



ŌURA for Organizations

Oura Cardio Effort: The science behind the feature

Table of Contents

Executive Summary	3
About the Oura Cardio Effort Feature	4
What it is	4
How to Interpret Cardio Effort	6
Variables Affecting Cardio Effort Scores	8
How it can be used by Oura Members	9
Why it matters	10
The Science Behind Cardio Effort	12
Background info	12
Oura science in developing the feature	15
Female and male sex-based differences	19
Clinical value	21
Conclusion	24

Executive Summary

The Oura Cardio Effort feature is a personalized estimate of how much a workout taxes a member's cardiovascular system. It is scored for each workout and summed across the week.

At its core, Cardio Effort is a heart-rate intensity and duration metric. It lets Oura members understand the impact of their movement independent of absolute metrics such as steps, calories, or movement minutes.

Cardio Effort draws on cardiovascular training-load principles such as Training Impulse (TRIMP). Heart rate is treated as an internal-load signal and interpreted relative to the member's own resting heart rate and recent activity baselines.

The same activity can yield different Cardio Effort values for different people, and the same activity may produce less Cardio Effort as fitness improves. It describes personal patterns and supports a sustainable interpretation of weekly fitness trends. It is not a universal target and does not diagnose disease.

Because it is a personalized cardiovascular strain metric, Cardio Effort can reveal meaningful trends in relation to VO₂max, Cardiovascular Age, women's health, aging, and more.



About the Oura Cardio Effort Feature

What it is

The Cardio Effort feature is a physiological load metric that quantifies the cardiovascular strain imposed by physical activity, determined primarily by exercise intensity and duration. It is computed at the session level for all workout types, including user-initiated (live), automatically detected, and imported activities. It is also aggregated into a cumulative weekly measure of total cardiovascular load. Cardio Effort describes how demanding an activity was for a specific individual, rather than reporting a static metric.

Cardio Effort is derived from each individual's physiology and adapts as that physiology changes over time, rather than relying on population-level norms or static goals.

Guiding principles

01

Measure effort rather than output. Cardio Effort captures cardiovascular strain. It is not a direct score of distance, pace, power, repetitions, or other external output.

02

Combine intensity and duration. A brief, intense workout and a long, easy workout can each be meaningful in different ways. The metric accounts for both how hard the cardiovascular system was working and how long that demand was sustained. An easy walk and a hard sprinting session can receive the same Cardio Effort depending on their durations.

03

Personalized to the member. Scores should be interpreted against a member's own baseline and history and not directly compared to other users.

04

Recognize maintenance as a valid goal. Scores are best interpreted over time. Improving fitness is one goal, but maintaining fitness is also valid. For members focused on improvement, lighter recovery weeks interspersed with weeks that push their limits are normal.

How Cardio Effort fits with other Oura metrics

Cardio Effort is part of a broader ecosystem of Oura metrics covering activity, fitness, cardiovascular risk, recovery, and long-term health.

Cardio Effort and VO₂max

VO₂max is the maximum rate at which the body can take up, transport, and use oxygen during high-intensity exercise. Higher values reflect greater aerobic capacity. Cardio Effort quantifies the training stimulus, or recent cardiovascular load, whereas VO₂max reflects the capacity that may develop in response to repeated stimuli and adequate recovery. Sustained increases in Cardio Effort over time can lead to improvements in VO₂max.

Readiness, HRV, and sleep

Cardio Effort measures the physiological strain the body experiences in response to movement, such as increase in HR during running or housework. Post-workout HRV is typically lowest immediately after exercise and then returns toward baseline. The higher the Cardio Effort, the larger the temporary HRV decrease before recovery. High-intensity activity close to the sleep window can also affect sleep and recovery scores. Cardio Effort describes the demand imposed by an activity, while HRV, heart rate, sleep, and Readiness provide context about the body's response and recovery. These relationships are associative rather than deterministic, and lower-intensity activity may have a smaller, or even restorative, relationship with some recovery signals.

Cardiovascular Age (CVA) and vascular markers

Members with higher weekly Cardio Effort tend to have a lower CVA, suggesting that more frequent moderate to vigorous activity is associated with a younger cardiovascular age. This observational relationship does not establish causality.



How to Interpret Cardio Effort

Cardio Effort is most useful as one piece of longitudinal context, not as a standalone judgment about whether a workout or week was good or bad. The value describes relative cardiovascular demand. What that demand means depends on activity type, recent history, recovery state, goals, and the quality of the underlying physiological measurements.

