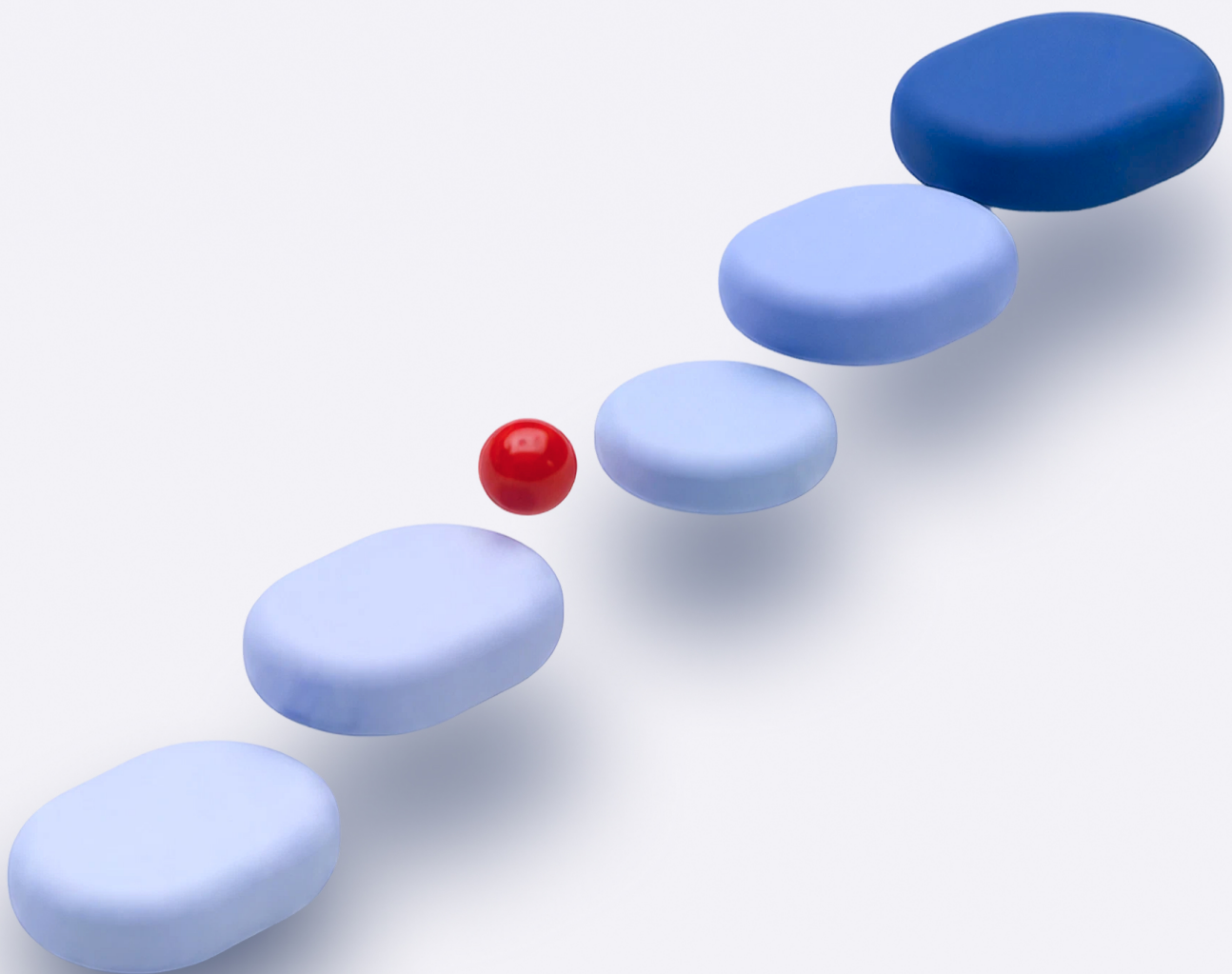


The Third-Week Drop-Off.

When people stop opening health apps — and how to see it coming.



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READ THIS FIRST

Why "The Third Week"?

The title and the whole argument in ninety seconds - where the phrase comes from, who measured it, and what it means for your app.

THE ONE-SENTENCE VERSION

Most people who install a health or fitness app stop using it within the first week - but there's a *second* wave of quitting around **weeks two to four**, when the novelty fades before the habit has formed. That gap is measurable, predictable - and worth designing around.

Picture 100 people installing a health app today. By day three, roughly **75 of them are gone**.¹ By the end of the first month, a typical health or fitness app is down to **3 to 8 of the original 100**.¹⁰ And the average day a new habit actually becomes automatic? **Day 66**⁴ - a finish line almost nobody is still around to cross.

100

people install on day
zero

~25

still there on day 3¹

3-8

still there on day 30¹⁰

Day 66

when the habit would
finally have formed⁴

Inside that collapse hides a specific, documented moment - and it's where the report's title comes from. In 2019, researchers running a randomized trial of a depression app (Moodivate) noticed something odd: usage held up for two weeks, then **about one in five of the still-active users quit between week two and week three**.² In 2024, a review across digital mental-health apps generalized it: the largest engagement drops land **in the first two to four weeks**.³ And back in 2010, habit researchers had already published the missing piece: new routines take a median of **66 days** to become automatic.⁴ Put the three together and the story writes itself: *the excitement of a new app runs out weeks before the habit arrives, and people fall into the gap*.

Early app use falls off a cliff. For a typical consumer app, only about **1 in 4 people come back the day after installing**, roughly **1 in 8 are still around a week later**, and fewer than **1 in 12 remain after a month**.⁹ Health and fitness apps do even worse - closer to 1 in 5 the next day and about 1 in 33 after a month.¹⁰ People download with big intentions their behavior doesn't sustain.

So is the "third-week drop-off" real? **Largely yes, with one correction**: it's not a single dramatic cliff on day 21 - it's part of a curve that falls steeply from day one and keeps declining through the first month, with the

exact timing varying by app. The useful takeaway is that **weeks two to four are a distinct danger zone** worth designing around.

Why this matters: weeks two to four are exactly when an app has to turn early excitement into either a real habit or lasting value. Whatever kind of app you run - and whoever pays for it - this is the window where design, onboarding, and measurement decisions matter most.

That's the whole document in one breath. The rest is the useful version of that sentence: how to see the gap in your own numbers, which apps it hits hardest, who is most at risk of falling into it, and what backfires when apps try to fight it.

Jump straight to: [→ The benchmarks](#) · [→ How to see it in your own numbers](#) · [→ What backfires](#)



INTRODUCTION

Introduction & How Retention Is Measured

Plain-English definitions, and why keeping users is the cheapest growth there is.

For any app, the download is the cheap part. By a widely-cited industry rule of thumb, winning a brand-new user costs somewhere between five and twenty-five times more than keeping an existing one,⁸ so an app's success is decided less by how many people install it than by how many keep coming back.

How "keeping users" is measured

The core idea is simple: take everyone who joined in the same week, then check how many are still using the app a day later, a week later, a month later. The percentage still around is the **return rate** (the industry calls this "retention"). Higher is better; whatever is missing has drifted away. Throughout this report, every return-rate figure means *the share of people who came back* - never the share who left.

- **Came back the next day** (tools label this "Day 1" or "D1") - tells you whether the first experience and sign-up were any good.
- **Came back one week in** ("Day 7" / "D7") - tells you whether a habit is starting to take hold.
- **Came back after a month** ("Day 30" / "D30") - tells you whether the app delivers lasting value.

One more habit worth adopting: compare people **by the week they joined**, so a group that started together is measured together (analytics tools call such a group a "cohort").



