evinlo

EVINLO EXPLAINERS

Movement, explained

How Evinlo compares your steps, active energy, exercise and time in daylight with your own usual range, by this time of day, and why movement has no score.

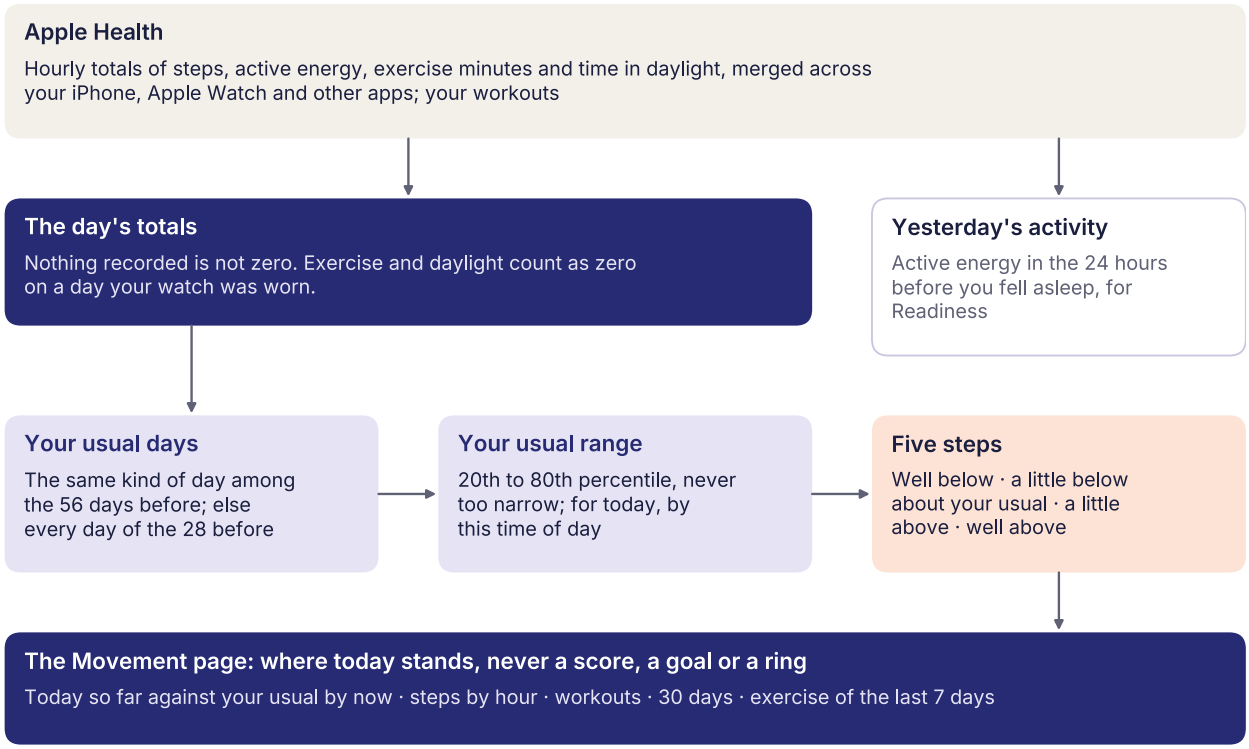


ALGORITHM
Movement 1.0.0

WRITTEN
October 2026

The one-minute version

Evinlo shows where your day stands against **your own usual**: steps, active energy, exercise minutes and time in daylight. There is **no movement score, no goal and no ring**. A quiet day can be exactly right.



How movement is worked out. Apple Health's merged totals become the day's totals; the same kind of day from the weeks before gives your usual range; today is compared with it by this time of day, in five calm steps. Yesterday's activity goes to Readiness.

IN SHORT

- **Apple Health's own totals, never sums.** Your watch and your iPhone count the same steps; Evinlo reads the merged totals the Health app shows.
- **Nothing recorded is not zero.** A day or an hour without data stays empty. Evinlo never guesses a value.
- **Your usual is a range.** The middle of the same kind of day, weekday or weekend day, over the last eight weeks.
- **By this time of day.** Today so far is compared with where your usual days were at the same clock time, and only once enough of a typical day lies behind you.
- **Five steps, no score.** From "well below" to "well above". Yesterday's activity goes to Readiness, where only more than usual costs points.