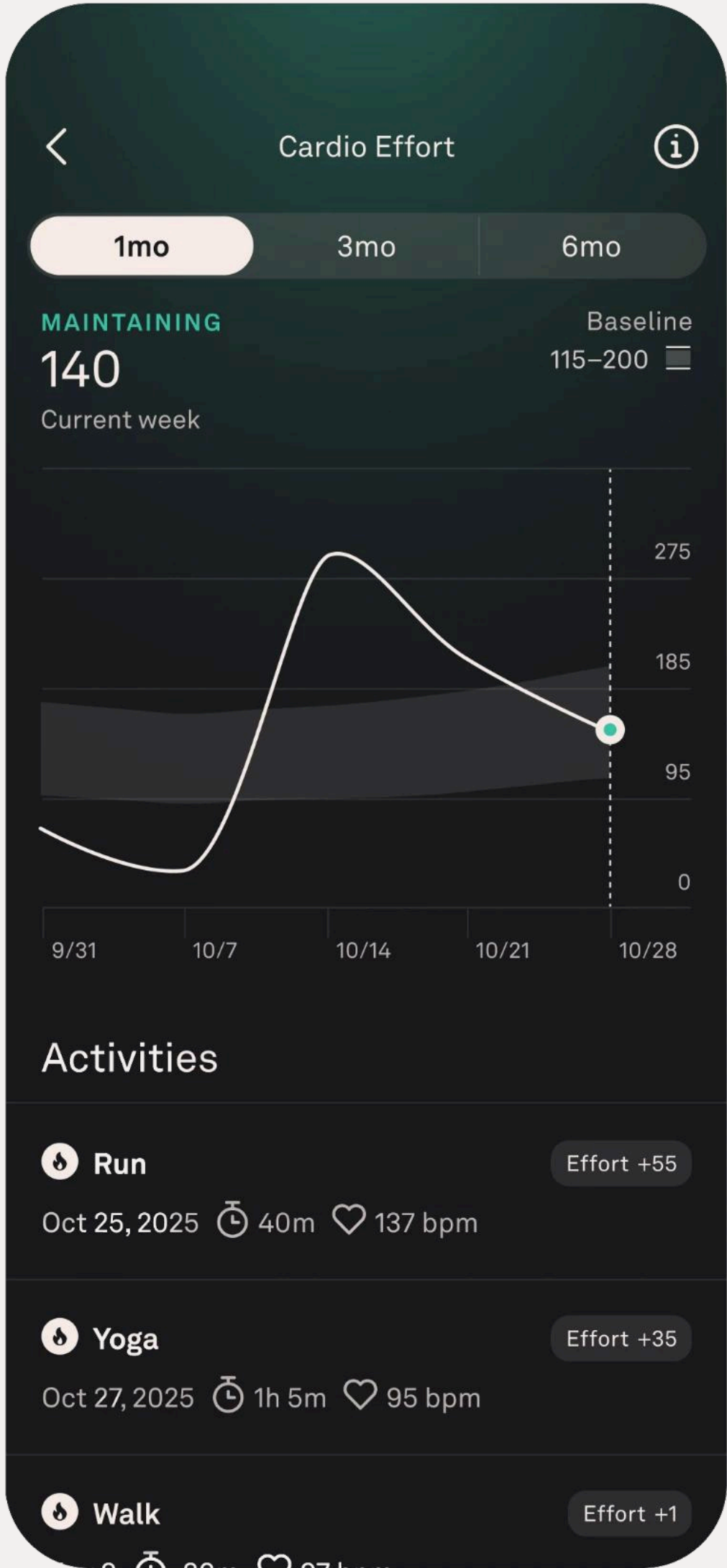
Because Cardio Effort is an individualized index rather than a standardized physical unit like calories, watts, or beats per minute, its greatest value is in comparing an individual’s own scores across workouts. The same score can represent different absolute workloads for different people. It is designed to show personal trends, not to rank or compare members.

Interpreting a single workout

Cardio Effort lets Oura members compare the relative cardiovascular impact of a workout with other workouts. It is not a direct measure of athletic performance, calories, mechanical work, or total physiological stress.

A higher value means the workout produced more modeled cardiovascular effort under the metric's assumptions. It does not necessarily mean the workout was more valuable or appropriate.

A short, intense workout can produce a similar value to a longer, easier one, because effort reflects both intensity and duration. For example, a 20-minute interval session with sustained periods of high heart-rate elevation may be similar to a 60-minute easy walk or steady bike ride. This is not a fixed equivalence. It depends on the member's baseline, heart-rate response, duration, intensity weighting, and signal quality.



A single-workout value should be read alongside:

Workout type:	Running, cycling, strength training, yoga, and mixed-interval sessions place different demands on the body, even when their Cardio Effort values are similar.
Data quality:	A measured value supported by broad, high-quality heart-rate coverage should be interpreted differently from an estimated value based on limited coverage, non-wear, or other activity-specific inputs. "Estimated" indicates lower confidence than a value calculated from a sufficiently complete measured heart-rate trace. It does not mean the value is wrong or meaningless. It is an informed approximation, not a direct observation of the full cardiovascular response.
Context:	Sleep, illness, heat, caffeine, stress, medications, and recent training can change the relationship between the same external activity and the resulting heart-rate response.

Interpreting the weekly view

Each week begins at zero on the first day of the member's week, and Cardio Effort accumulates across the calendar week as activities are completed. Load in the body does not reset on a calendar boundary (a hard run on Sunday is still felt on Monday), but the feature is most valuable in a weekly goal framework. This progressive build helps members plan their week and work toward their goals.

The weekly total is compared with a personalized baseline derived from the member's recent history and summarized in five bands:



Band boundaries are specific to each member and change as activity history changes. They should not be treated as universal targets or comparisons between members. For new members, the baseline is calibrated from around two weeks of activity history, so early bands may be less stable until enough observations accumulate.

Over time, the bands are associated with different fitness trajectories. Sustained periods in Building or Reaching can contribute to improvements in cardiovascular fitness, whereas sustained periods in Light or Fair may lead to a gradual decline. However, higher is not automatically better, and no single band is the correct target.

