Deutsche Sauna-Akademie®	**Deutsche Sauna-Akademie**
Titel	Why Does the Same Aufguss Feel Different on Different Benches?
Subtitel	Temperature gradients, water-vapour pressure, airflow, fanning technique, body position and local thermal load
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Short answer: The same Aufguss does not create the same exposure everywhere in a sauna cabin. Temperature increases strongly with height, while the hot vapour-rich plume from the heater initially rises into the upper cabin. Water-vapour pressure, airflow and the effect of fanning are therefore spatially uneven. A bather on the upper bench may receive hotter air, a stronger humidity pulse and faster convective transfer than someone sitting lower. Body position matters as well: sitting places the head, trunk and feet in different thermal layers, whereas lying down keeps more of the body at one height. The relevant dose is therefore local. The amount of water poured onto the stones is only the starting event; bench height, air movement and body position determine how much of that Aufguss actually reaches the individual.

An Aufguss is performed once, but it is experienced many times—one local exposure for every person and every position in the cabin. This is why two guests can remain in the same sauna for the same number of minutes and describe the same Aufguss very differently.

The reason is not merely individual tolerance. A sauna is spatially non-uniform. Temperature, humidity and air velocity vary with height and position, and fanning deliberately changes those variables again.

> **There is one Aufguss event, but there is no single Aufguss exposure.**

The sauna has a vertical temperature gradient

Hot air produced around the heater becomes buoyant and rises. Cooler air occupies lower regions and returns toward the heater, creating convective circulation.

The result is thermal stratification: the upper cabin is generally much hotter than the lower cabin. The difference is not a fixed number of degrees per centimetre; it depends on heater design, ventilation, room geometry and operating state.

Bench height therefore places the bather at a specific level within a vertical temperature field.

How large can the vertical difference be?

A 2026 Finnish sauna study measured temperature and relative humidity at six cabin locations and two heights. During the measured sessions, mean temperature was 69.0 °C at 1.73 m above the floor but only 50.8 °C at 0.90 m [1].

Those values belong to the specific experimental saunas and should not be treated as a universal bench-to-bench difference. They demonstrate the magnitude of spatial variation that can exist in real sauna conditions.

A single wall thermometer therefore cannot describe the environment experienced by every bather.

> **Moving to another bench can change the environment without changing the thermostat.**

Why the upper bench usually feels hotter before Aufguss

The upper bench is intentionally located in the hotter zone of the cabin. A bather there receives hotter convective air and is surrounded by hotter upper wall and ceiling surfaces.

Radiant exchange therefore also differs with position. The total thermal environment is a combination of air temperature, surface temperatures, humidity and air movement.

Aufguss begins on top of this already unequal baseline.

What happens when water reaches the stones?

Water absorbs energy from the hot stone bed, is heated and vaporised. The newly generated water vapour becomes part of the cabin air.

The heater's hot buoyant plume initially carries this vapour-rich air upward. It therefore reaches the upper part of the sauna before the entire cabin can become uniformly mixed.

The first seconds of an Aufguss are consequently strongly position-dependent.

Does the vapour simply stay at the ceiling?

No. Water vapour is a gaseous component of the air mixture and does not form a permanent separate layer.

Natural convection, ventilation, diffusion, people moving and deliberate fanning redistribute it through the cabin.

But redistribution takes time. During the transient humidity pulse, different benches and positions can experience different vapour concentrations and airflow histories.

Why water-vapour pressure matters

The amount of water vapour in the air affects the body's ability to lose heat through sweat evaporation.

When local water-vapour pressure rises, the vapour-pressure gradient between wet skin and the surrounding air becomes smaller. Evaporative cooling becomes less effective.

The same temperature can therefore impose a different thermal load when the local humidity is different.

Humidity is not uniform either

The 2026 Finnish study found substantial differences by measurement height. Mean relative humidity was 27.7% at 1.73 m and 53.8% at 0.90 m, while the upper location was much hotter [1].

This does not mean the lower bench contained more water vapour in absolute terms. Relative humidity is strongly temperature-dependent; cooler air can show a higher RH even with a lower or similar water-vapour content.

