

ROUTE SETTING AND RED-S

THE FIRST LINE OF DEFENSE AGAINST RELATIVE ENERGY DEFICIENCY SYNDROME

TEXT & PHOTOS: UDO NEUMANN

Good route setting is essential for inclusive, fair, and sustainable climbing competitions.

Inclusive means ensuring that people across a broad spectrum of body types can participate. Fair means avoiding morpho situations. A climb or move where the difficulty depends significantly on the climber's body shape or size is considered morpho, which is usually code for "hard for the short". But, and this is important, there is also anti-morpho, which is where taller climbers have a disadvantage. Think of small underclings close to bad foot-holds, where a taller climber's center of mass would be far outside their base of support.

Sustainable means helping athletes to remain competitive for more than just a couple of years and minimizing the risk of them experiencing negative (mental) health consequences later in life as a result of their participation in climbing comps. Since these three aspects are just as crucial when running a successful climbing facility as they are to competitive environments, these considerations should be relevant to you even if you don't have an interest in comp climbing.

Relative energy deficiency in sport (RED-S) is a syndrome caused by not eating enough food and thereby having insufficient energy available to account for the energy expended during sport. In an ongoing study among gymnasts, figure skaters, track athletes, and many athletes from other sports, climbers showed some of the most concerning results. The consequences of relative energy deficiency are impaired physiological functions including, but not limited to, metabolic rate, menstrual function, bone health, immunity, protein synthesis, and cardiovascular health. Since some of these consequences only manifest themselves later in life, they are often overlooked.

Let's take bone health as an example (unfortunately there are many, many more!).

Short- and long-term low energy availability (EA) has a negative impact on bone metabolism and health. Osteoporosis is a disease that weakens bones to the point where they break easily. It is called a "silent disease" because you may not notice any changes until a bone breaks. Before this happens, however, your bones will have been losing strength for many years. Bone is living tissue. To keep bones strong, your body constantly rebuilds this bone tissue. Sometime at around the age of 30, our bone mass stops increasing. To maintain healthy bones after this point, our goal is to keep as much bone as possible for as long as we can.

Although osteoporosis can strike at any age, it is most common among older people, especially older Caucasian and Asian women. Even if an athlete experiences none of the above-mentioned issues while climbing and exercising in the presence of energy deficiency during their competitive years, their bone health may have been negatively affected and the silent disease of osteoporosis might be closing in – ten, twenty, or even thirty years after they've ended their career.

THE SILENT DISEASE

It is this delay that makes RED-S such a serious concern. Once young athletes have started to become successful as a result of RED-S, we can't expect them to be motivated to gain weight just because of some potential future health risks that are completely abstract in their mind. In some cases, the adults (officials, coaches, and parents, etc.) who are meant to be taking care of the young athletes' health are neglecting their responsibilities. The status that these adults are gaining from being associated with a successful athlete has the potential to overshadow their concerns about the athlete's well-being.

WHAT'S AT STAKE?

In no way should we release officials, coaches, and parents from their responsibilities, yet for the sake of this article, let's consider wall designers and route setters as the only responsible adults in the room. Since they have no vested interest in who actually wins the climbing comp, they are in a unique position to make our beloved anti-gravity activity inclusive, fair, and sustainable. This is why I chose to write this article for Route Setter Magazine.

Another motivation is that the Olympic format is clearly steering bouldering and lead climbing in a more predictable direction. The general audience understands when climbers fall off because of fatigue, whereas movement errors reveal themselves only to experts. At the European Championships in Munich, Germany, the boulders and the route at the combined event were far less interesting than those in the individual discipline events. The women's lead route in particular was devoid of any committing, creative, or risky situations. The obligations involved in presenting a mainstream sports event might lead to climbing becoming a dumbed-down fitness test. We should be aware of this and ask ourselves if we want to see climbing represented as simply being about a demonstration of fitness.

"SO STRONG"

That climber is "so strong" is what most people think (or say) when watching an impressive athlete. Even experts have difficulty identifying the other qualities contributing to a climber's ability. I'll come back to this later when I talk about the RIC scale.