What goes in

What	Where it comes from	What Evinlo uses it for
Steps	Apple Watch and iPhone, merged by Apple Health	The lead measure: the headline, the bar and the chart
Active energy	Apple Watch (and other apps), merged	A readout; the lead measure for people without steps; yesterday's activity for Readiness; whether the watch was worn
Exercise minutes	Apple Watch	A readout; the week's exercise
Time in daylight	Newer Apple Watch models	A readout
Workouts	Any app that saves workouts	The day's workouts on the page

Evinlo reads hourly totals from Apple Health's statistics, the same merged numbers the Health app shows. It reads no workout distances and no routes, and it sets no goal.

Why there is no movement score

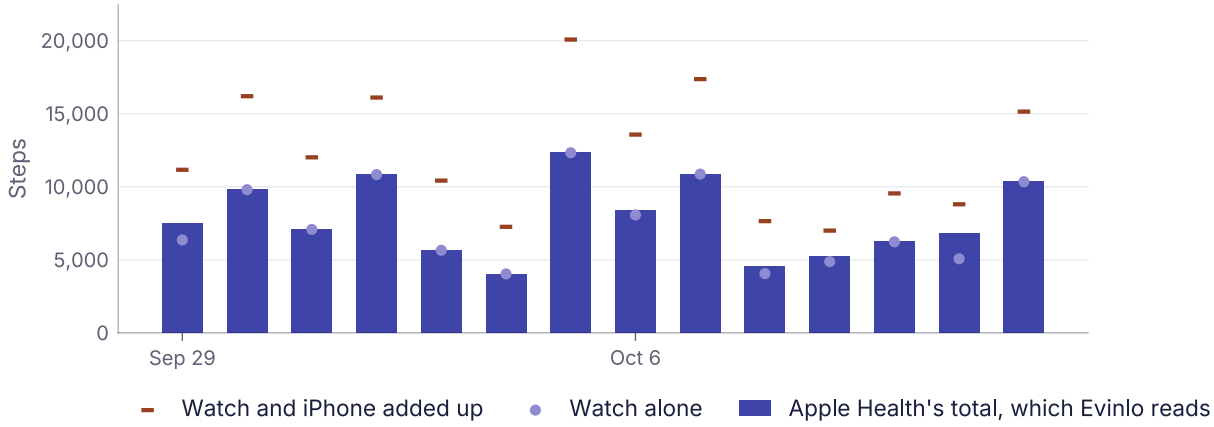
- **A score needs a target, and the evidence gives no sharp one.** The World Health Organization recommends a weekly amount of activity (Bull et al., 2020). For steps, pooled cohorts show the risk falling over a wide range of daily steps, as a curve and not as a threshold (Paluch et al., 2022). A number from 0 to 100 per day would claim a precision this does not have.
- **More is not better every day.** Readiness lowers its score after a clearly more active day. A movement score that rewards the same day would put two numbers on Home that pull in opposite directions.
- **Your usual is not a target.** A habitually quiet person's usual is not a goal, and a rest day is not a bad day.
- **Apple's rings already do goals** on the same devices.

How it works, step by step

Seven steps lead from Apple Health's totals to the page, and one of them on to Readiness. Every example is Maya, the synthetic person of every explainer, on Tuesday 13 October 2026 and the days before it.

Step 1: Apple Health's totals, never sums

Your watch and your iPhone both count steps while you carry both. Adding their samples up would count the same steps twice. Apple Health's statistics merge the sources as the Health app does, and that merged total is the one Evinlo reads.



Maya's steps over the 14 days before Tuesday 13 October. The bars are Apple Health's merged total. Her watch and her iPhone added up would be far above it every day, and on some days the total is above what her watch counted alone, because her iPhone counted while the watch was off.

On Monday 12 October Maya's watch counted 10,347 steps and her iPhone more on top; added up, the two would make 15,141. Apple Health's total, and Evinlo's, is 10,347, exactly the steps the generator gave her. Over these 14 days, adding up would have counted 61% too many on the median day. On 5 of the 14 days the total is above the watch's own count: the iPhone filled in while the watch was off.

Nothing recorded is not zero. A measure without a value on a day has no total. Only exercise minutes and time in daylight are filled in: a day without any of them counts as zero when the watch was worn that day (active energy in at least 10 of its hours; today, as soon as one hour has active energy) and the measure was recorded in the 30 days up to it. Steps and active energy are never filled in.

