bloo (YouTube). osu! 5 Best Improvement Tips for Beginners.

[15] D Tonehh (YouTube). do NOT make the game easier for yourself.

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- [22] D Tonehh (YouTube, 2020). Do NOT buy an XP-PEN G640 in 2020!; THE XP-PEN G640 IS BACK!!!; and osu! Can't move mouse with tablet drivers open FIX.
- [23] C The Followpoint: mrekk, the osu! Prodigy (osu! news, 6 May 2024). Official interview series run by the osu! news team; this one organised by MegaMix_Craft and written up with Utiba and DigitalHypno. <https://osu.ppy.sh/home/news/2024-05-06-the-followpoint-mrekk-the-osu-standard-prodigy>
- [24] C The Followpoint: WhiteCat, the Cat Who Dominated osu! (osu! news, 14 July 2024). Interview with the former rank 1. <https://osu.ppy.sh/home/news/2024-07-14-the-followpoint-whitecat-the-cat-who-dominated-osu>
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- [26] C The Followpoint: Azer, the Tournament Titan (osu! news, 15 April 2025). Interview with a veteran World Cup player, captain, and organiser. <https://osu.ppy.sh/home/news/2025-04-15-the-followpoint-azer-the-tournament-titan>
- [27] C The Followpoint: Flaro, the Queen of Speed (osu! news, 29 July 2024). Interview with a top United States speed and flow-aim player. <https://osu.ppy.sh/home/news/2024-07-29-the-followpoint-flaro-the-queen-of-speed>
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- [32] D BTMC (YouTube). THE BEST GUIDE TO IMPROVE AT OSU!?! (read-through of Korilak's guide with commentary). <https://www.youtube.com/watch?v=tRqqSJJ1IZU>
- [33] D BTMC (YouTube, September 2026). This changes osu! Forever (testing community tablet firmware). <https://www.youtube.com/watch?v=Yd1h29wRmlA>
- [34] D BTMC (stream clip). Answer to a viewer asking how to push stream consistency past 180 BPM (transcript supplied by the reader).
- [35] D Viscose (YouTube), FPS aim coach: argument that "muscle memory" is a misnomer and that sensitivity can be varied deliberately as a training tool, including a clip of the Valorant player TenZ on the same point. Transcript supplied by the reader. <https://www.youtube.com/watch?v=uPkYc84GrSc>
- [36] E FPS aim-training video on reading target movement, sensitivity ranges, and tension management; creator not identified in the transcript supplied by the reader. Accompanied by community aim-theory material (r/FPSAimTrainer, Aim Lab's mechanics glossary). <https://aimlabs.com/articles/aimlabs/aim-training-fps-mechanics-glossary-key-terms-explained/>
- [37] E r/osugame thread on which players to watch for each skill set (2026), with picks from several commenters and a dissent about how much watching helps. Reddit blocks automated access; the text was supplied by the reader. <https://www.reddit.com/r/osugame/comments/1wkiaxr/>
- [38] D ferret_irl (2026), "8 real tips to get good from a top 20 player", r/osugame. Written by a player ranked 24th globally in September 2026 and known for tapping. Reddit blocks automated access; the full text was supplied by the reader, including an

addition on hyperhidrosis from a commenter.

https://www.reddit.com/r/osugame/comments/1qwl2le/8_real_tips_to_get_good_from_a_top_20_player/

[39] **E** Anonymous community guide posted to r/osugame in the mid-2010s, “How to improve on osu! Brief Guide!”, including tips credited to DodefMaw and Zinkon. Reddit blocks automated fetching; the text was supplied by the reader.

https://www.reddit.com/r/osugame/comments/2xnzr5/how_to_improve_on_osu_brief_guide/

[40] **D** Interview video: I Asked Top osu! Players How to Improve (Here’s What They Said), with three players ranked roughly 15th, 20th, and 30th at the time. Their names as transcribed are uncertain, so they are not used here.

<https://www.youtube.com/watch?v=612sSx6HtIU>

[41] **E** Creator not identified. Video on precision and Hard Rock (transcript supplied by the reader).

[42] **E** Creator not identified. Video on consistency (transcript supplied by the reader).

[43] **E** Creator not identified. Video on skill plateaus and mindset (transcript supplied by the reader).

[44] **E** Creator not identified by name (an osu! coach, crediting a video by the long-time top player the transcript calls Silver). Improve at osu! FASTER — Stop Hyperfocusing. <https://www.youtube.com/watch?v=8ZTgXqK1fI8>

[45] **E** Stream clip of a rank-80 player laying out a streaming roadmap by rank (transcript supplied by the reader; player not identified).

