Eric Hörst Hangboard Moving Hangs Climbing Training Endurance Protocol

Jędrzej January 30, 2020 No Comments

"After 8 weeks of training, my finger strength increased by 17%! Thanks again for your wonderful site and your help selecting a plan! I can't wait to go crush!"

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Quick summary

Eric Hörst Hangboard Moving Hangs climbing training routine

- Low-intensity exercise, suitable for beginner climbers
- Dif be easily controlled

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- Powerful, versatile and easy to use method
- Suitable for both beginners and elite climbers
- More climbing-specific than dead hangs – engages the entire body
- Gentle on the shoulders, because the feet are supported
- A must-have in any climber's training toolkit

Eric Hörst Hangboard Moving Hangs climbing training protocol

The Hangboard Moving Hangs (HMH) climbing training protocol was described by Eric Hörst in his book Conditioning for Climbers [1][2]. Because the intensity of the exercise is rather low, even beginner climbers with a couple of months of training under their belt can give it a try. The great thing about the protocol is that it makes it possible to easily control the difficulty by changing the hold size, the placement of the feet support, or the pace at which the hands are moved around the hangboard. This facility in load control makes it possible to train either anaerobic endurance or aerobic endurance, depending on how the intensity is related to the climber's Critical Force (CF).

The Hangboard Moving Hangs climbing training protocol is a perfect introduction to hangboarding, because it's safe, it puts less strain on the shoulders than typical dead hangs, and it's easy to do. I started hangboarding with the Hangboard Moving Hangs climbing endurance protocol myself, and I would recommend it to beginners.

> *Simple and safe method of training both aerobic and anaerobic endurance. Suitable even for beginners!*

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1. Mount the hangboard, and support your feet on a chair, or some screw-ons on the wall.
2. Start moving your hands around the hangboard, changing the hold every 3 – 5 seconds.
3. After a while, you will start to develop a pump in your forearms. If so, try to shake out on some jugs.
4. Continue moving around the hangboard for a total time of 5 – 10 minutes.
5. Dismount the hangboard, rest for about 10 – 20 minutes, depending on set duration.
6. Perform 2 – 3 sets.

Eric Hörst Hangboard Moving Hangs climbing training routine remarks

- You can increase the intensity by moving the chair further behind the hangboard.
- If you want to train aerobic endurance instead of strength endurance:
  - Choose bigger holds to avoid getting pumped, and increase the number of sets,
  - Reduce the inclination – move the feet support closer to the hangboard.
- Once you improve, try to reduce the size of the holds on which you shake out.

Table 1: Eric Hörst Hangboard Moving Hangs climbing training protocol summary.

Hangboard Moving Hangs	
MVC-7 load (unilateral)	15 - 95%
Sets	2 - 3
Positions	3 - 10
Hang time [s]	3 - 5
Set duration [min]	5 - 10
Rest betw. sets [min]	10 - 20
TUT/arm [s]	375 - 750
Total time [min]	30 - 90

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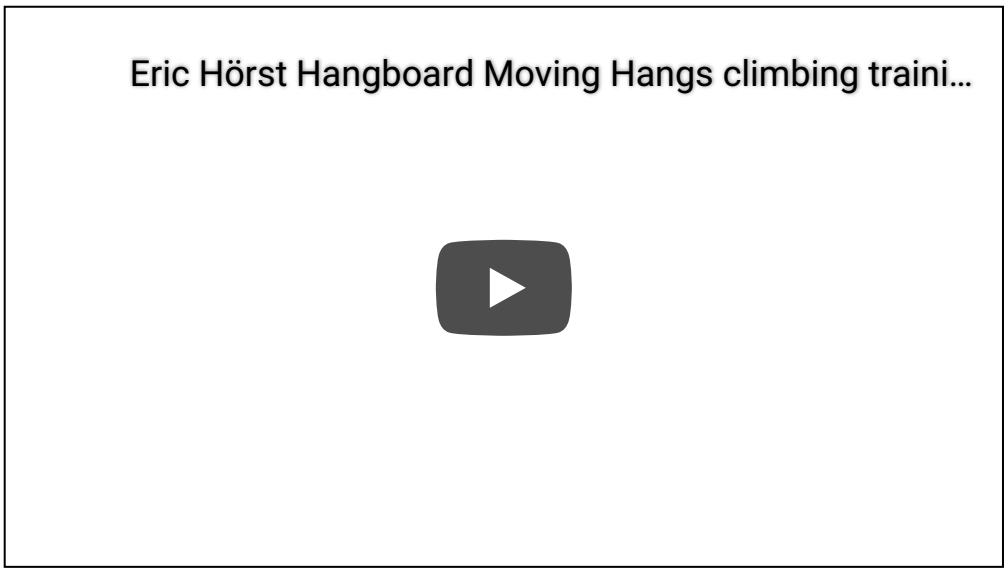
Hangb Moving Hangs anaerobic endurance training demo