Variables Affecting Cardio Effort Scores

The Cardio Effort feature is derived from heart-rate behavior relative to a personal baseline. Differences between members, between workouts, and between weeks are therefore expected. They can come from several sources:

Personal physiology and fitness	The same workout yields different values for different members. A 5K run may be relatively easy for one person and highly demanding for another. As fitness improves, the same activity may produce less Cardio Effort.
Environment and lifestyle	The same member may receive different values for similar workouts performed under different conditions or at different points in time. Changes in environment, lifestyle, fitness level, and life stage all influence scores. Heat, humidity, and altitude can raise or change the heart-rate response. For example, running the same 5K in 60°F weather versus 95°F heat with high humidity can substantially increase heart rate.
Medications	Medications can change vital signs as part of their mechanism of action. Beta blockers typically lower resting and active heart rates, while beta-agonists used for asthma often raise them. Other cardiovascular medications may also change the relationship between heart rate and effort.
Medical conditions	Hyperthyroidism may be associated with higher resting heart rate. Autonomic dysfunction such as POTS may change resting and active heart rates. Arrhythmias and other cardiovascular conditions can make a heart-rate-derived estimate less representative of the underlying response. Symptoms such as joint pain, fatigue, or shortness of breath can lead to lower activity tolerance, make the same task feel more demanding, and over time lead to deconditioning. These effects are not uniform, and a change in resting heart rate or Cardio Effort is not specific to any one of them. These situations do not necessarily make the metric unusable, but they reduce the confidence with which it should be interpreted.
Data quality and measurement	Motion artifacts, high grip pressure, low-motion exercise, ring fit, non-wear, and inaccurate workout start and end boundaries can all affect the result. Poor or incomplete heart-rate data may produce an "Estimated Cardio Effort" instead of a measured value.
Baseline maturity	New members have less stable baselines and weekly bands during the first couple of weeks.
Life stage	Menstrual cycle phase, pregnancy, postpartum, and aging can change the relationship between activity and heart rate. See Women’s Health differences below.

How it can be used by Oura Members

Cardio Effort can:

- Describe a member's personal patterns of cardiovascular activity across workouts and weeks.
- Show how cardiovascular activity adds up across a week and the contribution of individual activities.
- Summarize weekly activity ranges and provide context for what they may indicate about patterns over time.
- Compare the relative cardiovascular impact of workouts with the member's own history.
- Provide context for changes in related health signals over time, including HRV, sleep, estimated VO₂max, and other cardiovascular measures.
- Support research on relationships between activity dose, cardiovascular physiology, recovery, and health outcomes.

Cardio Effort cannot:

- Establish a universal longevity target or prove that a particular Cardio Effort level is optimal.
- Prescribe a training plan or determine that a member should increase, decrease, or maintain exercise without considering their goals, symptoms, recovery, and circumstances.

Practical ways Oura members can use Cardio Effort

- 01 **Plan the week.** Because the weekly total builds from zero, members can see how their week is shaping up and work toward their goals.
- 02 **Understand the impact of different activities.** Members can compare the Cardio Effort of an easy hour-long walk versus a 15-minute sprint session.
- 03 **Balance hard and easy weeks.** Alternate Building or Reaching weeks with Light, Fair, or Maintaining weeks to support recovery and adaptation. Maintaining is a valid goal.
- 04 **Keep continuity when the ring isn't worn.** A member who forgot to wear their ring can manually log an activity and receive an Estimated Cardio Effort, preserving their weekly ranges.
- 05 **Connect effort to recovery and fitness.** View trends alongside HRV, sleep, Readiness, VO₂max, and Cardiovascular Age.

Why it matters

Cardio Effort reflects the cardiovascular strain that exercise places on the body. It is reported for each session and summarized weekly to help answer a practical question: "How much cardiovascular work am I doing to support my fitness over time?" Cardiovascular fitness develops through the cumulative pattern of activity over time, including both how often members are active and how demanding each activity is for them.

Common metrics each capture only part of the picture

Steps and movement minutes describe volume but not intensity. The same number of steps can represent very different cardiovascular demands depending on height, stride length, pace, terrain, and the individual's fitness.

Calories estimate energy expenditure, but they are not a direct measure of cardiovascular strain or of the stimulus associated with improving cardiovascular fitness.

Workout duration does not distinguish an easy hour from a highly intense hour. An easy walk and a hard session of sprints may take the same time but register very differently in the body.