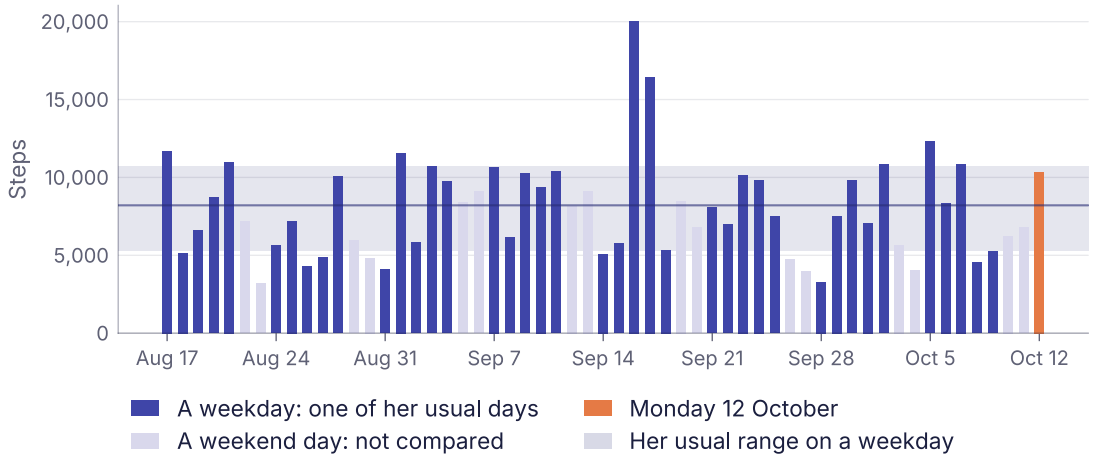
The lead measure is steps. A person without steps in the last 30 days, for example someone whose watch counts wheelchair pushes, sees active energy as the lead instead of an empty page. A measure without any value for 30 days reads "Not recorded"; without steps and active energy for 30 days there is nothing to show, and the page says so.

Step 2: your usual days

A day is compared with days like it:

1. **The same kind of day**, weekday or weekend day by your calendar, among the **56 days before**, when at least **8** of them have a value.
2. Otherwise **every day** with a value among the **28 days before**, when there are at least **14**.
3. Otherwise Evinlo is still getting to know your usual.

A day without a value is skipped, never counted as zero, and a day is never compared with itself or with a later day.



The 56 days before Monday 12 October. Maya's 40 weekdays are her usual days for a Monday; weekend days are left out. The band is the usual range they give for a whole weekday, the line their median.

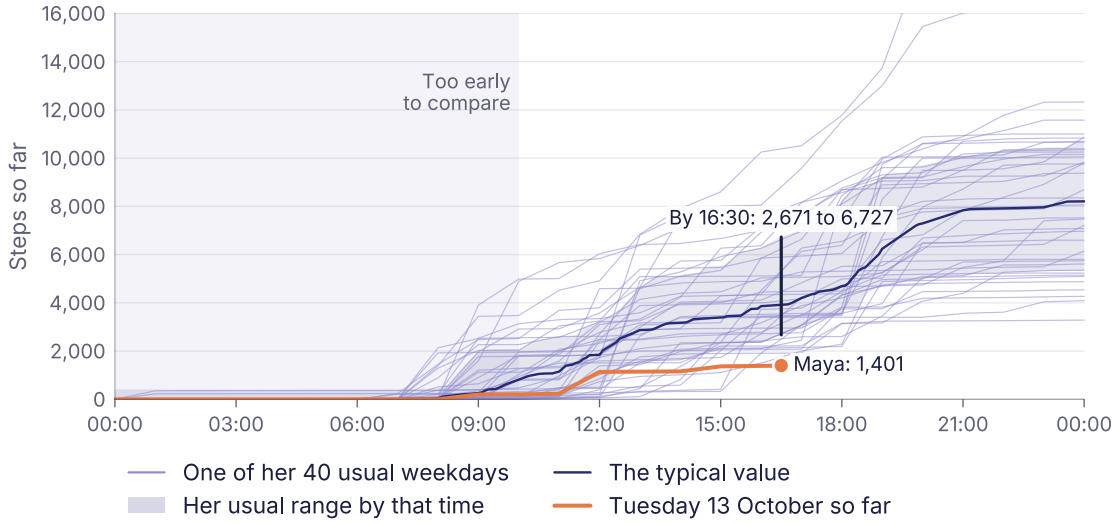
Step 3: your usual range

The range runs from the **20th to the 80th percentile** of those days (the values that a fifth of them lie below and a fifth above), with their **median**, the middle one, as the typical value. So about six of ten such days lie inside it. It is never narrower than a minimum on each side of the typical value: 250 steps, 20 kcal, 5 minutes of exercise or 5 minutes of daylight, or 5% of the typical whole day if that is more. That keeps the range from collapsing for someone whose days are nearly alike.