Climbing is a physical activity performed against gravity. Climbing belongs to the group of anti-gravitational sports alongside activities like ski jumping, gymnastics, and pole vaulting. These sports are not about your absolute strength, but rather about your strength-to-weight ratio, which is also called relative strength.

"THE LAWS OF GRAVITY CAN BE FIGURED OUT MUCH MORE EASILY WITH INTUITION THAN ANYTHING ELSE."
GABRIEL GARCIA MARQUEZ

Strength and power don't scale linearly. Unsurprisingly, larger muscle fibers generally produce more force and therefore tend to be stronger than smaller muscle fibers. However, while the absolute strength of muscle fibers tends to increase with fiber size, relative strength tends to decrease.

Let's consider two low-weight young male athletes, one who weighs 40 kg (88 lbs) and the other 60 kg (132 lbs). The lighter athlete can easily perform all manner of pull-ups, while the heavier athlete struggles a bit. In weightlifting, the heavier athlete can of course lift more in an absolute sense, but less relative to his own body weight. This is an example of how the principle of diminishing returns works in action and is the reason why coefficients and not body weight multipliers are used in strength sports to compare skill across weight classes.

When comparing world records in weightlifting, it is clear that relative strength diminishes as body weight increases.

The male athlete weighing 55 kg (121 lbs) has the highest relative strength, followed by the

fig. 1	Snatch	Clean & Jerk	Total	Relative strength
Male 55 kg	135 kg	166 kg	294 kg	5,34 %
Male 109 kg	199 kg	240 kg	435 kg	3,99 %
Female 45 kg	85 kg	108 kg	191 kg	4,25 %
Female 87 kg	132 kg	164 kg	294 kg	3,3 %

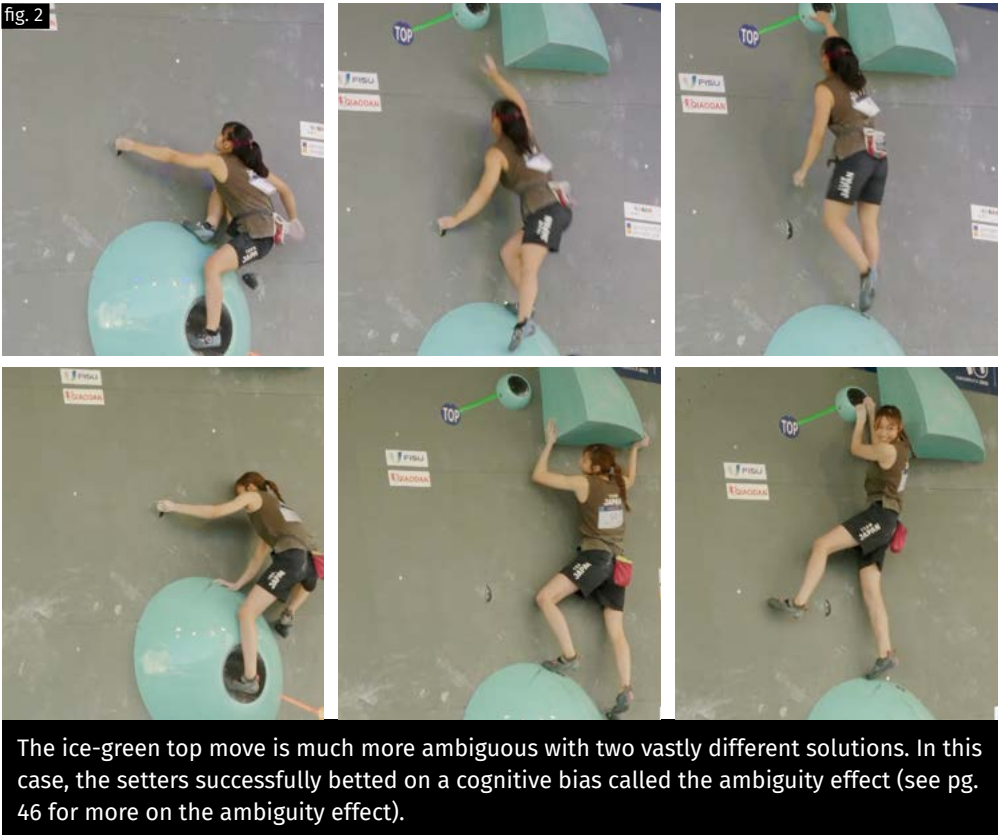
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female athlete weighing 45 kg (99 lbs). The 109 kg (240 lbs) male can't match her relative strength. The 87 kg (192 lbs) female lifts about the same as the 55 kg (121 lbs) male in absolute terms, but is the weakest in terms of relative strength.