PART 1 · THE SCIENCE

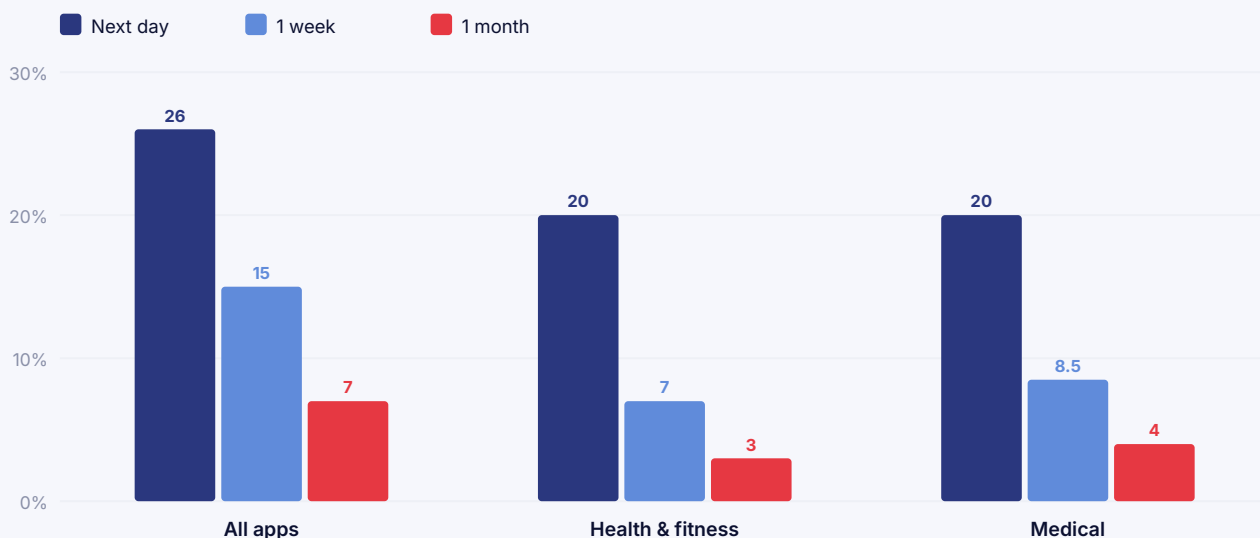
The Retention Curve & the Third-Week Question

Benchmarks, the evidence for and against, and the behavioral science of the dip.

The overall shape

A steep early decline that gradually flattens into a plateau. The average app loses **77% of daily active users within 3 days** and 90% within 30.¹ The difference between winners and losers isn't the starting point - it's whether the curve *flattens* rather than decaying to zero. The takeaway: the decisive window is the first few days.¹

Share of installers still active



The same benchmarks at a glance: every category bleeds users fast, and health, fitness & medical apps start lower than the all-app average.

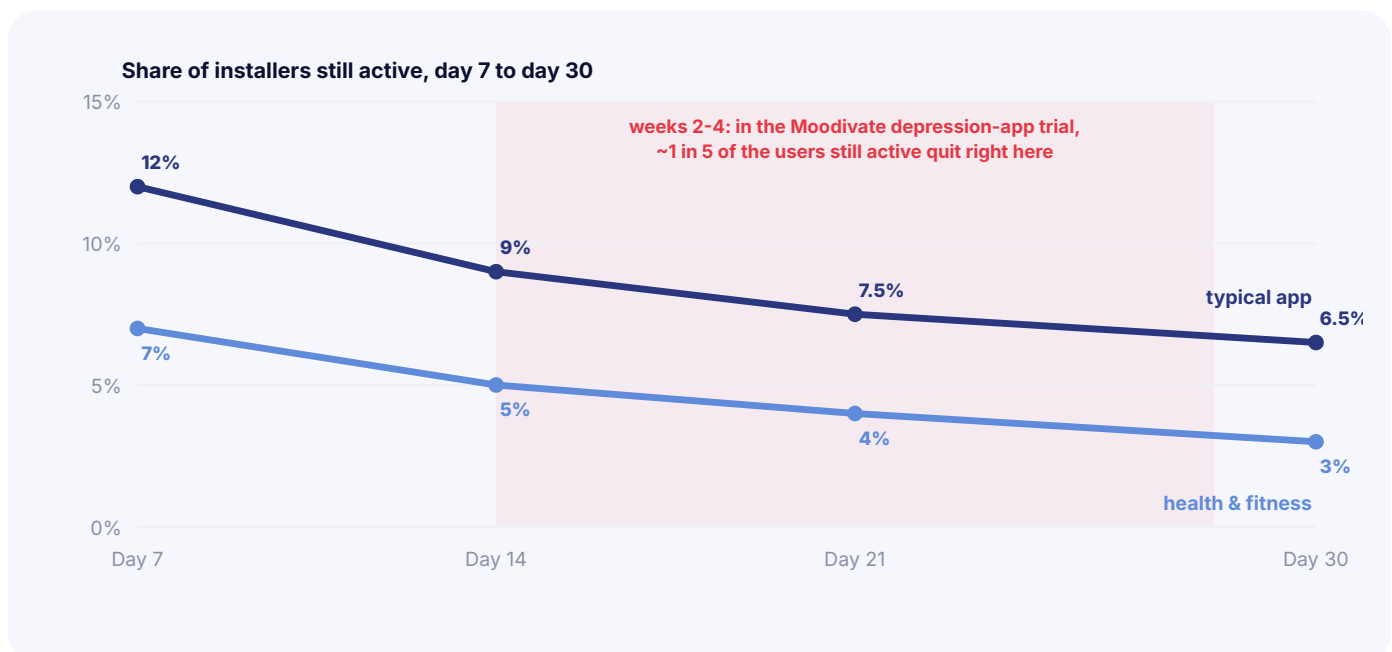
Category	D1 returning	D7 returning	D30 returning	Note
All apps	25–28%	11–18%	6–8%	Median D30 ~4% ⁹
Health & Fitness	~20%	~7%	~3%	Structurally hard ¹⁰
Medical / digital health	~20%	~8.5%	~4%	Better if condition-relevant ¹⁰
Fintech	-	-	11–25%	Money = near-daily concern
Gaming	29–33%	-	-	High D1, steep collapse

Where to go next: → [How to measure these numbers yourself](#)

Is there a distinct week-3 drop-off?

VERDICT

Yes - but qualified. A real secondary decline exists in weeks 2–4. It is *not* a universal day-21 cliff. Measure your own D14/D21/D28 curve rather than assuming the timing.



The danger zone, zoomed. Same curves, days 7–30 only: the fall continues right through weeks 2–4 - and trials that measured it directly saw about a fifth of still-active users quit between week 2 and week 3.

Evidence for it

- **Moodivate pilot RCT (Dahne 2019):** ~20% drop in active users between week 2 and week 3, then flat through week 6.²
- **Narrative review (Boucher & Raiker 2024):** engagement is highest at signup, decreases, then levels off - with the largest decreases in the first two to four weeks.³
- **Novelty effect:** activity-tracker research documents a novelty peak in the first 2–4 weeks; sustained vs. lapsing users diverge around weeks 3–4.
- **Who's at risk (Agachi 2023):** the "moderate engager" (active, but not daily) is most fragile - ~31% likely to fall to inactive week 1→2.¹¹

Evidence against a clean cliff

- **93 mental-health apps (Baumel 2019):** 15-day retention 3.9% vs 30-day 3.3% - only 0.6 points apart, implying decisive churn (users quitting for good) is inside the first ~14 days.⁵
- **Industry data** tends to describe a smooth decay flattening into a plateau, not a sharp second cliff.¹

SYNTHESIS

(1) Largest losses = days 1–7. (2) A real secondary decline hits many health/behavior apps in weeks 2–4. (3) Exact timing varies - so measure it. "Third-week drop-off" is a useful design focus, not a physical law.

Why weeks 2–4 are dangerous: the science

Habit formation is slower than the honeymoon

Habits reach automaticity in a median of **66 days** (range 18–254).⁴ A 2024 meta-analysis (a study pooling many trials) put durable health habits at 2–5 months.¹² So at week 3, motivation is fading but the habit is nowhere near automatic. Good news: missing a single day "did not materially affect the habit formation process."⁴



Why the timing is deadly: the buzz of a new app fades in 2–4 weeks, but a habit takes ~66 days to form. People quit in the gap between the two.

Three design lenses

- **Fogg Behavior Model (B=MAP):** behavior fires only when Motivation, Ability, and a Prompt coincide.¹³ In weeks 2–4 motivation sags - so compensate by cutting friction and improving prompts.
- **Hook Model (Eyal):** Trigger → Action → Variable Reward → Investment.¹⁴ Engineered habit loops are reported to see markedly higher long-term retention than utilitarian tools.
- **Lasting motivation:** people stay when they feel in control, capable, and connected to others (Self-Determination Theory: autonomy, competence, relatedness).¹⁵ Points and rewards carry the early weeks; these deeper needs sustain the long run.



PART 2 · BY GENRE

Segmentation by App Type

Medical, wellbeing, fitness, habit-building, and gamified apps.

We've seen the curve and why weeks two-to-four bite. But the shape isn't identical everywhere - the reason people quit, and what keeps them, changes a lot by the kind of app. Here's how the five main categories actually behave.