For Maya's Monday the reference days are 40 weekdays. Their median is 8,208.5 steps and her usual range is 5,328 to 10,722; the minimum on each side would be 410 steps, far less than the range itself. On Monday she walked 10,347 steps, inside the range: **"About your usual for the day"**.

Step 4: by this time of day

For today, every usual day is read at **the same clock time**: its hours before it, and the passed share of the running hour. Today so far is compared with the range those values give. Nothing is forecast: the page says “so far” and “by now”.

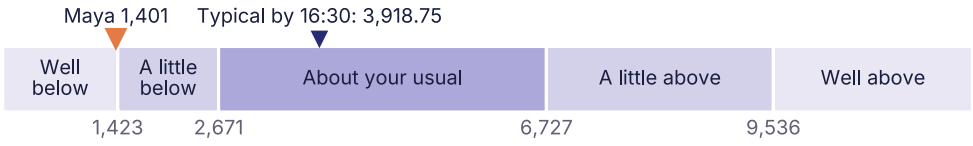


Maya’s 40 usual weekdays, each as its steps so far through the day, and the range they give at every time. Her Tuesday so far is the warm line: 1,401 steps by 16:30, below her usual 2,671 to 6,727 by then. Before 10:00 her usual weekday has less than a tenth of its steps behind it, so nothing is compared.

Too early. While less than a tenth of a typical day lies behind this time of day, nothing is compared: a few hundred steps would decide the words. Maya’s typical weekday holds 8,208.5 steps, so the comparison starts once her usual weekday has 820.85 steps behind it, at 10:00. On a day with a clock change, the hour that occurs twice counts as one clock hour and the skipped hour as nothing.

Step 5: five steps

Inside the range a value reads “about your usual”. Outside it, “a little” above or below. “Well” above or below starts only beyond **twice** the distance from the typical value to that end of the range. A larger value never reads as a lower step.



The five steps for Maya’s steps by 16:30 on Tuesday. Her usual range is 2,671 to 6,727; “well below” starts at 1,423, “well above” at 9,536.

With a typical value of 3,918.75 by 16:30, “well below” starts at 1,423 and “well above” at 9,536. Maya has 1,401 steps, just under: **“A quieter day so far”**. The words differ for today (“by now”) and for a day that is over (“for the day”).

Step 6: what else the page shows

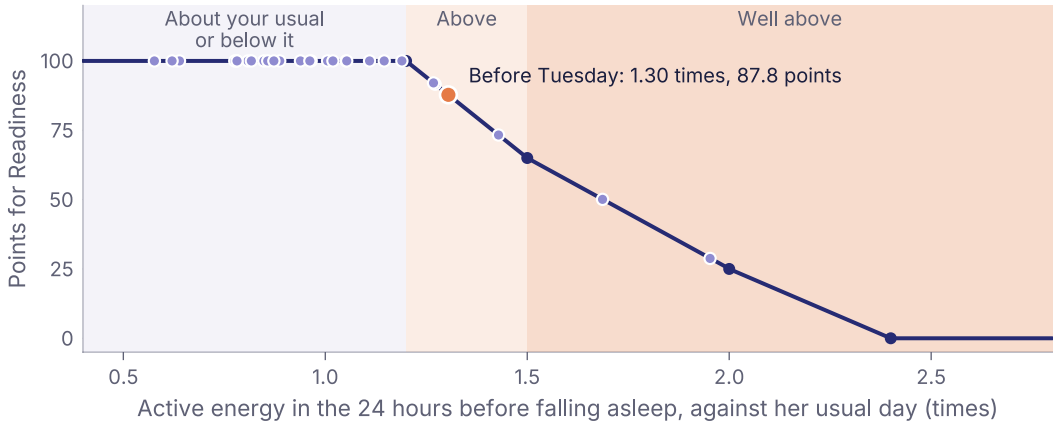
- **Steps by hour** for the whole day; an hour without data is empty, never estimated.
- **The last 30 days** of daily totals; a day without data is a gap. The dashed line is your plain average of the days before.

- **Exercise, last 7 days** as a plain sum, with the World Health Organization's 150 minutes a week named once and never tied to your number.
- **Workouts** that began on the day. Two records of one session, the same activity overlapping by at least half of the shorter one, are one workout: the Apple Watch's record stays, otherwise the longer one.