It's a law of nature that smaller and lighter animals have a better strength-to-weight ratio.

All things being equal, an animal's relative strength for its weight will decrease as the animal's size increases. In other words, an animal weighing 10 kg (22 lbs) will be stronger relative to its body weight than a 20 kg (44 lbs) version of the same animal. This means that the humble house cat is capable of more acrobatic stunts than a wild tiger. This is because strength increases in proportion to the surface area of a muscle's cross section, while the muscle's mass is based primarily on volume, which increases much more quickly than the cross section of muscle.

If you're an athlete, optimizing the strength-to-weight ratio is king when it comes to climb-



Two examples of a boulder problem's top move, which is mainly testing the competitors' contact strength. All the successful competitors pretty much did the same thing. Similar solutions are an indicator of low complexity.

ing performance and overall athleticism, and if you become too heavy, this task simply becomes impossible due to this non-linear scaling. This issue is amplified because of the limited contact points in climbing. The consequence of this is that athletes may use methods to reduce their weight in order to gain a competitive advantage. They may perceive body fat as ballast, yet this adipose tissue is a vital endocrine organ in terms of general health. Excessive dieting can lead to the above-mentioned relative energy deficiency (RED-S) and the associated problems.

Still with me? Cool! Remember how I mentioned earlier that your climbing ability is of course not determined by your pure strength-to-weight ratio alone? Climbing is a combination of full body strength and strategic body positioning, requiring us to coordinate pushing and pulling movements in our arms, trunk, and legs. It involves the constant management of forces such as gravity, elastic recoil, torque, and momentum. We find ourselves exploring all sorts of movement variations while balancing our body weight.

We have to deal with infinite positions and moves that sometimes place contradictory demands on us. This, in turn, provides huge amounts of complex and novel movement information to the nervous system.

In fact, climbing demands such complex and integrated movements on the physical and psychological level that even the most professional athlete can't prepare for making the

right decision in every situation or train for every possible movement.

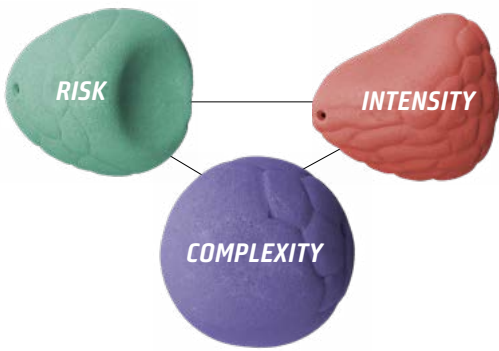
The RIC scale was developed with all this in mind.

THE RIC SCALE

The RIC scale is an elegant method for understanding climbs. Since being introduced by Jacky Godoffe and Tonde Katiyo, the concept has served as a complement to the standard grading system to further break down climbs and provide insights into sets.

Each climb can be broken down into the components R, I, and C. Before exploring and gaining an understanding of this concept, let's define these terms:

- R = risk
- I = intensity
- C = complexity



Strength-to-weight ratio and relative strength fall under the category of intensity. When it comes to intensity, all other things being equal, lighter climbers will perform better than heavier climbers in most scenarios. Please note that for the sake of my argument, I consider intensity in terms of contact strength, as intensity in compression climbing also involves other factors.