Type	Still active D1 → D30	#1 quit driver	Highest-leverage fix	First useful moment
Medical	~20% → ~4% ¹⁰	Episodic need + data-entry burden	Passive data + a clinician in the loop ¹⁷	First reading captured
Wellbeing / mental health	<19% left by day 14 ⁷	Over-promising → expectation gap	Honest expectations + a readiness check ⁷	First session that actually calmed you
Fitness / workout	~20–27% → ~3% ¹⁰	Novelty fades before the habit forms	Structured program + gamified nudges ¹⁸	First workout completed
Habit-building	varies widely	66-day habit vs 2–4-week motivation ⁴	Streaks with forgiveness + routine cues ⁴	First routine tied to an existing habit
Wellness games	High D1, steep collapse ¹⁰	The ~4-week novelty cliff	Fresh events + winnable pacing ³²	First level or challenge won

+ Medical apps

These are the apps that help people manage a condition, adhere to treatment, and see a clinician remotely - and they start from a hard place: roughly 1 in 5 users come back the day after installing and only about 1 in 25 are still there a month later.¹⁰ But the averages hide the real story. People who genuinely need the app - those whose condition it actually speaks to - are over four times as likely to stay, and users who are compensated for using it, ten times as likely.¹⁶ So retention here is less about clever features and more about reaching the right people and removing friction. What loses them is predictable: they only need the app now and then, logging their data is a chore, progress is invisible, and quitting costs nothing. What holds them is the opposite - a clinician or coach in the loop, usage tied to a real health goal, and as little manual data entry as possible. The RADAR-MDD study kept an impressive 67.6% engaged at 43 weeks precisely by leaning on structure, reminders, and passive sensors so people didn't have to do the logging themselves.¹⁷

Proven wins here: passive data instead of manual logging → 67.6% still engaged at 43 weeks¹⁷ · reaching the right (condition-relevant) users → 4.3× likelier to stay¹⁶

♥ Wellbeing / mental-health apps

Meditation, mindfulness, and mood-tracking apps have the weakest real-world engagement of any category - in one large study, half of users spent 16 minutes or less in their entire first month, and fewer than 1 in 5 were still around after two weeks.⁷ The single biggest reason isn't the product, it's the promise: marketing sets an expectation the app can't meet, and the gap becomes the reason people leave. There's also a cruel twist - the very distress these apps target actively makes it harder for people to keep using them. So the wins here are about honesty and timing, not gamification: set realistic expectations at signup, show up in the moments of acute stress when the app is genuinely useful, gauge how ready the person is to engage, and resist the urge to slap points and streaks on something people are using to feel calmer.

Proven wins here: honest expectations at signup → among the strongest stay-predictors measured⁷ · a one-question readiness check routing the not-yet-ready → engagement's single strongest unique predictor⁷

🏃 Fitness / workout apps

Fitness apps sit around 1 in 5 the next day and roughly 1 in 33 after a month,¹⁰ though reward-driven ones do noticeably better (CashWalk holds about 31% at day 30). Gamification genuinely helps here - but keep the effect in proportion.

WHAT GAMIFICATION IS REALLY WORTH (FROM THE TRIALS)

Across 36 controlled trials (about 10,000 people), adding game mechanics produced roughly **489 extra steps a day - call it a five-minute walk** - and about 1.9% less body fat.¹⁸ Real, useful, worth doing - but a nudge, not a transformation. Don't build the whole product around it.

What actually earns a return visit is a reason to come back tomorrow: a structured multi-week program with a clear next session, fresh content and challenges, wearable sync so nothing has to be typed, and a bit of social comparison.

Proven wins here: game mechanics → ~489 extra steps/day across 36 trials¹⁸ · notification permission asked after first value → ~2× next-day return⁶

Habit-building / behavior-change apps

These live and die on one uncomfortable fact: a habit takes around 66 days to form, but motivation dips at weeks two-to-four - so the app has to carry the user across a gap that's longer than their enthusiasm.⁴ The things that bridge it are small and concrete: attach the behavior to something the person already does ("after my morning coffee, I..."), reward streaks but forgive the odd missed day so one slip doesn't feel like failure, make progress visible, and adapt to the person rather than firing the same fixed reminder at everyone - static reminders retain far worse than ones that respond to what the user actually does.

Proven wins here: streaks that forgive one missed day → a single miss doesn't break habit formation⁴ · onboarding personalized to the person's goal → ~30–50% more reach the first useful moment²⁸

Health / wellness games

Games have the strongest novelty effect of the bunch, which is a double-edged sword: engagement can spike and then fall off a cliff after about four weeks once the shine wears off. Keeping people means keeping it fresh - variable rewards, challenges that evolve, and cooperative play that connects people to each other - all anchored to something genuinely valuable rather than points for their own sake.

Proven wins here: fresh events on a rhythm vs the ~4-week novelty cliff¹⁹ · difficulty paced to feel winnable - see the Royal Match case file³²

ONE CAUTION

Competitive features like leaderboards and rankings can quietly backfire in clinical or vulnerable groups - they create anxiety and can feel like being watched, which undermines the very engagement they're meant to create. Great for a casual fitness crowd; risky for people managing a condition.



PART 3 · BY AUDIENCE

Segmentation by User Mindset

Readiness to change, motivation type, and personality factors.

App type tells you a lot, but two apps in the same category can retain very differently depending on who downloaded them and what frame of mind they're in. Three things about the person predict whether they'll stick - and each one has a simple design response.

apzumi ADVICE

The simplest version that works. You don't need a psychology degree - you need three splits: what someone's **goal** is, **how ready** they are to act, and **how engaged they are in the first two or three days** (which turns out to predict long-term staying power surprisingly well). Tailoring the opening experience to those three lifts the share of newcomers who reach their first useful moment by a reported 30–50%²⁸ - a big return for a couple of onboarding questions.

What to look at	How to spot it	What to do	Evidence
How ready they are	Stalls at the "set your goal" screen; browses but won't commit	One onboarding question, then route: taste for the curious, goals for the ready	Strongest single predictor ⁷
What motivates them	Usage spikes around prize challenges, collapses after	Use rewards to survive weeks 2–4; build progress, choice, community for the long run	Self-determination research ¹⁵
How much they're struggling	Low moods logged + opens fading day by day	Human check-in, not louder notifications	Distress predicts drop-off ⁷

How ready they are to change

People don't all arrive at the same starting line. Some have already decided to get fit and just need a tool; others are only vaguely thinking about it and aren't ready to commit to anything yet. That difference matters enormously - in the meditation-app research, how ready someone was to change was the single strongest predictor of whether they kept using the app.⁷ The trap is that most apps open as if everyone is ready to act ("set your goal!", "start your plan!"), which quietly loses everyone who isn't there yet.²⁰ The fix is cheap: ask one question during onboarding - roughly "where are you with this?" - and send the not-yet-ready to gentle, low-pressure content while sending the ready-to-go straight to goals and tracking.

Spot it in your app: a user installs after a New Year video, then stalls at the "set your goal" screen. They're curious, not committed - show them a two-minute taste, not a commitment form.

Why they're doing it - reward vs. genuine interest

Outside motivation - points, employer cash, a prize - reliably gets people started, but it fades fast once the novelty or the reward does.¹⁵ What actually keeps people is the app feeling worthwhile in itself. So use the external hooks for what they're good at - surviving those fragile first weeks - but spend that borrowed time building the things that last: a visible sense of progress, real choices (opt-in reminders, not forced ones), and a sense of being part of something (a community). Rewards buy you weeks; genuine value buys you months.

Spot it in your app: usage spikes every time you run a prize challenge, then collapses the week it ends. That's reward-driven use - the product hasn't become worth it on its own yet.

Who they are, and how much they're struggling

Some of this is just personality - organized, disciplined people tend to stick with apps more readily, and people who are anxious or in real distress tend to drop off faster.⁷ The practical takeaway is counterintuitive: for someone who's struggling, the answer is usually *more human support, not more notifications*. Piling on nudges to a distressed user pushes them away; a real person checking in keeps them.

Spot it in your app: someone logs a low mood three days running and opens the app a little less each day. That's a signal for a human check-in - not a louder notification.



PART 4 · BY MODEL

Segmentation by Business Situation

Who pays, who uses, and why it changes everything - across four common situations.