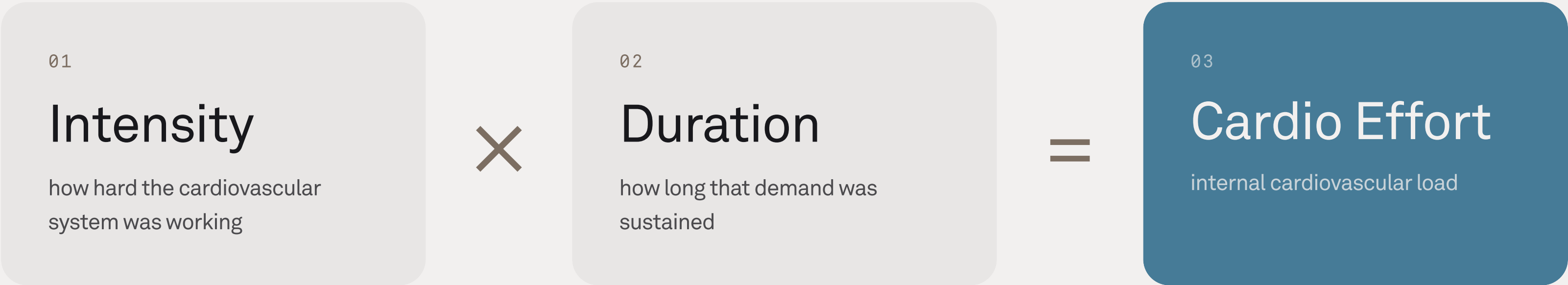
Generic heart-rate zones can be hard to personalize and interpret, particularly when a member's fitness, physiology, or activity context differs from the zones' assumptions.

Universal exercise prescriptions are often not specific to the user.

These metrics describe what a member did. They do not fully explain how demanding it was for that member's cardiovascular system.

What Cardio Effort adds

Cardio Effort combines exercise intensity and duration into a measure of internal cardiovascular load. It focuses on the physiological demand placed on the individual rather than only the external output of the activity. The central design principle is that Cardio Effort reflects effort, not raw output. That makes it specific to each member and useful for evaluating trends over time, including in relation to VO₂max.



Why it matters for health

Cardiovascular fitness is one of the most consistent physiological markers associated with long-term cardiovascular health. Cardio Effort gives members a personalized way to see the stimulus that drives it. Over time, it connects everyday movement and structured exercise with longer-term patterns in cardiovascular fitness, recovery, and health (See Clinical Value section).



The Science Behind Cardio Effort

Background info

Internal vs. external load

Training load can be described by two complementary components: the work performed by the body and the physiological response to that work.

EXTERNAL LOAD

External load is the observable or measurable work performed during an activity, independent of how straining it is for a particular person. Examples include running a 5K at an 8:00 min/mile pace, climbing a 14k peak, or riding a bike for 8k. It describes what was done, not how the body responded.

INTERNAL LOAD

Internal load is the body's physiological response to a given external load. Common indicators include heart rate, perceived exertion, blood lactate, respiratory rate, and other measures of cardiovascular or metabolic strain. Internal load can differ widely between individuals. A professional middle-distance runner and someone who does not typically exercise can both run a 5K, so their external loads are equal. Their heart rate, respiratory rate, stress, and perceived exertion will differ greatly. Fitness, fatigue, sleep, stress, temperature, hydration, illness, and medication all influence the response.

Heart rate as a proxy for internal load



Heart rate reflects the combined physiological demands of activity, including the muscles' increased oxygen demand and the autonomic nervous system's regulation of cardiac output. It captures a whole-body response, is often available continuously, and can be measured across many types of exercise. That makes it useful for relating an activity to the effort required, comparing responses across sessions, and identifying when a familiar external workload produces a different physiological response.

Heart rate is not a direct measure of mechanical work. Two activities can produce the same heart rate while involving different amounts or types of movement, and the same pace or power can elicit different heart-rate responses depending on condition and environment (heat, humidity, altitude). It is best interpreted as one informative measure of internal load, alongside external-load measures and, when available, complementary indicators such as perceived exertion.

History of quantifying cardiovascular load

Efforts to quantify the cardiovascular cost of exercise predate wearables by decades.

1957	In 1957, Karvonen and colleagues introduced expressing exercise heart rate relative to the range between resting and maximal values, now known as heart rate reserve. This framed intensity relative to the individual rather than as an absolute number.
1970s	In the 1970s, Banister and colleagues proposed the impulse-response (fitness-fatigue) model. Each training session produces a positive, long-lasting fitness effect and a negative, short-lived fatigue effect. To supply the inputs, Banister developed the training impulse (TRIMP). TRIMP multiplies session duration by a fractional heart rate reserve and an exponential weighting factor intended to reflect the nonlinear rise in blood lactate with intensity.
Later methods simplified or adapted TRIMP:	
1993	Edwards (1993) proposed a summated heart rate zone approach, in which time spent in each of five zones, defined as percentages of maximal heart rate, is multiplied by an integer weight and summed.
2003	Lucía and colleagues (2003) later refined the zone-based approach using individually determined ventilatory thresholds in place of fixed percentages of maximal heart rate, tying zone boundaries to each athlete's physiology.
2007	Stagno et al. (2007) modified the Banister model for team-sport athletes by deriving the weighting from an individual's own heart rate-lactate relationship.
2001	In parallel, Foster and colleagues (2001) introduced the session rating of perceived exertion (session RPE), which multiplies a post-session rating of effort, based on Borg's perceived exertion scales (Borg, 1970), by session duration. This method requires no heart rate data, and it has been widely adopted in practice and validated against heart rate-based approaches in several settings (Impellizzeri et al., 2004).

As monitoring became routine in high-performance sport, load metrics were used not just to describe training but to manage it. Practitioners compared recent (acute) load with longer-term (chronic) load, an approach popularized as the acute:chronic workload ratio. This use has been debated on conceptual and statistical grounds. Consensus guidance emphasizes that load measures are best interpreted alongside individual context and other indicators of response, rather than as stand-alone targets (Bourdon et al., 2017; Foster et al., 2017; Halsen, 2014).