Temperature and humidity must therefore be interpreted together rather than comparing RH percentages in isolation.

Why vapour pressure is better than RH alone

Relative humidity describes how close the air is to saturation at its current temperature. Water-vapour pressure describes the partial pressure contributed by gaseous water and is more directly relevant to evaporation from the skin.

Because saturation pressure increases steeply with temperature, the same RH at two bench heights does not represent the same amount of water vapour.

For Aufguss physics, temperature plus vapour pressure is therefore more informative than RH alone.

What happens at the upper bench during Aufguss?

The upper bench combines two effects: it begins with a higher air temperature, and it is reached early by the hot vapour-rich heater plume.

This can reduce the body's dry and evaporative heat-loss options at the same time.

If fanning then drives that air across the bather, the local heat-transfer rate can increase rapidly.

> **The upper bench does not merely receive 'more steam'. It receives a different combination of temperature, vapour pressure and airflow.**

Why does fanning change the experience so much?

Air adjacent to the skin forms a boundary layer that slows heat and mass transfer. Fanning disrupts this layer and replaces it with cabin air.

If that cabin air is hotter than the skin and rich in water vapour, stronger air movement can increase convective heat transfer while reducing the protective effect of the local boundary layer.

Fanning therefore changes transfer rate rather than creating heat.

The same fan movement is not the same everywhere

A towel or fan creates a directed jet and surrounding induced airflow. Its velocity decays with distance and is modified by walls, ceiling, benches, people and existing convection.

A guest directly in the path of a downward stroke may receive a much stronger local air velocity than someone one metre to the side.

Aufguss intensity can therefore vary horizontally as well as vertically.

Why professional fanning is a distribution technique

Fanning should not be understood primarily as a way of making the sauna hotter. It is a way of controlling where hot humid air moves and how quickly it contacts the body.

Broad circulation movements can redistribute the upper humid layer; directed strokes can create short local peaks in air velocity.

The operator is therefore shaping a spatial exposure field.

> **Fanning is not heat generation. It is heat-flow control.**

Why the front and back of the cabin can differ

Heater location creates an asymmetric starting point. The strongest buoyant plume originates above the heater and then interacts with the ceiling and ventilation pattern.

Exhaust placement can draw air preferentially through certain regions, while doors, corners and bench geometry create recirculation zones.

Two people at the same bench height can therefore still receive different humidity and air-velocity histories.

What does ventilation add to the picture?

Ventilation introduces cooler supply air and removes warm humid cabin air. Its effect depends not only on flow rate but also on inlet and exhaust position.

Well-designed mechanical ventilation can promote useful mixing; poorly positioned supply air can strengthen a cool lower zone or create local drafts.

During Aufguss, ventilation also determines how rapidly the humidity pulse is diluted and removed.

Why a lower bench can still feel intense

Lower does not mean thermally irrelevant. Strong fanning can transport hot humid air downward and across a lower-seated bather.

A lower bench may also be closer to the heater in horizontal distance, or located in a strong circulation path.

Bench height is therefore a major determinant, not the only determinant.

Body position changes the exposure

When sitting upright, the head may be many tens of centimetres above the feet. In a stratified sauna, different body regions therefore occupy different thermal layers.

The face and upper torso can experience hotter air and stronger Aufguss exposure while the legs and feet remain in a cooler zone.

Lying on an upper bench places most of the body at approximately the same height and makes the environmental exposure more uniform from head to foot.

Does lying down make the Aufguss weaker?

Not necessarily. Lying down reduces the vertical temperature difference across the body, but the entire body may now occupy a high and hot layer.

The exposure can therefore become more uniform without becoming less intense.

Whether it feels milder depends on bench height, local airflow and the direction of fanning.

Why surface area matters

A person exposes different body surfaces to moving air depending on posture. Sitting, reclining and lying alter the orientation of the chest, back, legs and face relative to the airflow.

Directed fanning onto a large exposed body area can increase total convective transfer even if the measured air temperature is unchanged.

Local thermal load is therefore partly geometric.