In the video, you can watch an example demo session of the Hangboard Moving Hangs protocol. I set the difficulty to reach exhaustion around the 5-minute mark. This means that I operate mostly in the anaerobic regime and train strength endurance.



Maximum Voluntary Contraction and Critical Force

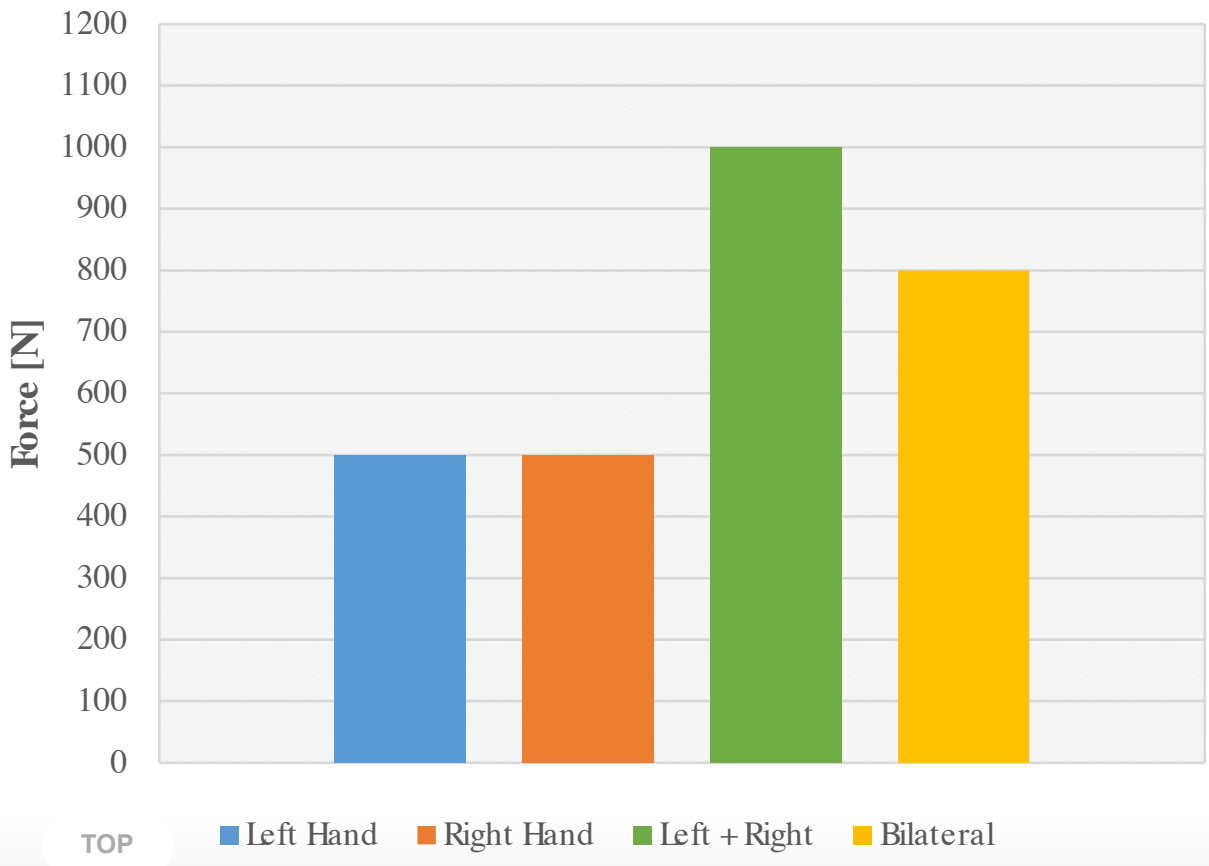
You can use the hangboard to develop both aerobic and anaerobic endurance, but how to tell which one you are training? For any intermittent hangs protocol, such as the Hangboard Moving Hangs, we can define what is called the Critical Force (CF). To make things very simple, we can say that the Critical Force is the load at which equilibrium is struck between the energy used by the muscles during the work period and the energy replenished by the blood flow during the rest period. The ratio of the work period to the rest period is called the duty cycle [3]. In theory, at Critical Force load, the exercise can be carried out indefinitely. In practice, this is not the case, but 20 minutes should be easily manageable.