Consumer wearables

Optical heart-rate sensing, continuous recording, and automatic activity detection now allow session-level and weekly load estimates without lab testing or manual entry. Commercial implementations generally share the same core principle: They express heart rate relative to an individual's physiology, weight higher intensities more heavily, and integrate intensity with duration. Cardio Effort follows this lineage. It computes load relative to each member's own resting physiology and recent history and presents the result as a personalized, unitless index rather than a universal target.

Oura science in developing the feature

Sensing

Oura measures heart rate primarily with photoplethysmography (PPG), an optical technique that detects pulsatile changes in blood volume through changes in reflected light. Oura Ring uses green and infrared PPG sensors for continuous heart-rate measurement, along with other sensors that help characterize movement and activity. The finger has substantial blood flow and a dense network of superficial vessels. A ring also maintains a relatively stable contact point with the skin during normal wear. Fit, rotation, pressure, temperature, and movement can still affect signal quality.



Inputs

Cardio Effort depends on both heart rate and activity information such as duration and intensity. Input quality and completeness determine whether a value is computed and labeled "Cardio Effort" or estimated due to low confidence and labeled "Estimated Cardio Effort."

Heart rate Heart rate is the primary input. The relevant input is the heart-rate time series during the activity, interpreted relative to the member's personal baseline and combined with the time over which the response is sustained. Higher elevation and longer exposure generally lead to higher values, so both the values and their temporal coverage matter.

Activity pathways Cardio Effort can be associated with activities from several sources:

Automatically detected workouts

Automatically detected workouts are identified by Automatic Activity Detection (AAD), which recognizes activities from running and strength training to housework. AAD determines the workout window while capturing heart rate and intensity. Members can accept it or adjust the window.

Manually logged workouts

Manually logged workouts have user-supplied activity type and timing. They can support an estimate even when the ring is not worn.

Live-tracked workouts

Live-tracked workouts provide explicit start, pause, resume, and end events and can pair the session with live or recorded heart-rate data.

Imported activities

Imported activities provide activity boundaries from a connected source and may also provide heart-rate data, which can serve as the activity-specific input.

Workout boundaries Accurate start and end times matter because Cardio Effort accumulates over time. If a session starts too early or ends too late, the score may not fully reflect the workout. Boundaries also help separate workout effort from post-workout heart-rate recovery, incidental movement, and other elevations that should not be attributed to the workout.