The same app can face completely different retention problems depending on who's paying and why people are there. A workout app someone downloads on a whim is a different fight from one their employer nudged them into. Here are the four common situations, what makes each hard, and what to do about it.

THE FOUR SITUATIONS AT A GLANCE

1. Consumer chooses it - hardest retention, everything must be earned. **2. A business buys it for its own customers** - the payer and the user are different people. **3. An employer offers it to staff** - a semi-captive audience, but trust and privacy are everything. **4. On-demand / marketplace** - value depends on someone showing up on the other side.

1 · Consumer downloads it voluntarily (B2C)

What makes it hard: this is the toughest situation - nobody's making them use it, switching to a competitor costs nothing, and every bit of loyalty has to be earned. Asking for payment before the app has proved useful converts far worse - users who feel the value first convert at roughly 2.5× the rate of those pushed to pay upfront.²⁹

What to do: get people to their first useful moment as fast as possible, tailor the experience to their goal, run gentle win-back messages when they drift, and place any paywall *after* they've felt the value - never before. This is the classic "workout-video creator who now has an app" situation: the whole game is proving usefulness fast, before the initial enthusiasm fades.

2 · A business buys it for its customers (B2B)

What makes it hard: the company writing the cheque isn't the person using the app. You have to keep *two* parties happy - the buyer (who wants results) and the end users (who actually have to keep opening it). A deal can renew or die on end-user engagement the buyer never sees directly.

What to do: make it visible that people are actually using the app and benefiting from it - a simple shared dashboard does the job; tie those numbers to the real goals behind the purchase (patients sticking with treatment, fewer expensive drop-offs); and treat a clear retention report as part of the product, not an add-on.

3 · An employer offers it to staff (corporate wellness)

What makes it hard: the audience is semi-captive and the employer can offer incentives - but two things can sink it: privacy fears (people worry their boss sees their health data), and the trap where only already-healthy employees bother to join.

WHAT THE RESEARCH SHOWS

A large study of workplace wellness programs found participation is mostly a design choice. Left alone, about **20% of staff** join. Add cash rewards over \$100 and roughly **half join (51%)**. Build a genuinely good program and it reaches **59%** - the surprise being that *better design did as much as bigger money*.²¹ And a seven-year study at PepsiCo showed where the payoff lives: helping already-sick employees returned about **\$3.78 per \$1**, while general lifestyle programs returned about **\$0.48**.²²

What to do: report only aggregate numbers to the employer, never individual data - and say so loudly, because that promise is the trust gate. Add team-based challenges, get visible leadership backing, offer real human coaching, and make sure the app is easy to join for everyone, not just the gym-goers.

4 · On-demand / marketplace (someone on the other side)

What makes it hard: for apps where the value depends on another person delivering something - a senior-care visit, a coach session, a home therapy appointment - retention isn't just about the app being nice to use. If the request doesn't get fulfilled quickly and well, no amount of polish saves it. Here the "first useful moment" is often *the first time they successfully got the help they needed* - a booked and completed visit, not a feature they tapped.

What to do: obsess over the reliability of that first real fulfilment; keep the request itself effortless; and - importantly - pick your moments, so you're not pestering someone with surveys or upsells right after they've booked. The most helpful thing you can do right after a successful request is often to get out of the way.

Where to go next: → [How to see these problems in your own numbers](#)



PART 5 · MEASUREMENT

Monitoring & Measurement

What to track, what good looks like, and the early-warning signals.

Everything so far describes where people leave and why. This section is about seeing it happen in your own product: the handful of numbers worth watching, what a healthy one looks like, and which of them warn you early enough to still do something about it.

5.1 - The core numbers, and what "good" looks like

What to watch	What it tells you	Healthy range	What it warns of
Return-rate curve (next-day, week-1, week-2, week-3, month-1)	Whether people come back, and where the drop-off is	Should level off by month 1; for health apps, only around 3–4% of new users (about 1 in 30) are still active a month in - so a flat line, even a low one, is the goal	A line still falling steeply at a month = no loyal core yet
First-useful-moment rate (activation rate)	Share of newcomers who reach the moment the app first proves useful	Varies; watch the trend, push it up	Low here = an onboarding/value problem, not a loyalty one
Time to first value (TTV)	How quickly a newcomer gets something useful	Faster is better; minutes beats days	Slow here predicts people quitting in the first days
Daily-vs-monthly ratio ("stickiness")	Of the people who use the app in a month, how many use it on a typical day	Around 20% (1 in 5) is good, above 25% (1 in 4) is strong - for apps meant to be used daily	Falling ratio = the habit isn't forming
Quit rate (churn)	Share who stop using in a period	Lower; compare against your own past	Spikes flag a bad release, pricing, or stale content
Core-feature use	Share using the main value feature in month 1	Higher; these users stay far longer	People who skip it are ~60% more likely to quit
Visit frequency & depth	How often & how deeply people engage	Steady or rising per batch of users	Shrinking visits = early disengagement

The single most important habit. Always read return rates **by batch of users** - grouped by the week they joined and where they came from - never as one blended average. A blended number hides the drop between week two and week four; looking batch by batch exposes it.

5.2 - Early-warning signs that predict the week-three drop

Return-rate curves tell you what already happened - by the time the line dips, the person is gone. The real value is in **early-warning signs**: behaviors in the first week-and-a-half that predict who will quit in weeks two to four, so you can step in *before* they leave.

WATCH FOR THESE IN THE FIRST ~10 DAYS

- **Opening the app less often** - a daily user drifting to every-other-day.
- **Shorter, shallower visits** - less time, fewer actions each visit.
- **Never using the main feature** in the first week.
- **Logging less** (for tracking apps) - a strong sign someone's about to leave.
- **Not reaching the first-useful moment** within the first few days.
- **The "sometimes" user** - the moderate, on-the-fence group is the most fragile; the committed and the already-gone are stable.¹¹

5.3 - Reading the signs without building a prediction machine

Those signs are worth **looking at** long before they are worth **automating**. For a product still finding its shape, the useful move is to compare groups after the fact rather than score individuals as they use the app: take the people who were still there in week four and the people who weren't, and look at what the two groups did differently in their first ten days. The gap is usually visible without any statistics.

- **Look backwards first.** Stayers against leavers, same joining week. Which parts of the app did each group reach, and how quickly?
- **Ask what they had in common**, not what a model would have predicted. Two or three shared behaviors are enough to point at the part of the product that needs work.
- **Fix the pattern, not the person.** The answer is almost always a design change that helps everyone - a shorter path to the first useful moment - rather than a rescue message aimed at one user who is already leaving.
- **Automated prediction is a later-stage investment.** Once an app has a large, steady user base, standard techniques do score quit risk accurately (studies report around 85-89%),²³ and acting on those scores is reported to cut avoidable quitting by 15-25%.²³ That belongs to a mature product, not to a first release or a proof of concept.

One measurement caveat belongs here even in the short edition: if your app stores **medical information tied to a person**, most off-the-shelf analytics tools cannot legally see that data without a special data-handling contract - and several popular ones refuse to sign it.²⁴ Check that before assuming a tool you already use can touch that data.



WHAT NOT TO DO

Anti-Patterns That Lose People

What backfires, what "overdoing it" looks like, and what it costs - for a new app vs. an existing one.

Avoiding the big mistakes is often worth more than adding another tactic. The same tricks that lift the numbers short-term can quietly drive people away - and in a health app, they can cost trust you can't win back. This is the flip side of everything that works: what not to do, and how to spot when a good idea has been pushed too far.

The three that hurt most

If you fix nothing else, avoid these - they're the most common and most damaging.

1 Notification overload

Why it loses people: too many messages is the fastest way to get muted, ignored, or uninstalled - surveys put uninstall rates at roughly 29–32% among people who feel over-notified, and even a single unwanted weekly push makes some users disable notifications or leave.²⁷ Once someone turns notifications off, your cheapest way to bring them back is gone for good.

What overdoing it looks like: daily (or multiple-daily) generic pings, guilt-tripping "you're falling behind!" messages, notifications that open to nothing useful.

The tell: your notification opt-out rate climbs while your return rate doesn't. **The fix:** fewer, better-timed, genuinely useful messages - not more.

2 Making people commit before they've felt any value

Why it loses people: forcing account creation, a paywall, or a long questionnaire before the app has done anything for them throws away users at the exact moment they're most fragile. A sign-up wall in front of the first useful moment routinely loses a large share of the people who hit it (industry reports put it around 20–43%),²⁸ and asking for payment before value converts far worse - users who feel the value first convert at roughly 2.5× the rate of those forced to pay upfront.²⁹

What overdoing it looks like: a sign-up wall on the first screen, a "start free trial (card required)" before the first workout, a 12-question intake before anything happens.