To train aerobic endurance, the hang load on either hand should not exceed the climber's CF. Interestingly enough, it was found that the best results are achieved when the hang load is exactly CF [4]. To train anaerobic endurance, the loads must exceed CF, which usually is the case, e.g. Hangboard Repeaters [5]. The concept of CF is closely related to the original idea of Critical Power, which is more appropriate to sports such as cycling. You can find more information on Critical Power in [4][6][3]. More detailed information on Critical Force in climbing can be found in [7][8]. You can also easily cal TOP ır CF with the Critical Force Calculator tool [9].

> *Aerobic endurance is most efficiently trained exactly at Critical Force load.*

Critical Force can be expressed in newtons, but it is usually more convenient to relate it to the Maximum Voluntary Contraction (MVC). The MVC is the maximum load with which the climber can hang for a given time on a given hold. The measurement time usually lies between 5 seconds (MVC-5) to 10 seconds (MVC-10). In this blog, the 7-second MVC (MVC-7) is typically assumed, which is consistent with [10].

The MVC is usually determined for two arm (bilateral) hangs. In the case of the HMH protocol, one arm is mostly used (unilateral). For simplicity, we will assume that the MVC for one arm hangs is precisely 50% of the two arm hangs MVC. It is, in fact, a bit higher than that, owing to the phenomenon of bilateral deficit. Research studies have shown that for isometric contractions, the average bilateral index lies in the range – 8.6 ± 8.5%, which means that the force produced by two limbs simultaneously is, on average, about 8.6 ± 8.5% lower than the sum of the forces generated by single limbs separately. This difference is likely to be negligible for our investigation, and it is not taken into account here. The phenomenon of bilateral deficit for one arm hangs is schematically depicted in Figure 1 below [11].



We know that for the 7/3 Endurance Repeaters protocol (70% duty cycle), the Critical Force usually lies within the range of 30% – 60% MVC-7 [10]. We also know that Critical Power depends on the duty cycle, i.e., higher work duration to rest duration ratios result in a lower Critical Power [12]. Hence it can be roughly inferred that the Critical Force for the 5/5 duty cycle is about 20% higher than for the 7/3 duty cycle. The expected CF range for the 5/5 repeaters duty cycle would thus be 36% – 72% MVC-7. The question is whether this intensity range can be covered with the Hangboard Moving Hangs climbing training protocol?

Hang intensity determination for the Hangboard Moving Hangs

The hang intensity for the Hangboard Moving Hangs climbing training protocol depends on the hold size and the supporting wall inclination. The inclination is controlled by how far behind the hangboard you place the feet support. The effect of supporting wall inclination on hang intensity was thoroughly discussed in [13]. Based on a simple analysis of the mechanical system involved and some very rough measurements, we can state that the load typically lies in the range between 30% – 70% of the climber's body weight (BW), depending on the type and position of the feet support used [14]. The experiment is illustrated in Figure 2 below.