Step 7: yesterday's activity, for Readiness

Readiness gives yesterday's activity 5% of its weight. Movement defines it, here and nowhere else:

1. **Window:** your active energy in the **24 hours before you fell asleep**, from hourly totals, in proportion at both edges.
2. **Wear:** active energy in at least 10 of those hours; otherwise the part is left out of Readiness.
3. **Your usual day:** the median total of the days your watch was worn (10 hours or more) among the **28 days that end two days before you woke up**, with at least 14 such days. The day before is left out, because most of the window lies on it. The usual counts as at least 150 kcal.
4. **Points:** 100 up to 1.2 times your usual day, 65 at 1.5, 25 at 2, 0 from 2.4, in a straight line in between. Only more costs points: a quiet day earns 100, not more.
5. **Words:** "about your usual or below it" up to 1.2 times, "above" up to 1.5, "well above" beyond. Readiness shows these words, never kilocalories.



The points of yesterday's activity against the ratio of the 24 hours before falling asleep to the usual day. The dots are Maya's last 30 nights; the warm one is the night before Tuesday 13 October.

Maya fell asleep at 23:47 on Monday, so her window ran from 23:47 on Sunday. It held 578 kcal against her usual day of 443 kcal, from 28 worn days: 1.30 times, which earns 87.8 points. Readiness shows the part as 88 points, with "Your active energy in the 24 hours before you fell asleep was above your usual. This part counts for little, so Readiness barely moved." On 23 of the 30 nights her activity earned the full 100.

A worked example

Meet **Maya**, the synthetic person of every explainer: the app's generator made her days, and no part of her comes from a real person. She wears her watch and carries her iPhone. It is **Tuesday, 13 October 2026, at 16:30**, the moment of the screenshots.

Measure	Maya by 16:30	Her usual range by 16:30	Typical by 16:30	Reads
Steps	1,401	2,671 to 6,727	3,918.75	well below: "A quieter day so far"
Exercise	6 min	9.8 to 34.4 min	18 min	a little below
Time in daylight	4 min	6.7 to 32.1 min	15 min	a little below
Active energy	161 kcal	189 to 301 kcal	249 kcal	a little below

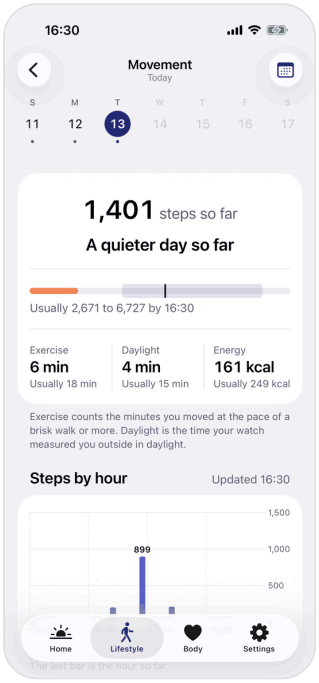
Each range comes from the same 40 weekdays, read at 16:30. Steps lead, so they give the headline; the page shows the other three with "Usually 18 min", "Usually 15 min" and "Usually 249 kcal". It is Tuesday, so every one of her usual days was a weekday. Over the last 7 days she has 3 hr 52 min of exercise. The page names the World Health Organization's 150 minutes a week once, and never ties that number to hers.

The day before, as a whole day. On Monday she walked 10,347 steps against her usual 5,328 to 10,722 on a weekday: "About your usual for the day". She had 1 hr 12 min of exercise, with a walk from 17:31 to 18:10 that appears as her one workout.

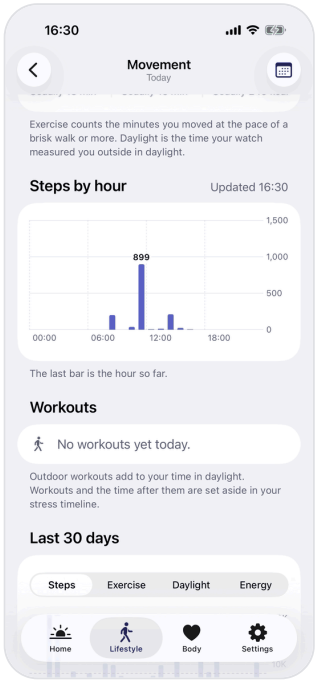
What Readiness took from it. The 24 hours before she fell asleep on Monday held 1.30 times her usual day. Her Readiness of Tuesday shows yesterday's activity at 88 points, above her usual, in a part that weighs 5%: it moved her score by less than a point.

