



How do we measure difficulty?

Difficulty is so subjective to the individual. We have measurements in our bodies that show how tough or easy things are: weights on a barbell, time on a mile run, etc, but the internal markers and the ways we interpret them, are so much more valuable to us on a day-to-day basis.

We might not always have the same treadmill, trail, or fitness set-up, but with certain intrinsic interpretations of our own effort level, we can assess just how challenging something is and how we adjust our exertion to match that. Our three methods here are RPE, Heart Rate & METs.

I. RPE

RPE is one of the most simple subjective measures, standing for Rating of Perceived Exertion. This is a simple scale of 1-10 to determine how hard you believe you are working, or that an exercise/effort level is. Other scales exist from 0-20, but for our purposes, we'll detail a scale of 1-10, where 1 is the easiest, and 10 is the hardest. The table attached below should do a good job of describing the RPE scale and should allow you to assess where you best rank on it.

Rating	Description
1	Nothing at all (lying down)
2	Extremely little
3	Very Easy
4	Easy (could do it all day)
6	Somewhat hard (starting to feel it)
7	Hard
8	Very hard (effort to keep up)
9	Very Very hard
10	Maximum Effort (can't do anymore)



II. Heart Rate

Let's start with what Heart Rate is. It's the beats/minute of the heart as it pumps blood through the circulatory system. As exercise intensity increases, there is a simultaneous increase in heart rate as well. Better conditioned individuals demonstrate lower resting heart rates and are able to maintain high target heart rates for a longer duration. First, we'll uncover how to determine your heart rate in its various iterations. This can all be coupled with devices that measure heart rates to determine if the intensity you are putting out matches the modality and method by which you are trying to push.

1. Find your Resting Heart Rate (RHR)

Either by placing your index & middle finger on the jugular vein or the carpal, sit quietly and count the number of pulses you feel within a 15 second period. Make sure not to shuffle or move around during this time. Ideally, this is done right after you wake up to ensure accuracy.

From here, multiply that number by 4 (60 sec per minute) to get your *Resting Heart Rate*.

2. Find your Age predicted Max Heart Rate (APMHR)

Start with the calculation of... (220 - age)

This is typically the standard for max heart rate registered by most people.

3. Calculate your heart rate reserve (HRR)

Take the two previous numbers and subtract them: (**APMHR - RHR**)

This becomes your *Heart Rate Reserve* (the difference between max and resting heart rate).

4. Find your Target Heart Rate (THR)

Take the intensity of each range and multiple it by your *Heart Rate Reserve*.

For each end of the relative heart rate reserve, add your resting heart rate back.

For a visual of 60-70% **MHR** (*Max Heart Rate*).

$$(0.60 \times \mathbf{HRR}) + \mathbf{RHR} = \mathbf{THR} @ 60\%$$

$$(0.70 \times \mathbf{HRR}) + \mathbf{RHR} = \mathbf{THR} @ 70\%$$

On the next page, we'll go through some charts and strategies for how to tailor these heart rate ranges to the ideal ranges for your intensities and goals.



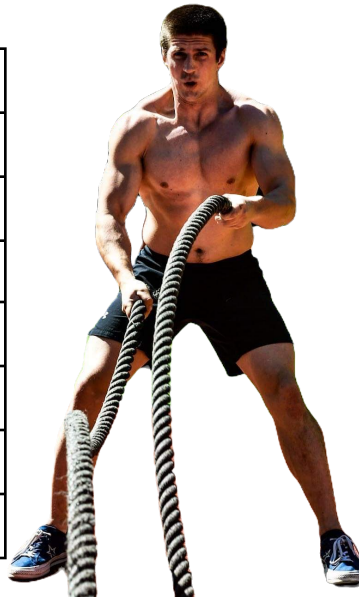
First, let's see the typical relationship between VO2 max, HRR & MHR.

% VO2 Max	% HRR	% MHR
50	50	66
55	55	70
60	60	74
65	65	77
70	70	81
75	75	85
80	80	88
85	85	92
90	90	96
95	95	98
100	100	100



Now let's look at what typical zones exist for specific intensities, based on your Target heart rate.