What about the other two factors, risk and complexity?

While intensity is often understood as referring to the physical aspects of climbing, risk and complexity refer to the cognitive side of things.

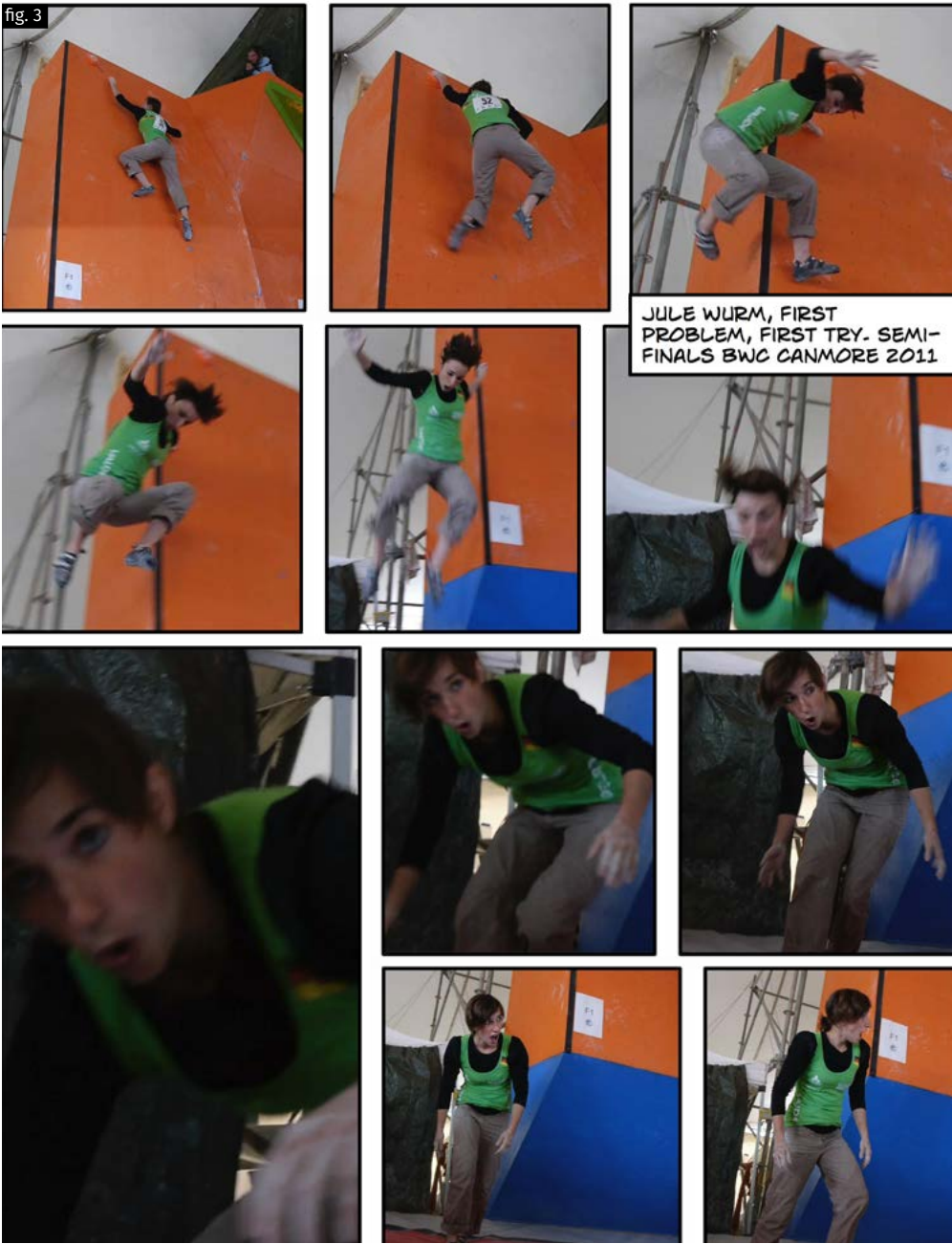
COGNITION

Cognition refers to "the mental action or process of acquiring knowledge and understanding through thought, experience, and

the senses". It encompasses all aspects of intellect, attention, thought, intelligence, the formation of knowledge, memory, judgment and evaluation, reasoning and computation, problem-solving and decision-making, comprehension, and more. Imagination is also a cognitive process, since it involves thinking about possibilities. Cognitive processes use existing knowledge to discover new knowledge. All in all, figuring out how to climb something is a cognitive process.