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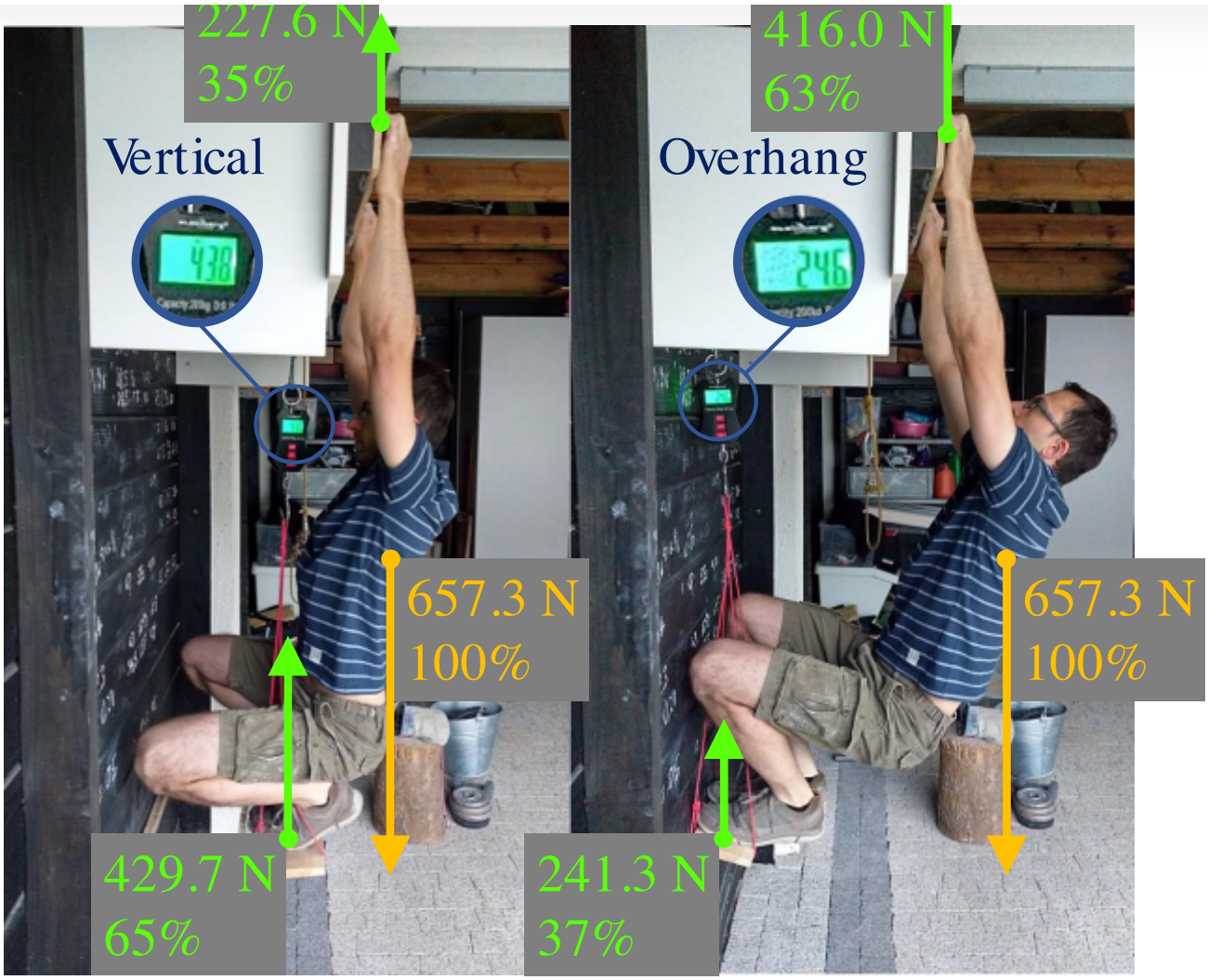

Figure 2: Climber's weight distribution during the Hangboard Moving Hangs climbing training protocol at vertical (left) and overhung (right) hang angle.

Let's assume that a climber whose bodyweight is 66 kg carries out the protocol on a set of three different edges. The respective MVC-7 values for bilateral (two arm) hangs, and unilateral (one arm) hangs are given in Table 2 below.

Table 2: Example load values for the Hangboard Moving Hangs climbing training protocol with respect to unilateral and bilateral MVC-7, at overhung and vertical position.