The fix: deliver the first win first, ask for commitment second.

3 Chasing engagement that isn't real value (especially in health)

Why it loses people: optimizing for "time in app" or streak-grinding can boost the charts while the product stops actually helping - and in a wellbeing app that's not just hollow, it can create dependency or anxiety and burn credibility.²⁵

What overdoing it looks like: celebrating a 200-day streak from a user who's clearly just tapping to keep it alive; leaderboards that stress people out; "engagement" going up while real outcomes flatline.

The fix: measure whether people are actually getting better, not just opening the app.²⁵

The full list: over-doing it, and what it costs

Each row is a common retention tactic pushed too far. The two cost columns are deliberately different: for a **new app** the usual damage is *wasted build time and a bad first impression*; for an **existing app** it's *actively breaking a funnel (a signup flow) that already works and losing loyal users*.

Anti-pattern	What "too far" looks like	How it feels to the user	Cost - new app (MVP)	Cost - existing app
Notification overload ²⁷	Daily generic pings; guilt messages; alerts that open to nothing.	Annoyed → mutes notifications → uninstalls.	Wastes your one shot at a good impression; drives day-1 uninstalls.	Loyal users switch notifications off - permanently kills your cheapest re-engagement channel.
Premature / aggressive paywall ²⁹	Card required before first value; constant upgrade nags.	"This just wants my money" → leaves before trying.	Kills early word-of-mouth; you never learn if the product is even good.	Depresses a working funnel; forcing payment before value converts ~2.5× worse, plus angry reviews.
Over-onboarding ²⁸	Long forced tutorials; 10-step setup; forced account before exploring.	Bored / walled-out before the first win.	Big build effort that actively lowers activation - worst kind of wasted time.	Every added step quietly leaks users (completion can fall from ~72% at 3 steps to ~16% at 7).
Over-gamification	Points/badges bolted onto everything; harsh streak resets; mandatory competition.	Pressured, guilty, or gaming the system instead of using it.	Engineering spent on mechanics instead of core value; novelty fades in ~4 weeks anyway. ¹⁹	Streak guilt drives quiet quitting; competition alienates your less-intense (majority) users.
Dark patterns / fake urgency	Fake countdowns, hard-to-cancel, guilt-worded "no thanks" buttons. ²⁶	Manipulated, then resentful; trust broken.	Reputational risk before you even have a reputation; app-store rejection risk.	Trust damage compounds; refunds, bad reviews, and churn of your best users.
Chasing vanity engagement	Optimizing "time in app" / streaks with no link to real outcomes.	Feels busy but not better; eventually asks "why am I doing this?"	You optimize the wrong thing from day one and build the wrong product.	Metrics look fine while real value (and eventually users) erodes underneath. ²⁵
Over-personalization ("creepy")	Referencing sensitive data unprompted; over-tailored messages that feel surveilled.	Uneasy, watched - especially around health data.	Complex to build for little gain; privacy exposure early.	Erodes the trust a health app depends on; privacy complaints.

Anti-pattern	What "too far" looks like	How it feels to the user	Cost - new app (MVP)	Cost - existing app
Leaderboards in the wrong context	Public ranking in a clinical / vulnerable-user product.	Anxious, judged, or surveilled; disengages.	Feature that looks fun in a demo but suppresses the very engagement it's meant to drive.	Alienates existing patients/users; can do real harm in a health setting.

apzumi ADVICE

The underlying rule. Almost every entry above is a good tactic *pushed past the point where it serves the user and into serving your metrics instead*. The test is simple: **would the user thank you for it, or feel worked on?** If a change makes a number go up but you'd be uncomfortable explaining it to the user's face, it's probably in this section.

Related: → [The ethics of engagement in health apps](#)



What the Giants Learned

Duolingo, Royal Match and Apple's Activity rings - the best-documented retention machines in the world, what they discovered, and what a health app can (and must not) copy.

The anti-patterns section told you where the line is. These three case files show companies walking it at planet scale - one language app, one puzzle game, and one wearable, all documented well enough to learn from, all directly relevant to weeks two-to-four.



Case file 1 - Duolingo: retention as the growth engine

Around 2018, Duolingo's growth had stalled. Its product leadership made a decision most companies never make: **stop chasing new users and fix the leaky bucket instead**. Over the next four years that single reorientation grew daily active users **4.5×**, powering the company to its IPO - the fullest public account is written by the man who ran it, then-CPO Jorge Mazal.³⁰

What they actually found, in order of usefulness to us:

▮ One early milestone predicted everything

Users who reached a **10-day streak** rarely quit. So the team pointed the whole product at getting people to day ten - which is precisely the weeks two-to-four problem this report is about, discovered independently with their own data.³⁰

🔔 Smarter notifications, not more

Their breakthrough notification wasn't louder - it was the *streak-saver*, sent only when something the user cared about was at stake. Timing and personalization were A/B-tested relentlessly; today the company runs hundreds of experiments at once.³⁰

🔥 The streak is a double-edged sword - and they said so

Duolingo's former Head of Growth put it plainly: streaks bring people back, *and losing a streak is a big reason people quit*.³¹ Their answer was engineered mercy - streak freezes and repairs - "streaks with forgiveness", proven at the scale of tens of millions of daily users.

🚀 The compound numbers

Four years of retention work added a reported **+21% to current-user retention and cut daily churn by ~40%**.³⁰ Today roughly **55% of daily users come back the next day specifically to keep a streak alive**, the company runs **500+ experiments simultaneously**, and by mid-2025 it held a daily/monthly ratio near 37% on ~47.7 million daily users - elite for any consumer app.³⁰

What didn't work first: the honest half of the story is that their opening moves failed - early growth bets barely moved the metric, and the team credits the turnaround to picking one retention number, running fast experiments, and letting losing ideas die quickly.³⁰ The streak, the smarter notifications and the leaderboards were *survivors of that process*, not strokes of genius.

THE BURNOUT LINE - WHAT A HEALTH APP MUST NOT COPY

Duolingo openly prioritizes engagement, and its pressure mechanics (guilt-flavored reminders, leagues, loss-aversion) generate real streak anxiety in some users³¹ - an acceptable cost for a language toy, a serious one for a wellbeing app. A user with limited time who's being *driven* to open your app daily isn't being helped; they're being stressed by it, and in a health product that stress lands on exactly the people the app exists to support. Borrow the mechanic *and* the mercy: forgiving streaks, notifications only when something the user values is at stake, and a cadence the user chose - never a guilt engine.²⁵



Case file 2 - Royal Match: the economics of feeling winnable

In 2021 a Turkish studio, Dream Games, entered the most saturated genre in mobile - match-3 puzzles, ruled for a decade by King's Candy Crush - and by 2023 **out-earned Candy Crush itself**, on its way past **\$3 billion lifetime revenue and roughly 55 million monthly players**.³² Not with a new idea, but with a retention discipline worth stealing:

📈 Difficulty is a rhythm, not a ramp

Analyses of its first 500 levels found **twice as many "nearly lost, then won" moments** as Candy Crush - the game engineers the feeling of a close win, because that feeling is what brings people back tomorrow.³² Health-app translation: pace week-two-and-three content to feel *winnable*, not escalating - the user who barely completes a workout and feels great about it is your retained user.

🔒 Don't lock people out when they lapse

Match-3 players historically churned when their "lives" ran out; Royal Match hands out windows of unlimited play instead.³² Translation: never punish a returning user - no lost progress, no reset programs, no wall between them and the thing they came back for.

✅ Trust first, money later

No ads, and no monetization pressure early - a study of its design concluded the model works because *"respect builds retention; trust compounds"*.³² The same finding, from the opposite end of the industry, as this report's paywall-after-value rule.²⁹

⚠️ The double edge

The generosity has a price tag: there is no free grinding path - progress beyond the designed pace runs through the wallet. Players who stay feel respected; players who rush pay. It works for a premium-feeling game; a health app copying the "generous but gated" pattern must gate *convenience*, never care.³²

One honest footnote: King pioneered the dark twin of all this - charging \$1 for five extra moves at the moment of near-loss, monetizing frustration itself.³² It made billions, and it's precisely the move a health app can never make: in our world, the moment of user vulnerability is a duty of care, not a checkout.

