EFFICIENT POWER

Move and breathe: the concept of efficient power production.

He/she who can produce more power aerobically without having to tap into other fuel substrates is more efficient. Efficiency = performance = fitness.

Why is the aerobic system more efficient at producing power?

The aerobic energy system is on all the time. It never shuts down, it uses fat for fuel via a process called beta-oxidation. This is where we breathe in air and it oxidises (burns up) lipids (fat) within our blood and cells for a slow and prolonged release of fuel. This process can sustain long slow activity equivalent to running 2 marathons back to back and it can sustain high sustained efforts for up 90mins. Add in some short recoveries and this system regenerates quickly, (somewhat) allowing you to go again without the need to refuel (to some degree.)

Conversely, the ATP-CP and lactate systems are literally a finite bank of energy reserves lasting for just 5-30min at best. When you exhaust or even tap into these, you need to refuel via sugars obtained by food. The use of this system often comes at a cost to the CNS – so while you may appear recovered after a tester/session, the CNS can be beat up for a sustained period, taking up to 72hrs to recover to a point where you're good to go again.

What is efficient power?

In fitness there are clear lines drawn in the sand when it comes to efficiency. There are those that are efficient, breathe in graceful balance with their movement, have the ability to recover quickly and seemingly have more to give at the end of their event. Then there are others who stumble around, can't hold a consistent pace, recover slowly and appear to be battling against their bodies in order to finish. The differences are visible: fluid flow vs floundering flap. For efficient power production to be present, we should be seeing the former.

Fluid flow VS floundering flap: spotting the difference.
Let's look at the following scenarios. 2 athletes, same size, similar lever length and similar strength base. Let's say they are competing at regional level CrossFit – skill and familiarity with the below movements are of no issue.

The tester:
AMRAP in 15min:
10 Power cleans @ 70kg
10 Wall balls @ 9kg
10 Burpees

Both athletes complete 15 rounds but the first is visibly within the depths of their aerobic system… moving and breathing, smooth execution of movements, you know they're pushing cos you can hear the breathing rates like wind blowing through a tunnel. Yet there is an element of calmness and peace, and when it's all over they simply walk away, breathing returning to normal within 1-2min. The second athlete is grunting, their pace per round is uneven, they surge, they go through visible ups and downs during the tester, visibly pained and in loads of discomfort, they look lost physiologically. They finish on their back – crushed, slow to recover, still shaking their body off from the tester some 10-30mn later.

What's going on here?
In both cases, power is being produced – both athletes have potentially both done the similar amounts of 'work' but derived from different means. The first athlete is efficient in their power production via usage of their aerobic system. The second is untrained in their aerobic system, and must default to other (less-efficient) fuel substrates that are perhaps more trained and familiar. They prefer to use glycolitic pathways like the CP system and lactate systems to derive power, shying away from the aerobic. Efficiency counts for something. Especially if athletes have to get up to perform again with 5,10 or 60min of completion of this (or any) tester. Some folks might not care if the result is efficient or not given that both athletes score the same result in that event (and may theoretically do the same 'work'), but it certainly counts across repeated events, across a day, days, weeks or a season of competition. Just using the above scenario, we can see where each athlete could potentially benefit from some bias toward specific energy system work in future training designs in order to make them more efficient at doing 'work'. To allow them to back up and perform, repeatedly, consistently.

Too often, the simple "go hard or go home" mindset that is applied to training can fail to return training adaptations over time. It's simply not a sustainable model for consistent progress over an extended period – it allows some potent changes initially, which then tend to level off after the beginner phases. This is where the concepts of intelligent program design and knowing yourself as an athlete can meet to produce training effects that are far reaching, helping to further develop the self knowledge to allow continual improvement long term – allowing you to reach and progress beyond the initial up-curve.

How do you know if you're using or training the aerobic energy system?

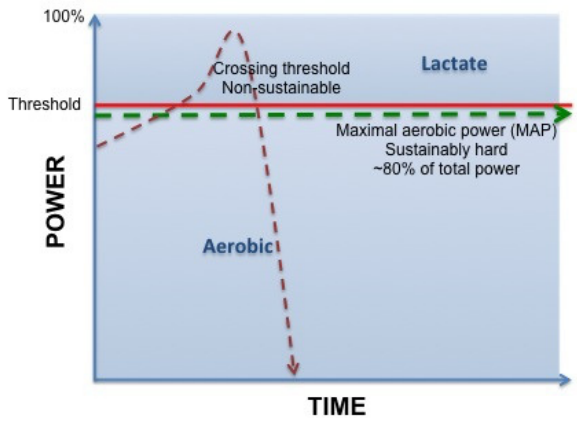
For the thinkers…
The aerobic system essentially means sustainable. In a marathon-type scenario where you need to be enduring, the system turn over

is slow and sustainable. Think big tractor tyre revolutions – loping and grinding its way along. However, the aerobic system also has a higher end with fiercer revolutions and more output (like that used within of a 3-5km run.) Think mid-size truck – can accelerate to get up to speed and maintain a good output on flat to mild undulations. However, if you get too carried away and think your aerobic system is a ferrari, where the top end revolutions are through the roof, the sustainability is lost. You've crossed the threshold. This is effectively you moving out of your aerobic system and tapping into higher power systems – like lactate. So the aerobic system is on a scale from sustainably easy through to sustainably very hard. But no more.