Zone	Description	Intensity (THR)
1	<i>Recovery</i>	< 65 %
2	<i>Aerobic</i>	65 - 75 %
3	<i>Extended Endurance</i>	75 - 80 %
4	<i>Intense Endurance</i>	80 - 85 %
5	<i>Anaerobic Threshold</i>	85 - 90 %
6	<i>Max Aerobic</i>	> 90 %
7	<i>Speed</i>	<i>Almost Max</i>



Now how do we get away from the numbers and tie it all together? Let's look at some examples of different exercise modalities and where we would apply these intensities (see the next page table).

Training Type	Intensity
<i>Long, Slow Distance or Aerobic Work</i>	<i>~ 70% MHR</i>
<i>Pace / Tempo Work</i>	<i>~ 85% MHR</i>
<i>Interval or HIIT (High-Intensity Interval Training)</i>	<i>Work periods > 90% MHR Rest periods ~ 65% MHR</i>

Now what does each category mean?

a. Long, Slow Distance

When you see yourself going for a long incline walk, a casual bike ride or an easy paced run. This is the realm you should shoot for. So going with the aforementioned equations, you should operate roughly at around **70%** MHR for your THR.

b. Pace / Tempo Work

This is meant to simulate a higher, faster intensity prolonged at a certain duration. Usually if you are training for a race, hitting a time trial and have conditioned yourself with a proper aerobic base, you can integrate Pace/Tempo work into the fold. These should be maintained at roughly **85%** MHR of your THR for about 20-30 minutes.

c. Interval or HIIT Training

These are a combination of work and rest periods that have an inverse relationship to heart rate. The higher your intensity based on heart rate, and the more intervals, the longer your rest periods need to be, and vice versa. You can build up your ability to maintain high intensities first by decreasing the rest periods to match them closer to your work set, before increasing the speeds and intensities present. The work periods should have a **90%** MHR or greater THR and the rest periods at roughly **65%** MHR.

III. METs

METs stand for Metabolic Equivalent and is considered the amount of oxygen required by the body of rest (3.5 ml - kg⁻¹ min⁻¹). The numbers you will see for metabolic equivalent basically mean that an activity listed here would take that relative number of the amount of oxygen than it would take than for the body to be at rest. The lower the number, the easier it is.

If something were rated a 9.0 MET, that means it takes roughly 9x the oxygen to execute the task than if you were resting. The table attached will give an idea of what this amounts to.

METs	Activity
1.0	Lying / sitting quietly, doing nothing, laying in bed
2.0	Walking less than 2 miles per hour on a level surface
2.5	Walking 2 miles per hour on a level surface
3.0	Light/moderate resistance training
3.5	Stationary Cycling, very light effort (30-50 watts)
4.3	Walking 2.5 miles per hour on a level surface
4.8	Walking 2.8-3.2 miles per hour on a level surface
5.0	Walking 4 miles per hour, aerobic dance, or moderate elliptical work
5.5	Step or Water Aerobics
5.8	Swimming laps, freestyle stroke, light to moderate effort
6.0	Resistance training, powerlifting/bodybuilding, vigorous effort
6.3	Walking 4.5 miles per hour or stair-stepping 20 steps per minute
6.8	Stationary Cycling, light effort (90-100 Watts)
6.9	Stair stepping 30 steps per minute
7.0	Rowing, moderate effort, 100 watts
7.3	Aerobic dance, high impact
7.5	Step aerobics
8.0	Calisthenics, vigorous effort, Outdoor Cycling 12-13.9 mph
8.3	Walking, 5 miles per hour
8.5	Rowing, moderate effort, 150 watts
8.8	Stationary Cycling, 101-160 watts
9.0	Running, 5.2 miles per hour, Step Aerobics (10-12 inch step)
9.5	Step Aerobics 10-12 inch step
9.8	Running 6 miles per hour, Swimming laps freestyle, fast & vigorous

10.0	Outdoor Cycling 14-15.9 mph
10.5	Running 6.7 miles per hour
11.0	Running 7 miles per hour, Stationary Cycling 161-200 W, Jump Rope
11.8	Running 7.5-8 miles per hour
12.0	Outdoor Cycling, 16-19 mph, Rowing stationary 200 watts, moderate effort
12.3	Running 8.6 miles per hour
12.8	Running 9 miles per hour
14.0	Stationary Cycling 201-270 Watts, Very vigorous effort
14.5	Running 10 miles per hour
15.8	Outdoor Cycling >20 miles per hour