Why the face often feels the Aufguss first

The face is highly thermosensitive and usually uncovered. It also contains moist surfaces around the eyes, nose and airways that respond strongly to hot humid moving air.

A directed airflow toward the head can therefore dominate the subjective impression of the entire Aufguss.

Perceived intensity is not a direct measurement of whole-body heat storage.

Perception and physiological load are related—but not identical

A short strong fan stroke can feel extremely intense because of rapid local skin heating while contributing only briefly to whole-body heat storage.

Conversely, a less dramatic but prolonged exposure can produce substantial cumulative physiological strain.

Professional practice should therefore distinguish peak sensation from total thermal dose.

What does research say about temperature and humidity?

In the 2026 study of 50 healthy recreationally active adults, both sauna temperature and relative humidity were independently associated with increases in heart rate and core temperature [1].

Across the sessions, heart rate increased by an average of 41.6 beats/min and core temperature by 0.4 °C. The study's multi-point measurements also documented pronounced spatial variation within the sauna [1].

This provides unusually direct evidence that both the physical environment and its spatial measurement matter when interpreting sauna exposure.

Does that study prove the upper bench is always more stressful?

No. It did not randomise participants between standardised bench heights to calculate a causal 'upper-bench effect'.

Its contribution is different: it shows that temperature and humidity vary substantially with location and that both variables independently relate to physiological responses.

The conclusion that bench position changes local thermal exposure follows from established heat-transfer physics plus the measured spatial gradients, not from a direct bench-comparison trial.

What about condensation on the skin?

If the local dew point exceeds the skin-surface temperature, water vapour can condense on the body and release latent heat.

A stable-isotope experiment demonstrated that condensation contributed substantially to water dripping from sauna bathers after löyly [2].

In the 2026 study, however, the dew-point-to-skin-temperature index showed only weak associations with heart rate and no significant relationship with core-temperature change [1]. Condensation is therefore a plausible heat-transfer mechanism, but its independent physiological importance under specific conditions should not be overstated.

Why this nuance matters

It would be tempting to explain every strong upper-bench Aufguss simply as 'steam condensing on the skin'. The available evidence does not justify such a single-mechanism explanation.

Temperature, impaired sweat evaporation, convection, radiation, condensation and airflow all interact.

A scientifically responsible model keeps these mechanisms together rather than selecting whichever sounds most dramatic.

Why sweat may not cool equally on every bench

Sweat cools only when it evaporates. The evaporation rate depends on skin wetness, vapour-pressure gradient and air movement.

Higher local humidity can reduce the vapour-pressure gradient, while fanning can increase mass transfer by disturbing the boundary layer.

The net result depends on whether the moving air promotes evaporation or instead delivers air so hot and humid that net heat transfer remains toward the body.

Can fanning ever improve evaporation?

Yes. In air that is sufficiently dry relative to the wet skin, increased air velocity can enhance evaporation and cooling.

During a strong hot-humid Aufguss, however, the available evaporative gradient may be greatly reduced, while convection from air hotter than skin adds heat.

This is why the effect of airflow cannot be labelled simply 'cooling' or 'heating' without describing temperature and vapour conditions.

Why timing matters

The local cabin environment changes second by second after water is poured. The plume rises, spreads, is fanned, mixes and is removed by ventilation.

A guest may therefore experience a brief high-intensity pulse followed by a rapid decline, while another position receives a delayed but longer exposure.

The time course is part of the dose.

Why the same Aufguss feels different on a second round

Even if everyone returns to the same bench, the second round may begin with different stone temperature, cabin humidity, surface temperatures and individual body heat.

The bather may also have incomplete thermal recovery from the previous sauna session.

Same water quantity plus same bench does not guarantee the same physiological starting condition.

Individual physiology still matters

After the environmental differences are accounted for, people still vary in skin temperature, sweat rate, cardiovascular response, heat acclimation and thermal perception.

The 2026 study also found substantial inter-individual variability [1].

Different reports from two guests therefore do not prove that one is 'better adapted' or that the environment was identical.

Why moving down is effective dose control

Changing to a lower bench usually reduces air temperature and can move the bather away from the strongest upper hot-humid layer.