RISK

Risky climbs are often defined as low-percent-age, intimidating/spooky, and condition-dependent. In competitions, higher risk climbs cause climbers to feel insecure regardless of how strong they are. Our tolerance towards ambiguity is challenged, since contact points don't scream "take me here and you'll be fine" at us. Slopers, slabs, and committing smears never reward us with a feeling of being in control.



RISK: This problem from back in 2011 is still the gold standard as far as risky problems are concerned. It involved thin and insecure climbing that led to a committing dyno that added one crucial element to it that I'll explain later: loss aversion. This problem was only topped twice, by the climber pictured, Juliane Wurm, with said dyno, and by Mina Markovič with a static, albeit more physical method. It's therefore a good example of how there should be a price competitors have to pay when solving a risky or complex problem by physical means. Unfortunately, this is not always a given, as discussed below.

COMPLEXITY

Complexity refers to problem-solving, readability, and the ability to understand the movement required. Complex climbs generally involve intricate body positions and a high level of coordination.

If the problem-solving aspect of climbing is removed, as was the case at the recent European Youth Bouldering Championships, all that is left is a fitness test. During this competition, the kids could watch the other competitors climb and were shown videos of adults climbing the boulders. This meant that they tried to replicate the “right” solution and looked at their coaches or parents for approval.

In my book, that’s youth sports gone wrong. Only the kids’ ability to physically cope with the climbs was tested, leading them to believe that a good strength-to-weight ratio was of utmost importance. Some of the kids might have secretly decided to improve their ratio by losing weight. They may well feel that problem-solving surely can’t be all that important in climbing, seeing as the beta was read to them by their coaches.

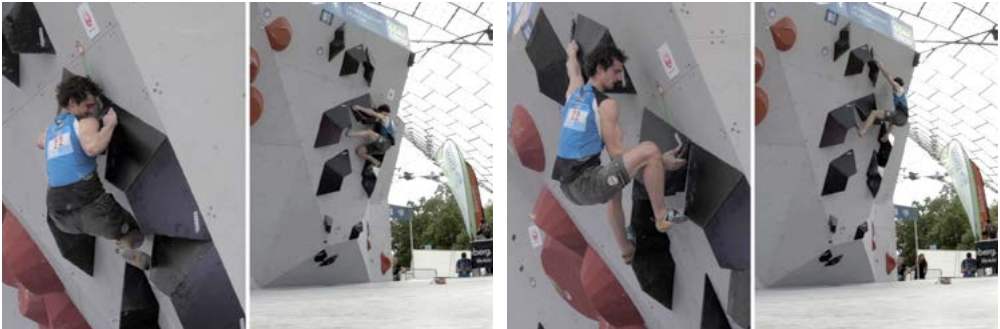
Wouldn’t it be much more beneficial for their future development as humans and climbers to place emphasis on quickly finding the most efficient solution to a complex and risky crux? In youth climbing comps in particular, it is important to place more emphasis on the cognitive aspects of risk and complexity.

For the kids who might have decided to lose weight to gain an advantage for the next comp, let’s consider what Dr. Jennifer Gaudiani says in the remarkable documentary film LIGHT by Caroline Treadway: “a mammal that is malnourished... isn’t going to be playful, is not going to be creative, and is not going to be adventurous! They are going to get really rigid, rule-bound, and serious!”

Let this sink in. How likely is it that this malnourished mammal will succeed in complex climbs without being playful and creative? How likely is it to be able to complete risky climbs without being adventurous?