What you see in the app

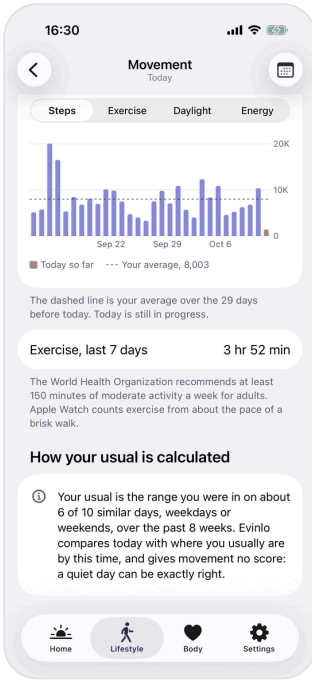
Screenshots of the app's synthetic data mode at 16:30 on Tuesday 13 October. Top: Maya's Tuesday. Bottom: her Monday as a whole day, a person with an iPhone and no watch (1,318 steps so far), and a new person (4 so far of the 14 days a usual range needs).



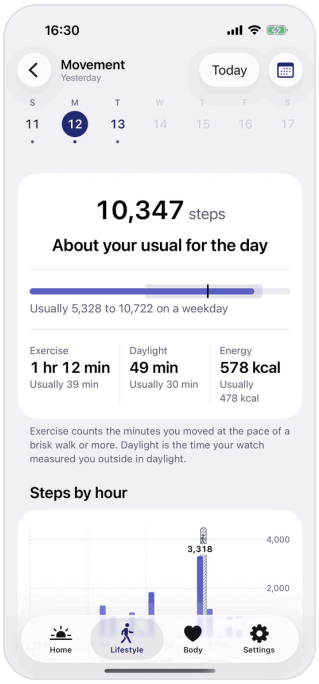
1,401 steps so far, "A quieter day so far", usually 2,671 to 6,727 by this time.



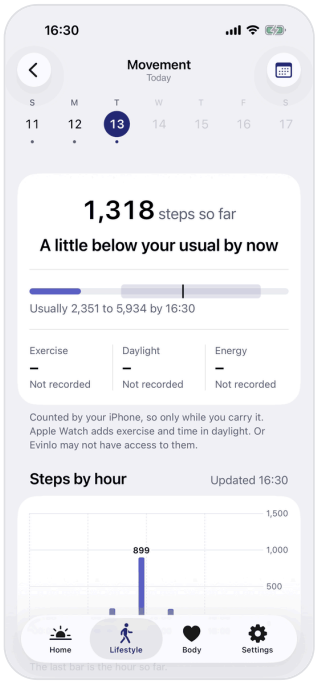
Steps by hour and the day's workouts.



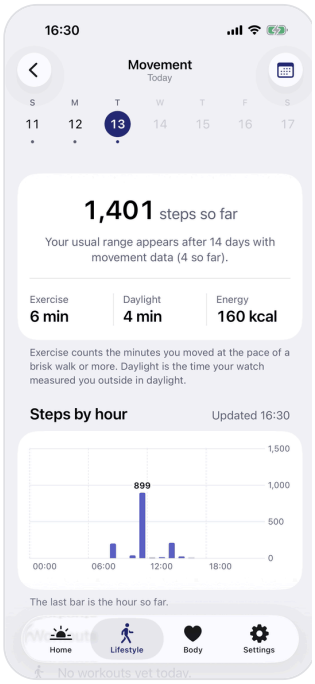
The last 30 days, the week's exercise, how your usual is calculated.



Monday as a whole day: "About your usual for the day".



An iPhone without a watch: steps only.



The first days: no usual range yet.

For the person with an iPhone alone the page says “Counted by your iPhone, so only while you carry it”, and exercise, daylight and energy read “Not recorded”. It never says that a watch is missing: Evinlo may simply not have access.

Honest limits

- **Your usual is not a target.** It describes your recent days, nothing more. A quiet day can be exactly right, and a busy one is not a reward.
- **Devices count differently.** The iPhone counts only while you carry it. Exercise minutes start at about the pace of a brisk walk, and time in daylight comes from newer watch models only.
- **The merge is Apple Health’s.** Evinlo reads Apple Health’s merged totals and does not second-guess which device counted what.
- **Weekday and weekend day come from your calendar.** A holiday counts as a weekday, and a shift pattern that ignores the week makes both kinds of day look alike. When the same kind of day has too few values, every day of the last four weeks stands in.
- **Your usual follows you.** After a lasting change of level, the usual has followed within eight weeks on made-up movers.
- **Travel.** Every day of a result is cut in your current time zone; a past trip is not re-zoned.
- **Yesterday’s activity is active energy only.** A long but gentle day and a short hard session can read the same. Where it starts to cost points, at 1.2 times the usual day, is a design choice, checked with the evaluation tool.
- **No forecast.** Evinlo never projects how your day will end.