Official osu! documentation and data

[46] **A** osu! wiki: Overall difficulty (hit windows, rounding rule, notelock, slider head leniency, mod effects).

https://osu.ppy.sh/wiki/Beatmap/Overall_difficulty

[47] **A** osu! wiki: Approach rate (visibility times, fade-in, mod effects). https://osu.ppy.sh/wiki/Beatmap/Approach_rate

[48] **A** osu! wiki: Circle size (radius formula, mod effects). <https://osu.ppy.sh/wiki/CS>

[49] **A** osu! wiki: Hard Rock (setting multipliers, map flip). <https://osu.ppy.sh/wiki/HR>

[50] **A** osu! wiki: Hidden. <https://osu.ppy.sh/wiki/Hidden>

[51] **A** osu! wiki: Unstable rate (definition, results screen, rate-changing mods, lazer change).

https://osu.ppy.sh/wiki/en/Gameplay/Unstable_rate

[52] **A** osu! wiki: osu! judgement system (slider judgements). <https://osu.ppy.sh/wiki/en/Gameplay/Judgement/osu%21>

[53] **A** osu! wiki: Spinner (clearing, bonus score and health on continued spinning, 477 SPM ceiling, Spun Out at 287 SPM, direction changes resetting the spin). https://osu.ppy.sh/wiki/en/Hit_object/Spinner

[54] **A** osu! wiki: Slider (tick and follow-circle rules). <https://osu.ppy.sh/wiki/Sliders>

[55] **A** osu! wiki: Lazer feature comparison (slider head and tail changes).

https://osu.ppy.sh/wiki/de/Client/Release_stream/Lazer/Feature_comparison

[56] **A** osu! wiki: Upgrading to lazer (feature comparison, including built-in tablet area adjustment and difficulty adjustment).

https://osu.ppy.sh/wiki/Help_centre/Upgrading_to_lazer

[57] **A** osu! wiki: Local offset. https://osu.ppy.sh/wiki/en/Offset/Local_offset

[58] **A** osu! wiki: Keyboard bindings (offset keys, Tab and Shift+Tab). https://osu.ppy.sh/wiki/en/Keyboard_Bindings

[59] **A** osu! wiki: Performance points (skill values, score weighting, update history).

https://osu.ppy.sh/wiki/en/Performance_points

[60] **A** osu! wiki: No Fail (score multiplier; miss-based pp penalty since January 2021).

https://osu.ppy.sh/wiki/en/Game_modifier/No_Fail

[61] **A** osu! global performance rankings (checked 22 September 2026: mrekk, Ivaxa, cryshina, Akolibed, NINERIK, milosz, lifeline, Zylice in the top eight; ferret irl at 24). <https://osu.ppy.sh/rankings/osu/global>

[62] **C** osu! forum post listing every mod by category with score multipliers.

<https://osu.ppy.sh/community/forums/posts/9662463>

[63] **A** osu! wiki: Accuracy (accuracy formula). <https://osu.ppy.sh/wiki/Accuracy>

[64] **A** ppy/osu pull request #20963 (UR estimation assuming normally distributed hits). <https://github.com/ppy/osu/pull/20963>