Algorithm overview

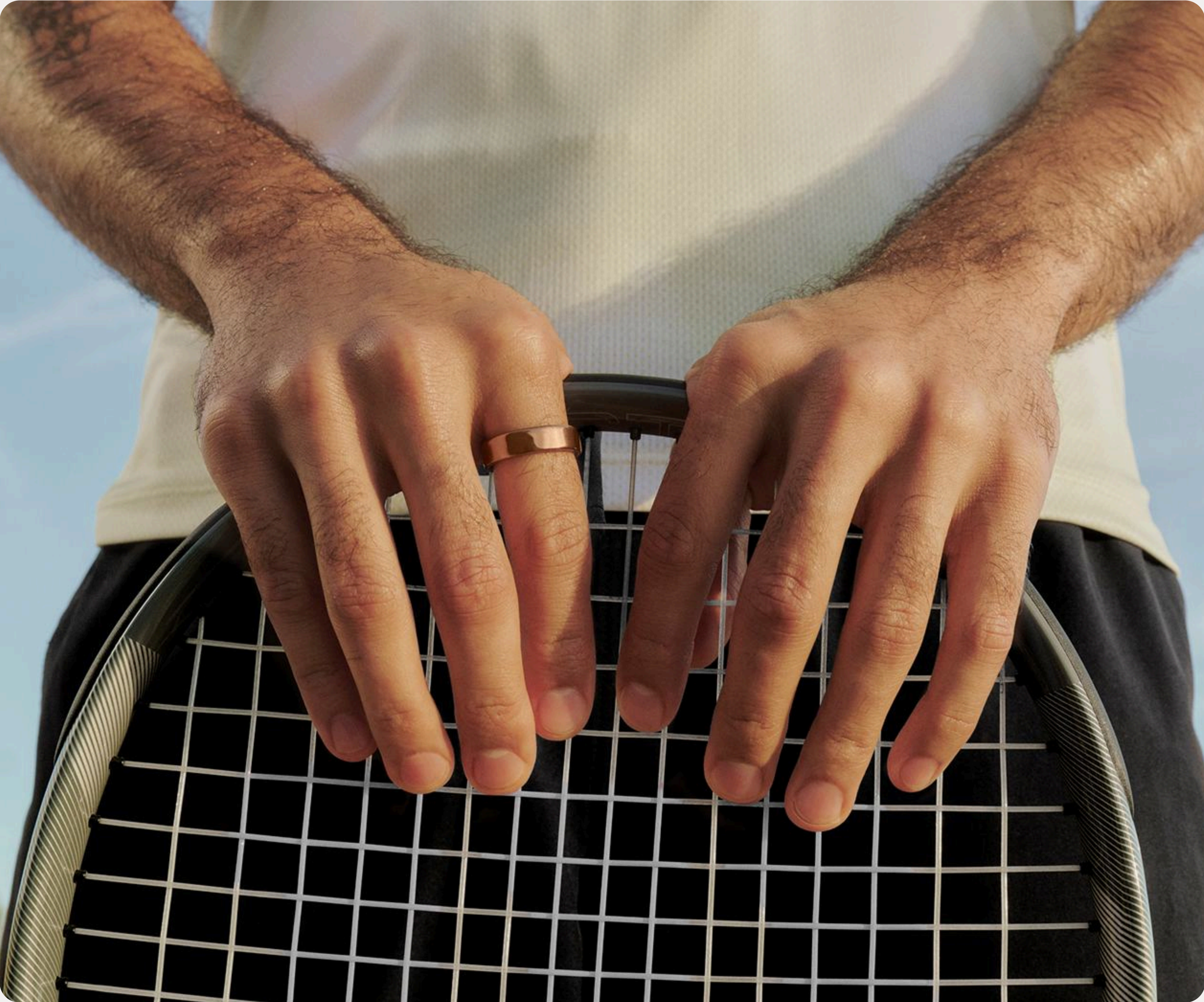
Session score	Cardio Effort analyzes the cardiovascular response during exercise relative to the individual's resting physiology and integrates it with activity duration. Conceptual inputs are exercise duration, exercise intensity, baseline cardiovascular physiology, and personal history. It considers both how far heart rate rises above baseline and how long that elevation is sustained.
Non-linear intensity weighting	The relationship between intensity and effort is not assumed to be linear. Higher heart-rate elevations receive progressively greater weight, so time at a demanding intensity contributes more than the same time at an easy intensity. This reflects the increasing physiological cost of higher-intensity work without implying a direct measurement of mechanical power or total physiological stress.
Logarithmic duration weighting	At a constant heart-rate elevation, the estimate increases with duration but gradually saturates, so early minutes contribute more marginal effort than very late minutes. This is a modeling choice to balance intensity and duration, not a claim that physiology follows an exact logarithmic law. It is consistent with a broader pattern in the exercise literature. Many population-level <u>dose-response associations between physical activity and outcomes</u> such as cardiovascular disease or mortality are non-linear. The largest marginal difference often occurs when moving from inactivity to some activity, with progressively smaller additional associations at higher volumes. A <u>2024 dose-response meta-analysis</u> reported little or no further reduction in cardiovascular, coronary heart disease, or stroke risk above its observed activity range. These findings do not establish a single biological ceiling, an optimal Cardio Effort level, or a rule that more exercise is harmful. Marginal benefits can diminish, the curve depends on outcome and activity type, and observational dose-response findings should not be converted directly into individual prescriptions.
Weekly scores	Session values accumulate into daily and then weekly totals. This gives a more stable view of recent cardiovascular exposure than any single workout and shows how activity is distributed across the week. Day-to-day variation is expected, with lower values on rest or easy days and higher values after harder workouts. Weekly thresholds are personalized from the member's historical Cardio Effort, not imposed as a population target. They produce the five ranges: Light, Fair, Maintaining, Building, and Reaching. New members need about two weeks of activity history to calibrate. As more weeks accumulate, baselines and thresholds better reflect typical patterns and adapt to sustained changes.

Estimated Cardio Effort

This component ensures completeness, delivers value to the member, and preserves the usability of weekly ranges. It applies when a member does not wear the ring and manually logs an activity, or when the ring is worn but insufficient heart-rate data is captured. It is especially useful for non-wear because it preserves continuity in activity history and weekly interpretation. It draws on workout type, duration, any available heart-rate information, the member's historical response, and perceived exertion when available. This reflects both the activity and the member's own context rather than applying one generic value to every workout with missing heart rate. Without an estimate, members would get no Cardio Effort context for workouts that were completed but not fully measured.

Limits of heart-rate-based estimation

Because Cardio Effort is derived primarily from heart-rate behavior, factors that alter heart rate independent of exercise (medications, arrhythmias, illness, heat, and others) affect interpretation.



Female and male sex-based differences

Cardio Effort is interpreted against physiological signals that change across the life course. Fitness, reproductive hormones, pregnancy, postpartum recovery, aging, illness, medication, and changes in activity behavior can all alter the relationship between an external activity and the heart-rate response used to estimate effort. The sections below describe how to interpret these patterns.

Menstrual cycle and cycle-aware interpretation

Current evidence suggests menstrual-cycle effects on Cardio Effort are modest or absent at the aggregate metric level.

Cardio Effort is influenced by the elevation of workout heart rate above a longer-term resting-heart-rate reference. Across the cycle, some studies report small changes in exercise performance, VO₂max, heart rate, or perceived exertion, while others find little or no meaningful difference. A [recent systematic review](#) of cardiovascular responses to exercise concluded that the luteal-phase effect was slight overall and the evidence remains heterogeneous. A living [systematic review of wearable HRV studies](#) reported cycle-related HRV differences on the order of a few percent. These should not be assumed to translate into a clinically meaningful change in Cardio Effort for every member.