For the experts

Version

`MovementAlgorithm.version` is **1.0.0**; every movement day and every recent load carries it. A change to a rule or parameter below is a new version, made through a proposal and a replay (`docs/scoring.md`, “Changing an algorithm”).

Every parameter

Parameter (`MovementParameters.v1`)	Value	What it does
`usualWindowDays`; `usualMinimumSameKindDays`	56; 8	The same kind of day: days looked back on; days with a value needed
`usualFallbackWindowDays`; `usualFallbackMinimumDays`	28; 14	Every day: days looked back on; days with a value needed
`usualLowerQuantile`; `usualUpperQuantile`	0.20; 0.80	The ends of the range (the median is the typical value)
`wellOffsetFactor`	2	“Well” beyond this many times the distance from the typical value to an end
`minimumHalfWidth`	250 steps; 20 kcal; 5 min; 5 min	The smallest distance from the typical value to an end, per measure
`minimumHalfWidthShareOfTypicalDay`	0.05	… or this share of the typical whole day, if that is more
`tooEarlyShareOfTypicalDay`	0.10	No comparison while the typical value by now is below this share of the typical day
`recentDays`	30	A measure or a watch counts as recorded with a value in the day and the 29 before
`historyDays`; `exerciseWeekDays`	30; 7	Days of the chart; days of the week’s exercise
`workoutDuplicateOverlap`	0.5	Two workouts of one activity overlapping this share of the shorter one are one
`loadWindowHours`	24	Yesterday’s activity: the hours before sleep onset
`loadReferenceDays`; `loadMinimumReferenceDays`	28; 14	The days behind the usual day; worn days needed
`loadMinimumWearHours`	10	Hours with active energy for a worn window or day (also for filling in zeros)
`loadMinimumUsualKilocalories`	150	The usual day counts as at least this
`loadPointKnots`	(1.2, 100), (1.5, 65), (2.0, 25), (2.4, 0)	Points against the ratio, linear in between, clamped to 0–100
`loadAboveRatio`; `loadWellAboveRatio`	1.2; 1.5	The words of yesterday’s activity
`loadUsesCalendarDay`	false	An evaluation variant: the calendar day before instead of the 24 hours

Formulas

A quantile of n sorted values $x_0 \le \ldots \le x_{n-1}$, by linear interpolation at $p = q\,(n-1)$:

$$Q_q = x_{\lfloor p \rfloor} + \left(p - \lfloor p \rfloor\right)\left(x_{\lfloor p \rfloor + 1} - x_{\lfloor p \rfloor}\right)$$

The range, with $t = Q_{0.5}$ of the values (whole days, or each day by this time) and T the median of the whole days:

$$w = \max\left(w_{\min},\ 0.05\,T\right), \qquad \text{lower} = \max\left(0,\ \min(Q_{0.2},\ t - w)\right), \qquad \text{upper} = \max\left(Q_{0.8},\ t + w\right)$$

"Well" below a value $v < t - 2\,(t - \text{lower})$, "well" above $v > t + 2\,(\text{upper} - t)$. Maya at 16:30:

$$3{,}918.75 - 2 \times (3{,}918.75 - 2{,}671.1) = 1{,}423.45$$

Yesterday's activity, with E the energy of the 24 hours and U the usual day:

$$r = \frac{E}{\max(U,\ 150)}, \qquad \text{points} = \begin{cases} 100 & r \le 1.2 \\ \text{linear through } (1.5, 65), (2.0, 25) & 1.2 < r < 2.4 \\ 0 & r \ge 2.4 \end{cases}$$

The order of operations

1. **Read** the hourly totals of the four measures from Apple Health's statistics, for the day and the 57 days before it, and the workouts around the day. Nothing that starts at or after the moment of the result counts.
2. **Sort** each bucket into the day and the wall-clock hour its start lies in; fill in the zeros of exercise and daylight on worn days.
3. **Lead measure:** steps if recorded in the last 30 days, else active energy, else nothing to show (`noRecentData`). An earlier day without any data is an empty day (`noDataThisDay`); today is always shown.
4. **Totals, history and the week's exercise.**
5. **The usual:** the reference days of the lead measure decide whether there is a usual at all; each measure with reference days of its own gets its range (by this time of day for today); "too early" is decided on the lead measure; then each total is put in one of the five steps.
6. **Workouts:** duplicates merged, those that began on the day kept.
7. **Yesterday's activity** for Readiness, separately: the hourly active energy of the 30 days up to the night, the window before sleep onset, wear, the usual day, the ratio, points and words.