SOLVING RISKY AND COMPLEX CHALLENGES IN PLAYFUL, CREATIVE, AND ADVENTUROUS WAYS

Consciously or subconsciously, setters often tease our cognitive biases.



Complexity: One climber who always shines in complex climbs is Adam Ondra. The panel above shows him climbing a problem involving tricky positioning and intricate loading directions that only he could decipher.



One movement sequence representing a perfect blend of risk, intensity, and complexity. All the way to the zone (the yellow hold on the far right), the spatial arrangement forced the competitors to mix and match their limbs’ trajectories. Once initiated, the sequence couldn’t be stopped before the zone, which is a hallmark of risky and complex climbing situations.

Cognitive biases are systematic errors in thinking that negatively impact decision-making quality and outcomes. Here are some of the many biases that can hold climbers back from performing to their best:

Loss aversion

First identified by famed scientists Amos Tversky and Daniel Kahneman, loss aversion relates to how the pain of losing something is more powerful than the pleasure of winning it. As such, humans will typically do more to avoid losses than they will to seek gains.

An example of where loss aversion came into play was at the 2011 Boulder World Cup in Canmore, Canada where a competitor hesitated to do a committing move two-thirds up a challenging climb.

Escalation of commitment

This is where people use their cumulative prior investment to justify why they are continuing to invest in a decision, despite new evidence suggesting that the decision was probably wrong. An example of where this might occur in climbing is when a competitor



Climbers had to anticipate the end position before initiating the two crux moves pictured here. Problem solving, decision-making, and imagination are cognitive processes that involve thinking about possibilities. Cognitive processes use existing knowledge to discover new knowledge. The climbers even had to carefully consider how to hold the top and some competitors fell victim to decision fatigue.

GOODGRIP

the little things make the difference

- stick brushes | boulderbrushes | vegan bristles
- ringo's | woody's | special bits | bit holder
- skinshaper's | chalk | tape | more



the little things make the difference

- social workshops | from people with disabilities
- low waste | wooden and recycled materials
- handmade in germany

english: www.goodgrip.org
german: www.goodgrip.info





Exhibit 1: Innsbruck (Austria) Finals W1. There is no element of either risk or complexity in this route, at least not given the abilities of female climbers competing in 2022. Long reaches in between positive holds mean that problems like this risk being morpho, thus favoring taller climbers (top left). A boulder problem I was surprised to see in 2022!



Exhibit 2: It was announced that W2 in Innsbruck's finals would start with a triple dyno. It was topped (both flashed) by two athletes, both of whom did not do the triple dyno. This method was very intense, but not as complex and risky as the beta intended by the setters. The climber pictured didn't even use the middle of the holds making up the triple dyno. None of the other competitors who tried the dyno even made it to the zone. While I applaud the two successful competitors for identifying this problem's affordances, I cannot help but wonder if the setters responsible are in tune with the female competitors' capabilities!



Exhibit 3: Seoul (South Korea) Finals W3: A dyno is made more complex when the target hold can only be held with the help of an opposing toe hook that you need to catch. A toe hook catch was not needed here though, as climbers could hold onto just the handhold. Mind you, the picture on the right shows the backswing! In ideal setting, strong climbers shouldn't be allowed to avoid complexity!

figures out the beta and sticks with it despite ending up in the wrong position to do the crucial last move.

Neglect of probability

This is the tendency to disregard probability when making a decision under uncertainty. For example, how many times have you actually practiced the stunt that you are thinking about performing to solve this boulder problem? Innovative setters sometimes create

a situation that hasn't featured in a comp before. Neglect of possibility may lead to athletes trying something that they have never practiced before instead of thinking about which of their skills they could use to meet the problem's requirements and then gauging the result.

Ambiguity effect

This is the tendency to avoid options for which the probability of a favorable out-

come is unknown. An example of this is when athletes do not use unfamiliar holds and wall features to their full potential. Classic, modern dual-texture holds give setters new opportunities here.