It is therefore one of the fastest ways for a guest to reduce exposure without asking the operator to change the entire cabin.

Leaving the sauna remains the appropriate response whenever symptoms or discomfort make continued exposure undesirable.

> **Bench choice is a built-in personal control for thermal dose.**

Why moving up should not be a status symbol

The upper bench is not a test of experience, toughness or sauna competence. It is simply a more intense thermal location in most cabins.

Social pressure to remain high can prevent guests from regulating their own exposure appropriately.

Professional Aufguss culture should normalise moving down or leaving at any time.

What should the Aufguss master observe?

The operator should understand which benches receive the strongest plume, where directed strokes land and how the cabin's ventilation changes circulation.

Technique can then be adjusted so that the intended experience is distributed rather than accidentally concentrated on a few guests.

This requires knowledge of the specific cabin, not merely mastery of standard towel movements.

Why an empty-cabin rehearsal can help

Airflow can be explored before a public session using safe non-invasive indicators and repeated observation of temperature and humidity sensors at different positions.

The goal is to understand circulation paths and local gradients rather than to create theatrical smoke tests that contaminate the sauna.

Multi-point environmental measurement is especially useful because one sensor cannot describe the whole cabin.

What should be measured?

At minimum, temperature measurement should state height and location. For research or technical commissioning, multiple temperature and humidity points are much more informative.

Air velocity is harder to measure reliably in a hot humid sauna, especially during transient fanning, but it is central to local heat transfer.

A professional description of Aufguss intensity should therefore include water dose, cabin volume, environmental conditions and distribution technique.

Why 'the sauna was 90 °C' is insufficient

A single temperature value says nothing about measurement height, local humidity, fanning, bench position or duration.

The bather's thermal exposure occurs at the body, not at the wall thermometer.

This is particularly important when comparing Aufguss studies or making claims about how 'hot' a session was.

A useful local-dose model

For practical thinking, local Aufguss exposure can be described as the interaction of local air temperature, local water-vapour pressure, local air velocity, radiant environment, exposure time and body position.

The water poured onto the stones creates the event, but these variables determine the dose actually received by the individual.

The model is conceptual rather than a validated numerical equation.

> **Aufguss dose is local: temperature + vapour pressure + airflow + radiation + time + body position.**

Why this matters for health-oriented Aufguss

Health-oriented practice aims for a controlled and recoverable heat stimulus rather than maximum local intensity.

If the upper bench receives a disproportionately strong pulse, the operator can reduce water, alter distribution, moderate directed strokes or give guests clear freedom to choose another level.

Professional control therefore includes spatial control.

What is the myth?

The myth is that everyone in the cabin receives 'the same Aufguss' because the same water was poured onto the same heater.

The ritual event is shared, but the physical exposure is not.

A sauna cabin is a three-dimensional, changing thermal field, and each bather occupies only one part of it.

So, why does the same Aufguss feel different on different benches?

Because bench position changes the local combination of air temperature, vapour pressure, radiation and airflow.

The upper bench generally starts hotter and receives the buoyant vapour-rich plume early. Fanning then redistributes that air unevenly and changes transfer at the skin. Sitting versus lying further changes how much of the body occupies each thermal layer.

The subjective experience and physiological load therefore emerge from local conditions, not from water quantity alone.

Conclusion

An Aufguss is not spatially uniform. Temperature stratification exists before the water is poured; vaporisation creates a transient humidity pulse; the heater plume transports it upward; ventilation and fanning redistribute it; and body position determines how the resulting environment contacts the individual.

This explains why two guests can experience the same ritual as two different thermal doses.

For professional practice, the consequence is straightforward: water quantity must be controlled, but distribution must be controlled as well. Bench height, airflow and body position are not secondary details—they are part of the Aufguss dose.

The best Aufguss is therefore not merely reproducible at the heater. It is understandable and controllable where the guests actually sit.

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Editorial note: Published sauna research rarely standardises water dose, bench height and fanning simultaneously. Statements about local Aufguss exposure therefore combine directly measured spatial sauna data with established heat- and mass-transfer principles; they should not be interpreted as a validated bench-specific dose equation.