Edge	20 mm	14 mm	10 mm
Bodyweight	66 kg		

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bilateral	[illegible] kg	[illegible] kg	[illegible] kg
MVC-7 unilateral	54 kg	47 kg	44 kg
Load in overhung position	50% BW/33 kg		
% MVC-7 bilateral - overhang	30%	35%	38%
% MVC-7 unilateral - overhang	61%	70%	75%
Load in vertical position	30% BW/20 kg		
% MVC-7 bilateral - vertical	18.5%	21%	23%
% MVC-7 unilateral - vertical	37%	42%	46%

Now, let the climber switch hands every 5 seconds, with the switch time equal to one second. At a moderately overhung inclination, 50% of the climber's body weight is supported by the feet, and 50% rests on the fingers. The instantaneous load for a single hand is plotted in Figure 3 below.

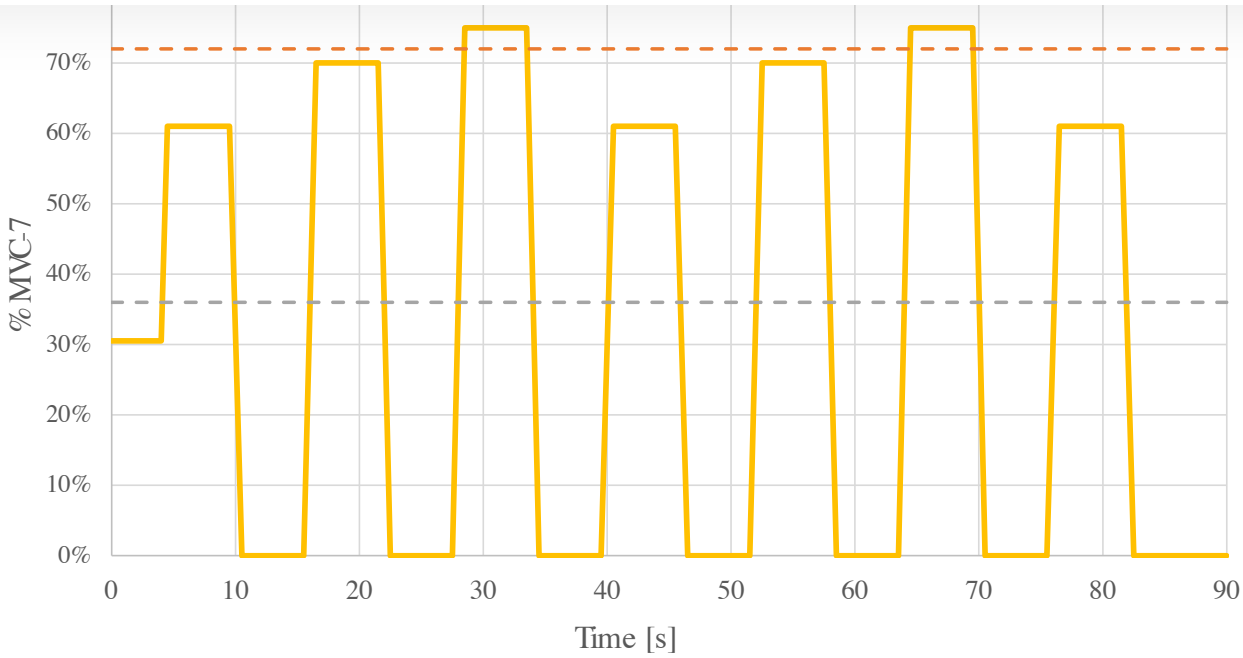
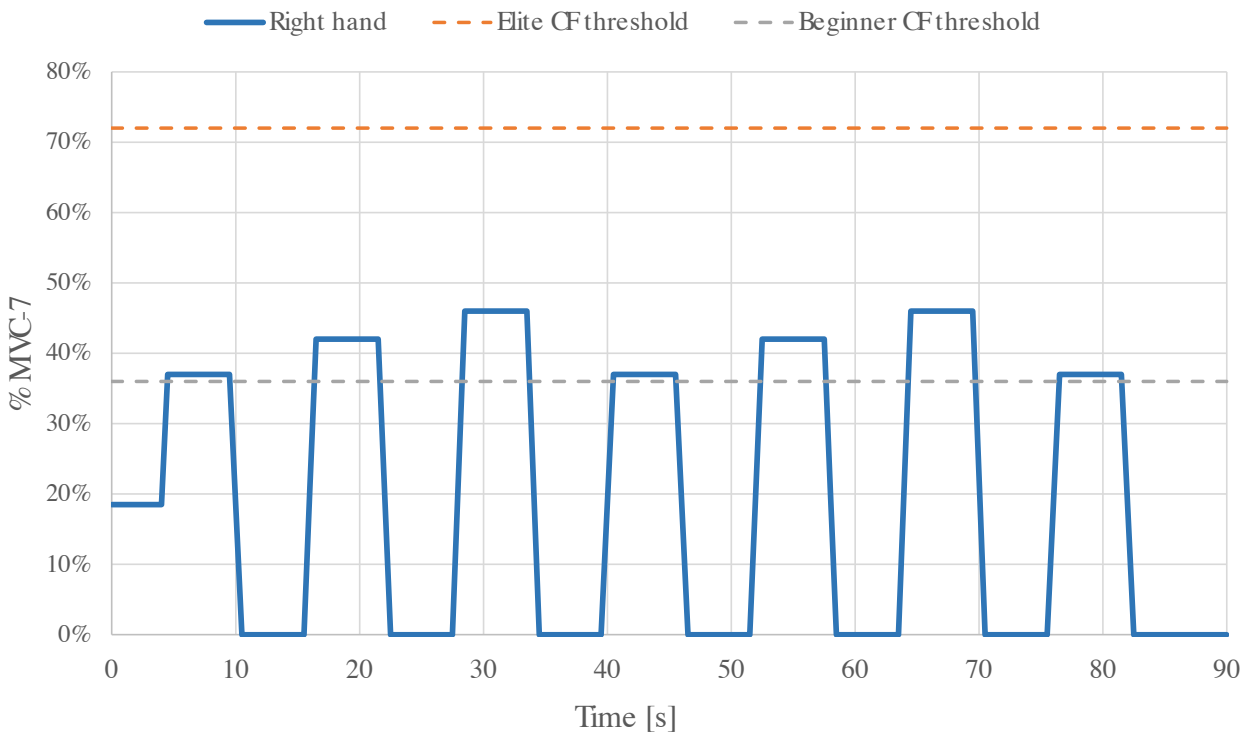