Menstruation and the surrounding cycle can still affect activity behavior and perceived exertion. Cramps, headache, gastrointestinal symptoms, sleep disruption, mood changes, heavier bleeding, fatigue, and body-temperature changes can reduce interest or ability to exercise, or make a familiar workout feel harder even when Cardio Effort is similar. These effects tend to be individual and symptom-dependent more than phase-dependent. A member may experience higher RPE, lower energy, or reduced volume without a large change in the heart-rate-based value.

Cycle-aware interpretation should distinguish between three questions.

01

Did the heart-rate-derived effort change?

02

Did activity behavior change?

03

Did the workout feel different?

They may have different answers. Cardio Effort should not be used to imply that a member should train harder or compensate based on menstrual cycle alone.

Pregnancy

Pregnancy produces progressive cardiovascular adaptations that substantially change how heart rate relates to activity. Plasma volume expands by approximately 45% by late pregnancy and red-cell mass also increases. Cardiac output rises through changes in stroke volume and heart rate, while systemic vascular resistance decreases. Resting heart rate typically increases as pregnancy progresses. These changes support maternal and uteroplacental circulation and should not, by themselves, be read as improving or declining aerobic fitness ([American Heart Association review](#); [NIH review](#)).

Pregnancy also changes ventilation, thermoregulation, body mass, and the cardiovascular response to exercise. A baseline-relative metric like Cardio Effort may therefore move up or down even when aerobic capacity, training quality, or the healthfulness of the activity has not changed. A pregnancy-related change should not automatically be interpreted as improving fitness, declining fitness, or a reason to train harder.

For uncomplicated pregnancies, the [American College of Obstetricians and Gynecologists \(ACOG\)](#) encourages at least 150 minutes of moderate-intensity aerobic activity per week, distributed across the week, plus strength conditioning when appropriate. People who regularly performed vigorous exercise before pregnancy may often continue, with modifications and individualized clinical guidance. Exercise selection and intensity should account for gestational age, prior activity, symptoms, balance and injury risk, environmental heat, hydration, and any medical or obstetric complications.

Heart rate can provide useful context, but it should not be treated as an intensity guide or interpreted through a universal fixed ceiling. [ACOG notes](#) that both blunted and normal heart-rate responses have been observed during pregnancy and recommends perceived exertion as a patient-centered way to estimate intensity. The talk test is another practical complement.

Cardio Effort during pregnancy should be framed as contextual information about a recorded activity, not a fitness target. Interpretation should consider activity mode and duration, gestational stage, perceived exertion, symptoms, baseline quality, heart-rate measurement quality, and the individual's medical and exercise history.

Per [ACOG guidelines](#), exercise should be stopped and evaluated according to standard clinical guidance if warning signs occur: vaginal bleeding, fluid leakage, regular painful contractions, dizziness or faintness, chest pain, unusual shortness of breath before exertion, headache, muscle weakness affecting balance, or calf pain or swelling.

Postpartum

Postpartum interpretation is a separate challenge, not a simple continuation of pregnancy interpretation. Hemodynamics change rapidly after delivery, while sleep, recovery demands, lactation, blood loss, delivery mode, complications, and return-to-exercise behavior vary substantially between individuals. The timing and method for recalibrating a baseline should be treated as individualized and not assumed from the pregnancy trend. Postpartum Cardio Effort should be interpreted cautiously alongside recovery context and clinical guidance ([NIH review](#); [ACOG guidance](#)).

Clinical value

Cardio Effort as a stimulus for cardiovascular health

The Cardio Effort feature represents the physiological demand placed on the cardiovascular system during an activity. When this stimulus is repeated over time and appropriately matched to an individual's capacity, it is associated with adaptations that improve cardiorespiratory fitness and broader cardiovascular health. These adaptations are not limited to exercise performance. They may also influence blood pressure regulation, vascular function, arterial stiffness, and the efficiency with which the heart and muscles deliver and use oxygen.

Cardiorespiratory fitness and long-term outcomes

Cardiorespiratory fitness, often estimated or measured through VO_2max , is one of the most consistent physiological markers associated with long-term cardiovascular health. Across [cohort studies](#) and [meta-analyses](#), higher fitness is associated with lower risks of cardiovascular disease and mortality, in a graded relationship where even modest differences are meaningful. A metabolic equivalent of task (MET) expresses the energy cost of an activity relative to rest, where 1 MET is the energy used sitting quietly.

18%

A [long-term study](#) of initially low-risk adults found that each 1-MET higher baseline fitness level was associated with an 18% lower risk of cardiovascular mortality.

46-year

A 46-year [follow-up study](#) found that higher midlife cardiorespiratory fitness was associated with greater longevity and lower cardiovascular mortality.

These findings are observational and do not mean fitness alone determines health outcomes. They support using cardiorespiratory fitness as an important indicator of cardiovascular health.

VO₂max is trainable

Aerobic training can improve the cardiovascular system's ability to deliver oxygen through greater plasma volume, improved stroke volume, and higher maximal cardiac output. Skeletal muscle adaptations, including increased capillary supply, mitochondrial capacity, and oxygen extraction, let active muscles use that oxygen more effectively. Together these central and peripheral changes increase aerobic capacity. Evidence across exercise-training studies indicates VO₂max is trainable, although the response varies substantially between individuals and depends on training dose, modality, baseline fitness, and adherence.