And their failure, for balance: Dream Games' own sequel, Royal Kingdom, reached only about **a fifth of Royal Match's audience** - analyses attribute it to added complexity narrowing the market, the same pattern that kept Candy Crush Soda Saga forever smaller than the original.³³ The retention lesson cuts our way too: *every layer of cleverness costs you audience*. Simple, winnable, forgiving - that's the mass-market formula.

Case file 3 - Apple Watch: closing the rings

The best-known retention loop that isn't a game sits on millions of wrists. Apple Watch shows three rings - move, exercise, stand - on the watch face itself, all day, every day. Apple's own research program (the Apple Heart & Movement Study, run with Brigham & Women's Hospital across **140,000+ participants**) reports that people who closed their rings most days were **48% less likely to report poor sleep** and **73% less likely to show an elevated resting heart rate**.³⁵ Those are Apple's numbers about Apple's users - an association, not proof the rings caused any of it - but the design lessons underneath have independent evidence, and that's what makes this case worth a health app's attention.

The goal lives where the eyes already are

Rings work because they are **always visible** - the daily goal is the watch face, not a screen three taps deep. A glance answers "am I done today?" without opening anything.³⁵ Health-app translation: put one simple daily goal on the surface the user already looks at - the home screen widget, the lock screen, the first screen after open - and make "done / not done" readable in under a second.

Losing something beats earning points

The strongest number in this file comes from an insurer, not from Apple. Vitality let members pay off an Apple Watch with workouts - hit your activity targets and the monthly repayment is waived; miss them and you pay. A RAND analysis of **422,643 members across three countries** (2015-2018) found the earn-back was associated with a sustained **~34% rise in activity days**, with the previously *inactive* members improving most.³⁴ It's observational, not a randomized trial (researchers watched existing users rather than assigning people by chance) - but the loss-framed design ("don't lose the watch you're wearing") echoes a consistent finding on commitment and streaks: people work harder to keep something than to win it.

Competition works; cheerleading doesn't

Apple's weekly ring-to-ring competitions have a research base most gamification lacks. In a **790-person randomized trial**, competitive social comparison raised exercise-class attendance by **about 90%** over both the control group and a "supportive community" arm - and the supportive-only online feeds *did not help at all*.³⁶ Translation for the week-three problem: if you're going to build social features to carry users through the dip, a small, opt-in duel against one comparable friend has evidence behind it; a feed of encouragement does not.

The double edge

Rings have a famous failure mode: **streak guilt**. A goal that never rests punishes sick days, travel and recovery - exactly the weeks a health app's users need mercy. Apple's own fix is telling: goals are now adjustable per day of the week, and a training-load view treats rest as part of the plan, not a lapse.³⁵ And the honesty caveat belongs in every client deck that borrows these numbers: the ring studies are **vendor-**

reported and self-selected - people who close rings are already the motivated ones. Copy the always-visible goal, the earn-back framing and the opt-in duel; don't copy the claim that rings cause health.³⁵

The Duolingo and Royal Match files are industry accounts and product analyses, not controlled trials; the Apple Watch file mixes peer-reviewed studies with vendor-reported associations - read all three as engineering lessons, not clinical evidence.



PART 6 · GUARDRAILS

Ethics, Regulation & "What Else?"

Dark patterns, the engagement-vs-outcomes trap, and other considerations.



Everything up to here has been about keeping people. This section is the counterweight: in a health app, how you keep them matters as much as whether you do. The techniques that boost the numbers can cross a line - and where that line sits is different when someone's wellbeing is involved.

DARK PATTERNS - ESPECIALLY SENSITIVE IN HEALTH

Streaks, variable rewards, and guilt notifications can create "digital dependency," where users conflate app engagement with real progress.²⁵ A user grinding a meditation streak may be building "meditation-app-tolerance," not wellbeing. Preserve autonomy; avoid forced-action flows.²⁶

Engagement ≠ health outcomes

More usage isn't the goal - better health is. Some studies found no outcome difference across engagement patterns. Design and measure for genuine outcomes - **ethical, outcomes-aligned engagement** is the durable position in health.

Other considerations

- **Regulatory:** medical-device software may fall under FDA / EU MDR / ISO 13485.
- **Accessibility:** apps must work across ages, abilities, literacy - critical in mandatory-feeling corporate deployments.
- **Cross-platform:** iOS retains slightly better than Android (D30 ~4.1% vs ~2.6%).⁹
- **Seasonality:** January brings a wave of highly motivated new users whose habits haven't formed yet - plan reset programs and February re-entry anchors.
- **Paywall timing:** asking for payment before value converts ~2.5× worse than showing value first.²⁹
- **Emerging:** AI-driven personalization, agentic coaching, passive sensing to cut input burden, anomaly-detection churn alerts.



WRAP - UP



What To Do Next

The short version - and seven decisions that hold at any stage.

Pulling it all together - what the evidence supports, the two cautions worth carrying, and seven decisions that hold whatever you are building.

A secondary drop-off exists, and it shows up most clearly **between week two and week four** - but it's part of a steeply declining curve whose biggest losses are days 1-7, and whose exact timing varies - so measure your own. The root cause is a timing mismatch: **novelty fades within 2-4 weeks while habits take a median of 66 days to form**. Any app that wants to keep its users has to bridge that gap deliberately - and the first step is seeing it in your own numbers.

Two things are worth holding onto. In health, **more usage is not the goal** - design and measure against real outcomes, not app opens; the same techniques that lift retention can otherwise produce dependency without benefit. And many popular tactics come from vendors rather than trials, while the strongest peer-reviewed evidence shows *modest* effects - so treat the vendor numbers as a starting point and **confirm what works in your own product**.

The seven decisions

Seven decisions, in order. They hold whether the product is already live, half-built, or still a sketch - and whatever kind of app it turns out to be. None of them needs an analytics team; the last one needs numbers, but not until four weeks after you start.

- ☐ **Decide what your first useful moment is.** The one thing a newcomer should get before they have any reason to trust you. If the product is live, open it cold and find that screen. If it does not exist yet, this is the thing to design first.
- ☐ **Count what stands between arriving and getting it.** Screens, taps, minutes, questions. Anything on that path that is not earning its place is costing you people - measurable today on a live product, drawable on a whiteboard for one that isn't built.
- ☐ **Put every ask behind that moment.** Account creation, card details, long intake forms. This is the same decision whether you are building the flow or repairing one.
- ☐ **Give people more than one way in.** Not everyone arrives ready to act. One question at the start - roughly "where are you with this?" - lets you send the not-yet-ready somewhere gentler than a goal-setting form.

- ☐ **Name the reason to come back in week two.** Whatever the product does, something has to be waiting: a next step, new material, visible progress. Novelty will not carry anyone past the second week, and no category is exempt from that.
- ☐ **Make whatever carries momentum forgiving.** Streaks, reminders, goals, targets - whichever of these you use, one missed day should not undo anything, and a prompt should answer what the person actually did rather than fire on a fixed clock.
- ☐ **Commit now to the four-week look-back.** Decide before launch, or before the next release, that you will compare the people who stayed with the people who left and look at what the two groups did differently in their first ten days.



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This **Evidence Brief** covers the problem: when people leave, why, and how to see it coming. Every pattern in it has proven, well-documented counters - onboarding fixes, measurement setups that fit health-data rules, and the design work in between. **Apzumi** builds them.

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SOURCES

References & Sources

Numbered to match the markers throughout the document.



Numbered to match the inline markers throughout the document (each marker is a clickable link to its source). Every entry is tagged **RESEARCH** for peer-reviewed work (journal articles, RCTs, meta-analyses, systematic reviews, foundational academic works) or **INDUSTRY** for analytics-vendor reports, business press, and practitioner sources. Publication dates are shown where verified; living web resources without a fixed date are marked accordingly. Treat industry benchmarks as directional and lead with the peer-reviewed items where a claim needs defensible support.