Figure 3: The hang intensity during the Hangboard Moving Hangs climbing training protocol with respect to the one arm MVC-7. Even elite climbers with a high CF threshold are likely to enter the anaerobic regime.

Next, let's change the inclination to vertical, so that 70% of the climber's body weight is supported by the feet, and only 30% rests on the fingers. The instantaneous load for a single hand is plotted in Figure 4 below.



anaerobic regime.

From this simple case study, we can conclude that for the moderately overhung inclination, the climber executing the protocol is most likely to operate predominantly in the anaerobic intensity range. On the other hand, for the vertical position, even a beginner climber is expected to work in the aerobic intensity range.

In Figure 5 below, the sources for energy production are plotted in function of time. We can see that at very high exercise intensities, reaching 100% the anaerobic-alactic energy system is used, and ATP produced from creatine phosphate (CP) is utilized as the energy source. After about 5 seconds, the ATP and CP become exhausted. At this point, the anaerobic-lactic energy system kicks in, and ATP is produced from carbohydrates, but after about 7 – 10 seconds, it is no longer possible to maintain the maximum intensity muscle contraction. This is why MVC test hangs should last between 5 – 10 seconds.

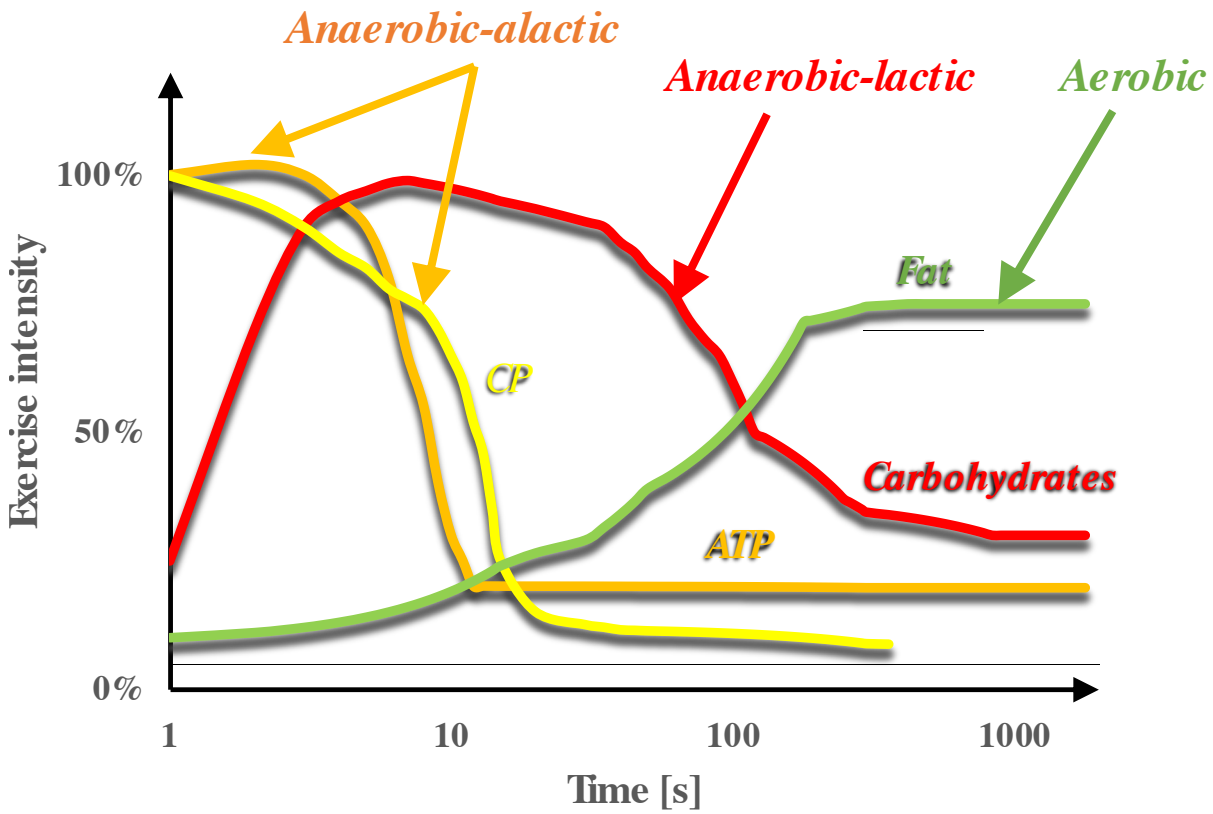


Figure 5: Energy sources and energy production. At different training intensities different energy sources and systems are used [15].

After 10 seconds, the efficiency of the anaerobic-alactic energy system starts to decay rapidly, and the lactic energy system takes over completely. From the plot, we can see that anaerobic activity at 80% intensity can be maintained for about 60 seconds, which corresponds well to the typical Hangboard Repeaters endurance protocol [5]. At around the 100-second mark the aerobic energy system

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endurance. In well-conditioned endurance climbers, the Critical Force can be as high as 90% and they can keep going at this intensity for a very long time. However, most climbers are unlikely to make it past 200 seconds [10].

Climbing training anaerobic endurance adaptations

Let's take a look at the climbing training adaptations resulting from the Eric Hörst Hangboard Moving Hangs protocol executed above the Critical Force threshold. Based on the definitions given by Holloszy, at loads above CF we can classify the Hangboard Moving Hangs as a form of anaerobic interval training [15]. The protocol increases adenosine monophosphate protein (AMP) levels, triggering mitochondrial growth, and enhanced vascularization of type II muscle fibers, induced by hypoxia. What is even more important, the activity of enzymes involved in anaerobic metabolism is boosted. Further, resistance to lactic acid is enhanced, while the A-VO_2 difference increases. PCr recovery rates are also improved, and the total PCr levels in the muscles are heightened [16]. Finally, muscle hypertrophy is expected, owing to anabolic hormone secretion, caused by lowered blood pH, and fast-twitch muscle recruitment [15].