For the feelers…

When in use, the aerobic system is relatively pain-free at low-end effort. Boredom, not pain should be the limiter at low-effort intensities. However, when higher effort intensities are introduced or built towards within a training scenario, you begin to flirt with a concept of sustainably hard. This flirting with pain becomes the training objective – learning to cope with enduring the sensations of just wanting to stop. This is you sitting just under your threshold, and holding yourself in that state.

The graph below illustrates the difference between aerobic power and lactate usage. The red line is one's limiter or threshold (combination of many things: HR, muscular endurance, emotions, occlusions). If one goes into the red (crosses threshold and spills into lactate) it's like burning up matches. There are only so many you can burn up before you run out. However, if one has an understanding of how to flirt with this red line and keep effort sustainably hard without over revving the engine (this is aerobic power), then there can be efficient energy produced over much longer, more sustainable time frames.



What ultimately determines your ability to stay at truck speed and endure a sustainably hard effort is how well you know your aerobic energy system. How good are you at flirting with the higher revs of the engine but still knowing when to relax and move & breathe through it to keep the system and emotions running evenly? How close can you keep yourself to that line without crossing it?

How can you test your aerobic power?

Other than setting up some GASP analysis, VO2 mml progressive max tests, a simple way to look at this would be a scenario that allows for unbroken, sustainable and cyclical movement. For example:

8 Rounds for time, recording your round splits:
Row 600m
12 Burpees

Note that this is for time, so you need to go after it based on how you feel is the best possible way for you to score a good time. Then upon completion analyse your round times.

If you're holding a high rate of effort and have split times within 2-3 sec of each other, then we can say your aerobic system is somewhat in place. Conversely, if your effort/output is varied, and your split times vary across rounds by 5-10sec or sometimes more, then it's fair to say they your aerobic system is less in place.

How can you train your aerobic system to be more efficient at producing power?

Remember "sustainably hard"? "Move and breathe"? Well these two phrases need to be your go-to mantras within your aerobic training sessions to ensure you remain within your aerobic energy system. Get comfortable with feeling like you're going easy or at least easier than you have been going previously. Especially if you're inclined to produce power like a ferrari. Harder is NOT better when it comes to developing this system. Go slow to go faster over time. You need to be comfortable sitting well below the red line at approximately 80% of your top end effort.
To figure out where your 80% is, try this test:

AMRAP in 30min, wearing a HR monitor:
Run 1km loops

The pace per 1km and the HR you're holding after 20mins will give you an idea of where 80-90% of your upper end output is. This is a handy way to get an idea of where your threshold is. This threshold is your red line – you need to become well aware of where this is and what it feels like within training scenarios. Anything above that 80% threshold will create too much fatigue on the system and push you into using other fuel substrates that are less efficient at developing power. Getting to know this 80% aerobic effort is a skill. It takes time and practice.

How can you apply 80% aerobic effort (MAP) within training scenarios?

Firstly it all starts with training session design. Things to keep in mind when designing a session to train at 80% aerobic effort:

1. The use of the acronyms FT and AMRAP are often used way too much in fitness these days. They both imply max effort/testing scenarios and do not allow athletes to train the aerobic system accurately if they are unfamiliar flirting with that little red line.
2. Adding too many unsustainable movements within a circuit will force the body to shift to using different fuel substrates other than

the desired stimulus of the aerobic system. Less is more. Keep movements simple. light and cyclical.

3. You use clever rest periods to allow for sustainability.

4. Think about the stimulus you want to incite and the % of effort being expended… use mantra terms like “sustainably hard” and “move & breathe” to remind of pacing.

Initially, it is often hard join the dots between aerobic power and better overall power output, especially when we’re telling you to slow down in order to go faster – it can be counter-intuitive. But look at it like this: Training the aerobic system creates more oxidative tissue within musculature of the body. Muscle, when trained becomes stronger. Just as other training scenarios like weight training create tissue adaptation, so too does aerobic training. Tissue adapts stronger, and over time, the capacity for that tissue to produce similar power output to previously non-oxidative tissue increases. Only now those tissues are able to sustain the desired power output far more efficiently… You produce more work and are able to recover for consistent output, more efficiently… That makes you fitter.

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