- [65] **C** Railey2 (2017), “The reason why ‘never retry’ is (probably) bad advice”, osu! forum, with data gathered by abraker and a 2020 reanalysis by Full Tablet in the same thread. <https://osu.ppy.sh/community/forums/topics/676392>
- [66] **C** jesse1412 (2012, edited to 2014), How to improve at osu! (osu! forum): the most-read improvement guide of the early 2010s, with contributions and argument from thelewa, darkmiz, kriers, tom69, winber1, Soly, Aqo and others. <https://osu.ppy.sh/forum/t/99612>
- [67] **C** Almost (around 2020), “Guide to Streaming: From Zero to Hero” (osu! forum): a staged streaming course with accuracy, flow aim, speed, and stamina training, plus gates for each stage. <https://osu.ppy.sh/community/forums/topics/1121473>
- [68] **C** osu! forum reply proposing Relax and Autopilot as diagnostic tools for separating aim problems from accuracy problems, plus drills for unstable rate on slow maps and for straight-line cursor paths. <https://osu.ppy.sh/community/forums/posts/3134088>
- [69] **C** yellowbadbeast, osu! forum reply distinguishing skillcap (playing outside your comfort zone, roughly 87 to 95% accuracy) from consistency (high accuracy inside it), and arguing for a mix of both. <https://osu.ppy.sh/community/forums/posts/10059166>
- [70] **C** Kaoru, osu! forum guide on posture, settings, audio, and grip for players at any level. <https://osu.ppy.sh/forum/p/3960231>
- [71] **C** osu! forum thread on new-player practice strategy, with replies from WalkingAbacus and FrostyF on comfort zone versus skill pushing and on accuracy targets for beginners. <https://osu.ppy.sh/community/forums/topics/1589199>
- [72] **C** ScarletStory (2014), “Why you aren’t improving at osu!” (osu! forum), with replies from thelewa, ethox, AmaiHachimitsu, Legxis, WOLOLOXIII and others. The second of the two most-read improvement guides of the early 2010s. <https://osu.ppy.sh/community/forums/topics/187364>
- [73] **C** osu! forum discussion of burst vs. stream terminology. <https://osu.ppy.sh/community/forums/posts/9111933>
- [74] **A** osu! news (January 14, 2021): Performance points updates (No Fail change from a flat 10% to a miss-based penalty). <https://osu.ppy.sh/home/news/2021-01-14-performance-points-updates>
- [75] **A** osu! news (July 2021): Performance Points & Star Rating Updates (strain peak weighting; damping of short spikes). <https://github.com/ppy/osu-wiki/blob/master/news/2021/2021-07-27-performance-points-star-rating-updates.md>
- [76] **A** ppy/osu-wiki pull request adding the September 2024 Performance Points & Star Rating Updates news post. <https://github.com/ppy/osu-wiki/pull/12159>
- [77] **A** osu! news (March 6, 2025): Performance Points & Star Rating Updates. <https://osu.ppy.sh/home/news/2025-03-06-performance-points-star-rating-updates>
- [78] **A** osu! news (October 29, 2025): Performance Points & Star Rating Updates. <https://osu.ppy.sh/home/news/2025-10-29-performance-points-star-rating-updates>
- [79] **A** osu! news (July 3, 2026): Performance Points & Star Rating Updates. <https://osu.ppy.sh/home/news/2026-07-03-performance-points-star-rating-updates>
- [80] **A** ppy/osu GitHub wiki: Latency and unlimited frame rates (lazer caps draw and update at 1,000 Hz). <https://github.com/ppy/osu/wiki/Latency-and-unlimited-frame-rates>
- [81] **A** ppy/osu issue #8165 (developer comment: lazer runs input on its own thread at about 1,000 Hz, separate from drawing). <https://github.com/ppy/osu/issues/8165>

Tools, drivers, and firmware

- [82] **E** McOsu (Steam / GitHub): a standalone osu!-compatible client with practice features including speed and difficulty overrides, used by some players for slowed-down technique practice. Not tested for this book. <https://github.com/McKay42/McOsu>
- [83] **T** osu! trainer (FunOrange, GitHub): open-source tool for making modified copies of beatmaps. <https://github.com/FunOrange/osu-trainer>
- [84] **T** OpenTabletDriver (GitHub): open-source, cross-platform, user-mode tablet driver. <https://github.com/OpenTabletDriver/OpenTabletDriver>

- [85] T hawku/TabletDriver releases (GitHub): the older osu! tablet driver; last release v0.2.3. <https://github.com/hawku/TabletDriver/releases>
- [86] E Custom tablet firmware and filter toggles by Shaveet (supports PTK-470, PTK-670, PTK-870, CTL-472, and CTL-672 per the site). Not tested for this book. <https://files.shav.it/osu/tablet/>
- [87] E Custom tablet firmware site listed in BTMC's video description (CTL-472, CTH-480, CTL-4110 per the description). Not tested or reviewed for this book. <https://xstarry.dev/firmware>
- [88] E CNX Software: hands-on write-up of the SayoDevice O3C Hall-effect keypad for osu! (magnetic switches, rapid trigger, 0.05 mm actuation steps, advertised 8,000 Hz polling, on-board screen). Manufacturer specifications, not independent measurements. <https://www.cnx-software.com/?p=166248>
- [89] E Manufacturer explainer on Hall effect (magnetic) switches: contactless sensing, adjustable actuation from about 0.1 to 4.0 mm, rapid trigger, and its popularization by Wooting. <https://pav.nuphy.com/blogs/journal/what-is-magnetic-switch>

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