> *Execute the Eric Hörst Hangboard Moving Hangs climbing training protocol above Critical Force threshold to improve strength endurance, tolerance to lactic acid, PCR recovery rates, and trigger muscle hypertrophy.*

The adaptations listed above mostly concern the anaerobic energy system and are supposed to enhance the energy store component W', but not CF, which is more related to aerobic metabolism [10]. Thus it seems that the Hangboard Moving Hangs climbing training protocol done above the Critical Force threshold is a typical strength endurance training method, and is less likely to trigger improvements in the aerobic energy system.

Climbing training aerobic endurance adaptations

If the Eric Hörst Hangboard Moving Hangs climbing training protocol is executed below, or better yet, precisely at Critical Force load, it becomes very similar to Endurance Repeaters [8]. The goal of aerobic endurance training is to increase the vascularization, enzyme activity and the number of mitochondria in slow-twitch muscle fibers, which in most sport disciplines is done using high-volume training at low intensities of up to 40% MVC [17]. In route climbing, the goal of such training is to

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sequences and facilitates recovery on large holds [10].

> *Execute the Eric Hörst Hangboard Moving Hangs climbing training protocol below Critical Force threshold to improve aerobic endurance, slow-twitch muscle vascularization, mitochondrial density, and forearm muscle reoxygenation rates.*

According to Holloszy, the Eric Hörst Hangboard Moving Hangs climbing training protocol executed at loads below Critical Force would be qualified as a form of aerobic interval training. What is very interesting is that at this exercise intensity, anaerobic metabolism is also induced, but lactic acid can be eliminated efficiently. The mitochondrial density in slow-twitch muscles increases, and the activity of enzymes involved in oxidative metabolism is enhanced. Vascularization of the forearm muscles is additionally developed [15]. The adaptations listed above are crucial, because it was shown that the forearm muscle oxidative capacity is significantly greater in elite climbers compared with nonelite climbers. What is more, the O_2% recovery per second is significantly greater in elite climbers compared with nonelite climbers [18].

Eric Hörst Hangboard Moving Hangs climbing training protocol conclusions

The Hangboard Moving Hangs is a simple to use climbing training protocol, which can be utilized to develop both strength endurance and aerobic endurance. The intensity can be easily adjusted by using smaller holds, or moving your feet support further behind the hangboard. The workout can be used as an excellent introduction to hangboarding for beginner climbers. It can let them get familiar with the holds and to slowly get used to the high loads on the fingers.

> *Powerful and versatile endurance training technique, suitable for both beginner and elite climbers. A definite must have in any climber's toolkit.*

The Eric Hörst Hangboard Moving Hangs climbing training protocol can also be effectively used by advanced climbers, as a replacement for the Hangboard Repeaters (anaerobic version), or

particularly in the overhung position. On top of that, it naturally forces a 50/50 work to rest ratio, as opposed to the 70/30 duty cycle used mostly with the Repeaters protocols. The above, in my opinion, makes the Hangboard Moving Hangs slightly more climbing-specific. Finally, because the feet are supported, the method is much gentler on the shoulders than dead hangs, making it safe for beginners. To sum up, the Eric Hörst Hangboard Moving Hangs climbing training protocol is a powerful and versatile technique for developing forearm endurance, and it is worth including in any climber's training portfolio.

If you have any questions, feel free to contact me. Please subscribe to the blog, to keep up to date with upcoming posts on cutting edge methods of climbing training!

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About the author

Jędrzej

A veteran hangboarder and a Moonboard fan, Jędrzej is crazy about training for climbing. There's nothing he likes more than trying out different protocols and applying the newly acquired skills on the wall. Jędrzej also enjoys playing the electric guitar, baduk, and reading articles on the science of sports training. He holds a Ph.D. in electrical engineering.

ONE ARM HANGS HANGBOARD TRAINING ... 8-MONTH HANGBOARD FINGER STRENGT...

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