Movement is worked out for every day the app opens, including days more than a year back.

Edge cases

- **A measure with too few reference days of its own** has no range and no step, while the lead measure has one; its total stands on its own.
- **Today before anything is recorded** is shown with empty totals; an earlier day with nothing recorded says so.
- **A workout alone** makes a day: an earlier day without any samples but with a workout is a day with data.
- **Clock changes:** the hour that occurs twice is one wall-clock hour (its buckets added), the skipped hour has no value; by this time of day reads each usual day at the same wall-clock time.
- **Wheelchair users:** without steps, active energy leads and gives the headline.

- **Yesterday's activity is left out** without active energy in the last 30 days, with fewer than 10 worn hours in the window, or with fewer than 14 worn reference days; Readiness then shares its 5% among its other parts.

Where it lives in the code

Paths under `Packages/EvinloKit/Sources/EvinloAlgorithms/` unless they say otherwise.

What	Where
Parameters, version, the engine	`Contract/MovementContract.swift`
One movement result, in order	`Movement/MovementDayCalculation.swift`
Days, hours and clock changes; the hourly table	`Movement/MovementWindow.swift`, `Movement/MeasureTable.swift`
Your usual days and the range	`Movement/MovementUsualRules.swift`, `Movement/OrderStatistics.swift`
Duplicate workouts	`Movement/WorkoutMerging.swift`
Yesterday's activity	`Movement/RecentLoadCalculation.swift`
The day as the app reads it; the five steps of a range	`Packages/EvinloKit/Sources/EvinloModels/Movement.swift`
The words on screen	`App/Evinlo/Data/Wording/MovementWording.swift`

How it is checked

The evaluation tool (`Tools/EvinloEval`) replays every day through the day pipeline, without look-ahead, on synthetic people and on a developer's own Apple Health export, and judges:

Guardrail	Rule
MG1 to MG3	Two replays agree and later data never changes an earlier complete day; a result uses nothing from its moment on; no NaN or ∞, no range out of order, no negative total
MG4	The tool's merged steps are never above the sum of all samples and never below the top-ranked kind of source's own total
MG5, MG6	A larger value never reads as a lower step; the load points never rise with the ratio and never jump
MG7	With a usual from 16 days or more, at most 35% of days read "well" above or below
MW1 to MW3	Days in the usual range 45–70%, "well" off at most 25%, and the picture at 14:00 against the end of the day within 8 points
MW4, MW5, MW7	Nights with fewer than 100 load points at most 35%, fewer than 60 at most 10%; the load must not point the wrong way against the next night's sleeping heart rate; merged active energy within 2% of Apple's daily total on at least 85% of days
MS1, MS3, MS6	On a synthetic person: a steady mover mostly reads as usual; merged steps within 3% of the true steps while the sum of all samples is far above them; on the presets with big days, the night after one has at most 65 points and after an ordinary day at least 90

On made-up movers whose day totals vary as widely as people's do, a little over half of the days read as usual and between a tenth and a sixth as "well" off, at 14:00 as at the end of the day. Every figure and number of this explainer comes from `evinlo-eval export` on synthetic people; the steps each device

counted come from `evinlo-eval synthesize` of the same person, and the ranges are worked out again from the exported hours and checked against the export.

References

- Bull et al., *British Journal of Sports Medicine* 54(24), 2020: the World Health Organization's guidelines on physical activity.
- Paluch et al., *Lancet Public Health* 7(3), 2022: daily steps and mortality, pooled cohorts.
- Hynynen et al., *International Journal of Sports Medicine* 31(6), 2010, and Myllymäki et al., *European Journal of Applied Physiology* 112(3), 2012: more or longer exercise raises the next night's heart rate and lowers its HRV.
- Apple's documentation: statistics queries merge sources as the Health app does; a sum of samples does not.
- The complete reference for every rule: docs/scoring.md, "Movement (v1)".

Spotted something unclear or wrong, or want to improve a rule? Evinlo is open source, and every rule can be changed through a proposal and a replay. Start at **evinlo.com/contribute**.