On the previous page (fig. 6 & 7) are two brilliant examples of a very attractive balance of risk, intensity, and complexity from the recent European Championships. Although these problems were very intense, ambiguity

tolerance, forward thinking, spatial awareness, and adaptability paid off in both cases. In both examples, one move had to lead into the next and momentum had to be conserved. The malnourished mammals mentioned above certainly wouldn't benefit from their superior strength-to-weight ratio here!

IN CONCLUSION

How is it going? Are route setters the responsible adults in the room?

At the start of this article, I stated that setters are in a unique position to make our beloved anti-gravity activity inclusive, fair, and sustainable.

They have the potential to create playful, creative, and adventurous climbing competition environments.

However, route setters need to make more of a conscious effort in this regard. On the left (pg. 46, fig. 8/9/10) are three examples from the 2022 Boulder World Cup season that make me wonder if setters have the option to stand their ground when organizers demand predictable, easy-to-digest, fast-moving comps catering to a mainstream audience. There certainly seems to be a tendency for women's comp routes to lack creative complexity.

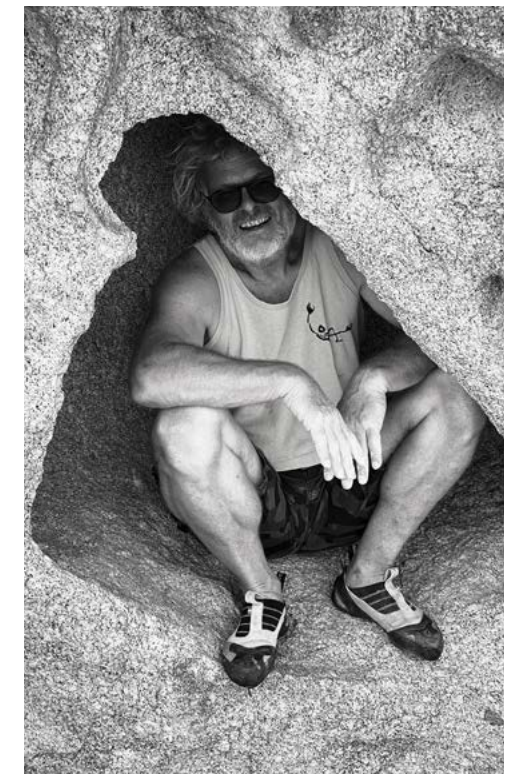
As they gain popularity and exposure, climbing competitions are at risk of being seen as competitions where athletes ridden with RED-S are most often successful. The design of a climbing competition, its wall, and its route setting determine if they are a pure fitness test, in which the athlete's strength-to-weight ratio trumps everything or if prob-

lem-solving and decision-making are equally as important for success.

If we want inclusive, fair, and sustainable climbing competitions, we need to place more emphasis on the cognitive elements of climbing, namely risk and complexity on the RIC scale. Setters can draw on their expertise and use modern holds and, at least in bouldering, modern wall shapes to achieve this. As far as lead climbing is concerned, a discussion about the steepness of the walls would be helpful. Ultimately though, it is up to the officials and decision-makers to consider athlete well-being across the board when planning and designing climbing comps. 🧗



Udo Neumann is one of the climbing world's most highly respected and sought after biomechanics, skill acquisition, and motor control experts. He began climbing in 1982, and since then, he's been documenting and analyzing the sport of bouldering in all sorts of media – books, films, photographs, and mixed media. He's shared his findings and knowledge in countless publications, both off- and online. He authored some of the most successful training books, like "Performance Rock Climbing", "Der XI. Grad", and "Lizenz zum Klettern". Recent video publications include "Climbing Technique of the 21st Century" and the "Ideas to Improve your Climbing" series. Udo has traveled all continents, rock climbing and bouldering. From 2009 until 2017, he was the German Bouldering Team coach, training world and European champions. Nowadays he's advising federations and training teams as well as coaching athletes and coaches.



UDO NEUMANN

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Lives in: Köln, Germany

Background: Master in Sports Science, author, filmmaker, consultant and coach