Vascular adaptations

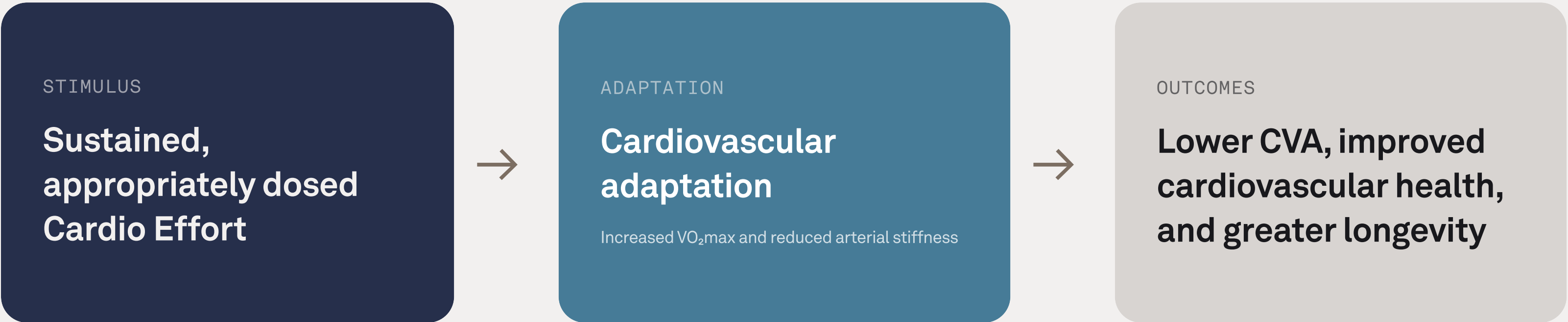
Repeated increases in blood flow and vessel-wall shear stress can improve endothelial function, while regular aerobic activity may reduce arterial stiffness and support healthier blood-pressure regulation. A 2024 systematic review and meta-analysis of 24 randomized controlled trials in older adults found that aerobic and combined training improved endothelial function and arterial stiffness. A separate meta-analysis in adults with hypertension reported that aerobic exercise improved endothelium-dependent vasodilation and reduced blood pressure. Because these studies were in older adults and people with hypertension, the magnitude of change may be smaller in younger, healthy individuals.

Link to Cardiovascular Age (CVA)

CVA is largely derived from pulse wave velocity (PWV), a measure of arterial stiffness. Higher Cardio Effort sustained over time may be associated with a lower CVA through cardiovascular adaptation. Repeated aerobic demand can improve endothelial function and reduce arterial stiffness (reflected directly in lower PWV). It can also increase VO₂max, which is itself associated with more favorable cardiovascular risk profiles. This is a plausible physiological pathway, not evidence that Cardio Effort directly causes a particular change in CVA. The magnitude and direction of change depend on the duration and intensity of the stimulus, baseline fitness, recovery, age, sleep, body composition, blood pressure, medications, and underlying disease. In practical terms, sustained weeks in the Building or Reaching bands reflect the kind of repeated, progressively challenging stimulus most likely to drive these adaptations, while Maintaining weeks help preserve them.

The overall model

The evidence supports a model in which sustained, appropriately dosed Cardio Effort is associated with cardiovascular adaptation, including increased VO₂max and reduced arterial stiffness. These adaptations are associated with lower CVA, improved cardiovascular health, and greater longevity. The links between fitness and long-term outcomes are observational, and individual responses to training vary substantially.



Clinical context

Medications, medical conditions, and life stages can change heart-rate behavior and therefore how Cardio Effort should be read. Trends should be interpreted alongside symptoms, activity, medications, and other relevant context.



In Conclusion

The Oura Cardio Effort feature is a personalized, heart-rate-based estimate of cardiovascular training strain that helps members understand how demanding their activity was relative to their own history. Its greatest value is in revealing workout and weekly patterns that can support informed, sustainable activity decisions. Cardio Effort represents one dimension of health and training. The broader vision is to connect everyday movement and structured exercise with longer-term patterns in cardiovascular fitness, recovery, and health while preserving the context, uncertainty, and individual variation that make those relationships meaningful. The goal is to use this feature, along with other features in the Oura app, to improve overall health and wellbeing over time.

Report prepared by Sabrina Lynch, PhD, Joseph Munaretto, PhD, Christine Curry, MD, PhD, Michael Freedman, MD, MPhil, and Katie D. McMillan, MPH

DISCLAIMER

Oura's Cardio Effort is a wellness estimate of recent cardiovascular effort and is not a diagnostic tool. It is not a diagnostic measure of cardiac output, contractility, stroke volume, cardiovascular risk, or overall heart function. It should not be used to diagnose, treat, or rule in or rule out any medical condition, to determine pregnancy safety, fetal well-being, or pregnancy outcomes, or to predict lifespan, mortality risk, or future clinical events. It is not a complete measure of physiological stress and is not an exercise prescription. It does not guarantee improvement for any individual and does not replace medical guidance, symptom evaluation, or individualized clinical advice. Symptoms such as chest pain, syncope, or unexplained shortness of breath take precedence over any Cardio Effort value or trend. A favorable score or weekly band should not be read as evidence that concerning symptoms are benign or used to delay medical evaluation. Members experiencing such symptoms should seek medical care consistent with the severity and urgency of their presentation.