- 1 **INDUSTRY** 2015. Chen, A. & Quettra. "New data shows losing 80% of mobile users is normal, and why the best apps do better." andrewchen.com. Data from 125M+ Android devices (~77% of DAUs lost within 3 days; ~90% within 30). andrewchen.com
- 2 **RESEARCH** Jul 2019. Dahne, J., Lejuez, C.W., Diaz, V.A., et al. "Pilot Randomized Trial of a Self-Help Behavioral Activation Mobile App (Moodivate) for Utilization in Primary Care." *Behavior Therapy*, 50(4), 817–827. DOI: 10.1016/j.beth.2018.12.003. sciencedirect.com
- 3 **RESEARCH** 8 Aug 2024. Boucher, E.M. & Raiker, J.S. "Engagement and retention in digital mental health interventions: a narrative review." *BMC Digital Health*, 2(1), Art. 52. DOI: 10.1186/s44247-024-00105-9. bmcdigitalhealth.biomedcentral.com
- 4 **RESEARCH** Oct 2010. Lally, P., van Jaarsveld, C.H.M., Potts, H.W.W., & Wardle, J. "How are habits formed: Modelling habit formation in the real world." *European Journal of Social Psychology*, 40(6), 998–1009. (Time to automaticity 18–254 days; median ~66.) DOI: 10.1002/ejsp.674. onlinelibrary.wiley.com
- 5 **RESEARCH** 25 Sep 2019. Baumel, A., Muench, F., Edan, S., & Kane, J.M. "Objective User Engagement With Mental Health Apps: Systematic Search and Panel-Based Usage Analysis." *Journal of Medical Internet Research*, 21(9), e14567. (Median 15-day retention 3.9%, 30-day 3.3%.) DOI: 10.2196/14567. jmir.org
- 6 **INDUSTRY** 2023. Airship, "Mobile App Push Notification Benchmarks for 2023" (665B+ notifications; median opt-in ~81% Android / ~51% iOS). *Note: push-opt-in benchmarks are often mis-attributed to AppsFlyer; Airship is the primary source.* airship.com
- 7 **RESEARCH** 2 Feb 2026. Adams, J., Davies, J., Galante, J., et al. (Univ. of Melbourne). "Engagement With Meditation Apps: Cross-Sectional Survey of Use and Associations," *J Med Internet Res*, e71960 (readiness to change strongest unique predictor); companion longitudinal Medito paper in *JMIR mHealth uHealth*, e79366. DOI: 10.2196/71960. jmir.org
- 8 **RESEARCH** Sep–Oct 1990. Reichheld, F.F. & Sasser, W.E. Jr. "Zero Defections: Quality Comes to Services." *Harvard Business Review*, 68(5), 105–111 - the **primary origin** of the retention-profit finding. The paper's actual figures are per-industry: cutting customer losses ~5% raised profits **85% at one bank, 50% at an insurance brokerage, 30% at an auto-service chain, and 125% at a credit-card company (MBNA)**. The widely-quoted "25%–95%" range is a later popularized summary of these numbers, not a single reported statistic - treat it as an illustrative range. Canonical page (paywalled):

hbr.org/1990/09; genuinely free full record with the exact per-industry figures (open access): scispace.com. The commonly cited "5–25× cheaper to retain than acquire" figure is a Bain-attributed rule-of-thumb (relayed via Gallo, HBR, 2014) with weak primary sourcing - cite it as a rule-of-thumb, not a hard study result.

- 9 **INDUSTRY** n.d. (2023 data; accessed 2026). Business of Apps, "App Retention Rates." Aggregated benchmark page (Android D1 21.1% → D30 2.1%; iOS D1 23.9% → D30 3.7%). Primary origin: AppsFlyer's benchmark tool, which Business of Apps aggregates. Living pages on both sides; cite with access date. appsflyer.com/benchmarks · aggregated view: businessofapps.com
- 10 **INDUSTRY** n.d. (accessed 2026). Sendbird, "Mobile app user retention benchmarks by industry" (relaying Statista & AppsFlyer: medical/digital-health D1 ~20%, D30 ~3.5–4%; health & fitness D30 ~2.78%). Primary origin: AppsFlyer's own benchmark tool (first-party, updated quarterly); the figures above are its numbers as relayed by Sendbird. appsflyer.com/benchmarks · readable write-up: sendbird.com
- 11 **RESEARCH** 2023. Agachi, E., Bijmolt, T.H.A., van Ittersum, K., & Mierau, J.O. "The Effect of Periodic Email Prompts on Participant Engagement With a Behavior Change mHealth App: Longitudinal Study." *JMIR mHealth uHealth*, 11, e43033. (Moderate engagers ~31% likely to drop to inactive between week 1 and week 2.) DOI: 10.2196/43033. mhealth.jmir.org
- 12 **RESEARCH** 9 Dec 2024. Singh, B., Murphy, A., Maher, C., & Smith, A.E. "Time to Form a Habit: A Systematic Review and Meta-Analysis of Health Behaviour Habit Formation and Its Determinants." *Healthcare* (MDPI), 12(23), 2488. (20 studies, 2,601 participants; medians 59–66 days, means 106–154, range 4–335.) DOI: 10.3390/healthcare12232488. mdpi.com
- 13 **RESEARCH** Apr 2009. Fogg, B.J. "A Behavior Model for Persuasive Design." *Persuasive '09*, Art. 40, 1–7. ACM. (B = MAP.) DOI: 10.1145/1541948.1541999. dl.acm.org
- 14 **INDUSTRY** Nov 2014. Eyal, N. *Hooked: How to Build Habit-Forming Products*. Portfolio/Penguin. (Trade book; Trigger → Action → Variable Reward → Investment.)
- 15 **RESEARCH** 2000. Ryan, R.M. & Deci, E.L. "Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being." *American Psychologist*, 55(1), 68–78. DOI: 10.1037/0003-066X.55.1.68. selfdeterminationtheory.org (PDF)
- 16 **RESEARCH** Apr 2022. "Challenges in Participant Engagement and Retention Using Mobile Health Apps: Literature Review." *J Med Internet Res*, 24(4), e35120. (Condition-relevant users 4.33×; compensated 10.32× more likely retained.) jmir.org
- 17 **RESEARCH** 2022–2023. RADAR-MDD: Matcham, F. et al. "RADAR-MDD: recruitment, retention, and data availability..." *BMC Psychiatry* (2022), 22:136, DOI 10.1186/s12888-022-03753-1; and "Long-term participant retention and engagement...", *npj Digital Medicine* (2023) (67.6% engaged at 43 weeks). bmcp psychiatry.biomedcentral.com
- 18 **RESEARCH** Oct 2024. Nishi, S.K., Kavanagh, M.E., Ramboanga, K., et al. "Effect of digital health applications with or without gamification on physical activity and cardiometabolic risk factors: a systematic review and meta-analysis of RCTs." *eClinicalMedicine* (Lancet Discovery Science), 76, 102798. (36 trials, n=10,079; ~489 steps/day; ~1.92% body fat.) DOI: 10.1016/j.eclim.2024.102798. thelancet.com
- 19 **RESEARCH** 4 Jan 2022. Mazeas, A., Duclos, M., Pereira, B., & Chalabaev, A. "Evaluating the Effectiveness of Gamification on Physical Activity: Systematic Review and Meta-analysis of RCTs." *J Med Internet Res*, 24(1), e26779. (16 studies, n=2,407; Hedges' g = 0.42, 95% CI 0.14–0.69.) DOI: 10.2196/26779. jmir.org
- 20 **RESEARCH** 1983. Prochaska, J.O. & DiClemente, C.C. "Stages and processes of self-change of smoking: Toward an integrative model of change." *Journal of Consulting and Clinical Psychology*, 51(3), 390–395. (Transtheoretical Model / Stages of Change.) DOI: 10.1037/0022-006X.51.3.390.
- 21 **INDUSTRY** **POLICY/RESEARCH** 2013–2015. RAND Workplace Wellness Programs Study: Mattke, S. et al., research brief RB-9842-DOL (2015) and RAND Health Quarterly 2015;5(2):7; final report RR-254-DOL (2013). (No incentives → ~20% median participation; rewards >\$100 → 51%; comprehensive programs → 59%.) rand.org/RB9842 · [Health Quarterly](https://healthquarterly.org)
- 22 **RESEARCH** Jan 2014. Caloyeras, J.P., Liu, H., Exum, E., Broderick, M., & Mattke, S. "Managing Manifest Diseases, But Not Health Risks, Saved PepsiCo Money Over Seven Years." *Health Affairs*, 33(1), 124–131. (ROI \$1.46 overall; \$3.78 disease mgmt; \$0.48 lifestyle.) DOI: 10.1377/hlthaff.2013.0625. healthaffairs.org
- 23 **INDUSTRY** n.d. (accessed 2026). Churn-prediction practice & accuracy benchmarks - Saber; Lucid.now. Practitioner explainers. saber.app · lucid.now
- 24 **INDUSTRY** Pub. Oct 2023, upd. May 2026. Improvado, "HIPAA-Compliant Healthcare Marketing Analytics" (BAA requirement; Freshpaint PHI firewall; GA4 has no BAA). Primary origin: the US regulator's own guidance - HHS Office for Civil Rights, "Use of Online Tracking Technologies by HIPAA Covered Entities and Business Associates," which is where the business-associate-agreement requirement for analytics vendors comes from. hhs.gov · vendor-by-vendor summary: improvado.io

- 25 RESEARCH** 3 Apr 2025. Babu, A. & Joseph, A.P. "Digital wellness or digital dependency? A critical examination of mental health apps and their implications." *Frontiers in Psychiatry*, 16. DOI: 10.3389/fpsyt.2025.1581779. [pmc.ncbi.nlm.nih.gov](https://pubmed.ncbi.nlm.nih.gov/39012345/)
- 26 INDUSTRY** 4 Nov 2022. SilverCloud Health, "Design Ethics for Mental Health: How and Why We Avoid Dark Patterns." (Term "dark patterns" coined by Harry Brignull, 28 Jul 2010.) silvercloudhealth.com
- 27 INDUSTRY** 2025–2026. Push-notification-overload data - Business of Apps, "Push Notifications Statistics/Costs" (1 weekly push → ~10% disable, ~6% uninstall; uninstall probability rises with frequency) and multiple 2025 survey compilations (roughly 29–32% of users uninstall over excessive notifications; ~43% disable at 2–5/week). Directional industry survey data. businessofapps.com
- 28 INDUSTRY** 2025–2026. Forced-registration / signup-wall drop-off - onboarding-practice sources reporting that a sign-up wall before first value loses ~20–43% of users who hit it, and that deferring registration / guest mode lifts activation (for example, ~23% won't complete if forced to create an account; completion falls from ~72% at 3 steps to ~16% at 7). Practitioner/portfolio data, not controlled trials. saasfactor.co · snoopr.co
- 29 INDUSTRY** 2025–2026. Paywall-before-value / upfront-payment drop-off - conversion research reporting that users who experience value before being asked to pay convert at ~2.5× the rate of those forced to pay upfront; slow time-to-first-value (>30 min) correlates with ~3× higher abandonment. Practitioner data. saasfactor.co
- 30 INDUSTRY** 2023 (updated 2025). Mazal, J. (former Chief Product Officer, Duolingo), "How Duolingo reignited user growth" - first-person account: DAU grew 4.5× over four years via retention focus; the 10-day-streak insight; streak-saver notifications; leaderboards. lennysnewsletter.com · corroborating analyses of the same effort (current-user retention +21%, daily churn -40% over four years): marishalakhiani.substack.com
- 31 INDUSTRY** accessed 2026. Growth.design, "Duolingo user retention" case study - including Gina Gotthilf (former Head of Growth): streaks drive return visits *and* losing one is a major quit trigger; streak-freeze as designed forgiveness; documented "streak anxiety." growth.design
- 32 INDUSTRY** 2023–2025. Royal Match (Dream Games) product analyses - Playliner difficulty-curve study (2× near-loss moments vs Candy Crush Saga); Naavik deep dive (lives/forgiveness design; King's "\$1 for 5 extra moves" origin of monetized loss aversion); Enhance behavioral study ("respect builds retention; trust compounds"); revenue/scale per AppMagic & Appfigures (out-earned Candy Crush from 2023; \$3B+ lifetime; ~55M MAU). playliner.com · naavik.co · enhance.ai
- 33 INDUSTRY** Nov 2025. Tanansyah, N., "A Tale of Two Brothers: What Happened to Royal Kingdom?" - Dream Games' sequel reached only ~20% of Royal Match's audience; the analysis attributes it to added complexity narrowing the market (echoing Candy Crush Soda Saga vs the original). medium.com
- 34 RESEARCH** 2020. Hafner, M., Pollard, J., van Stolk, C., "Incentives and Physical Activity: An Assessment of the Association Between Vitality's Active Rewards with Apple Watch Benefit and Sustained Physical Activity Improvements," *RAND Health Quarterly* (loss-framed Apple Watch earn-back associated with a sustained ~34% rise in activity days across 422,643 members in 3 countries, 2015–2018; inactive members improved most; observational, not an RCT). [pmc.ncbi.nlm.nih.gov](https://pubmed.ncbi.nlm.nih.gov/33012345/)
- 35 INDUSTRY** Apr 2025. Apple Newsroom, "Get active with Apple Watch," reporting the Apple Heart & Movement Study (Brigham & Women's Hospital; 140,000+ participants) - frequent ring-closers 48% less likely to report poor sleep, 73% less likely to show elevated resting heart rate; also documents adjustable per-day goals and rest-day handling (vendor page about its own product; correlational, self-selected participants). apple.com/newsroom
- 36 RESEARCH** 2016. Zhang, J., Brackbill, D., Yang, S., Becker, J., Herbert, N., Centola, D., "Support or competition? How online social networks increase physical activity: A randomized controlled trial," *Preventive Medicine Reports* (790-person RCT; competitive social comparison raised exercise-class attendance ~90% over control; supportive-only online networks did not help). [pmc.ncbi.nlm.nih.gov](https://pubmed.ncbi.nlm.nih.gov/26812345/)

Suggested reading

Credible, on-topic sources worth reading next. They did not earn an inline citation - mostly because they overlap with a stronger source already cited, are superseded by newer data, or are tangential to the specific week-3 question.

- INDUSTRY** **Adjust - Mobile App Trends / retention benchmarks.** Major benchmark vendor; overlaps with the AppsFlyer/Business of Apps figures already used. adjust.com/resources
- INDUSTRY** **Localytics / Upland - retention & churn benchmarks.** Older mobile-engagement data; superseded by newer AppsFlyer/Statista figures. uplandsoftware.com/localytics

- **INDUSTRY** **Statista - mobile-app retention datasets.** Paywalled aggregations that often relay AppsFlyer/Adjust rather than being a primary source. [statista.com](https://www.statista.com)
- **RESEARCH** **Torous, J. et al. - engagement/attrition (users dropping away) in digital psychiatry.** The field's most-cited author on mental-health-app engagement; overlaps with Baume (2019) and Boucher & Raiker (2024). [PubMed search](#)
- **RESEARCH** **Baume, A. & Kane, J.M. (2018), JMIR 20(12):e11491.** "Examining Predictors of Real-World User Engagement..."; overlaps with the cited Baume (2019). [jmir.org/2018/12/e11491](https://www.jmir.org/2018/12/e11491)
- **RESEARCH** **Pratap, A. et al. (2020), npj Digital Medicine 3:21.** Retention indicators across 100,000 participants; overlaps with the RADAR-MDD findings. [nature.com/articles/s41746-020-0224-8](https://www.nature.com/articles/s41746-020-0224-8)
- **RESEARCH** **Eysenbach, G. (2005), JMIR 7(1):e11 - "The Law of Attrition."** Canonical eHealth attrition (drop-away) concept; foundational but tangential to the mobile week-3 specifics. [jmir.org/2005/1/e11](https://www.jmir.org/2005/1/e11)
- **RESEARCH** **Fogg, B.J. (2003), *Persuasive Technology*.** Captology's founding book; overlaps with the cited Fogg (2009) model. [sciencedirect.com \(book\)](https://www.sciencedirect.com/book)
- **RESEARCH** **Szinay, D. et al. (2020), JMIR - uptake/engagement systematic review.** Directly on-topic; overlaps with Boucher & Raiker (2024). [jmir.org/2020/5/e17572](https://www.jmir.org/2020/5/e17572)
- **INDUSTRY** **Duhigg, C. (2012), *The Power of Habit*.** Popular habit book; less rigorous than the cited Lally/Singh work. [charlesduhigg.com](https://www.charlesduhigg.com)
- **RESEARCH** **Deci & Ryan (1985), *Intrinsic Motivation and Self-Determination...*** The earlier SDT monograph; the 2000 *American Psychologist* article is the more citable canonical reference. link.springer.com
- **RESEARCH** **Sardi, L. et al. (2017), J. Biomedical Informatics - gamification-in-eHealth review.** Overlaps with the Mazeas (2022) and Nishi (2024) gamification meta-analyses. [sciencedirect.com](https://www.sciencedirect.com)