

the
CrossFit
JOURNAL ARTICLES

Putting Out Fires

Lon Kilgore



Honolulu Fire Department, Hawaii; Orange County Fire Authority and Oakland Fire Department, California; Woodinville Fire and Life Safety District, Washington; Marietta Fire Department, Georgia; [Parker Fire District](#), Colorado. What do all of these fire departments have in common?

You've probably already guessed part of the answer: They use CrossFit, officially or unofficially, to prepare for the rigors of their profession. But there's more. In firefighter competitions around the country, it seems that whenever CrossFit-trained personnel enter, they end up at the top of the field. We might even say that fire companies like those above dominate the competition.

For those of us familiar with CrossFit and its results, this success is not terribly surprising. However, we have observed a phenomenon in these competitions that is curious indeed. In the parts of the competitions that require contestants to use oxygen tanks, CrossFit-trained firefighters consumed less from their oxygen bottles than other competitors. At first this seems odd—winners using less oxygen? The conventional understanding is that the more fit you are, the more oxygen you can consume (i.e., the greater your VO₂ max), the higher levels of exertion you can sustain, and the faster you can get the job done. Doing the same amount of work in less time should require at least the same amount of oxygen, if not more. So why would these

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athletes show a reduction in oxygen consumed? This flies in the face of all accepted wisdom on the subject.

Did the CrossFit-trained firefighters somehow become better at oxygen handling? Is there some kind of elaborate respiratory adaptation occurring that is related to an improved aerobic capacity? It is really tempting to look for some elegant explanation involving gas transport kinetics, enzymatic energy of activation, and a whole bunch of other scientific jargon. Let's cut to the chase though and say that the short answer is "no" to all of the above; it's not nearly that complex an explanation.

The first point to consider is that CrossFit-trained firefighters are more efficient machines than their competitors. They are performing equivalent competition work at a lower metabolic cost compared to their rivals because they are performing less extraneous work. This is an adaptation in neuromuscular efficiency rather than an oxygen kinetics phenomenon. Traditional physical training used by lots of firefighters is often limited to linear aerobic movement (running) and linear strength training (machines). Neither of these modalities is applicable to the multiplanar challenges of a firefighter competition course—or, for that matter, to the actual job demands of a firefighter. CrossFit training, with its hugely variant exercise menu, develops multiple motor and metabolic pathways in every plane of motion and articulates well with real-world (and competition) motor challenges.

So, OK, they are more efficient neurally and metabolically. But how does this reduce oxygen consumption? The single largest contributor to this reduction is an improvement in body control across a variety of movement patterns. CrossFit establishes and develops motor pathways relevant to sport and occupational effort. A well-developed motor pathway reduces the amount of external work done by the body and thereby reduces oxygen consumed. Think of it this way. Remember your first ring dip? Remember how wiggly your arms were and how much anterior-posterior and medial-lateral movement there was? Now fast-forward to today and your mastery of the ring dip. How much wiggling is there now? The movement

is more coordinated and each repetition takes less time than those first few brutally hard and spastic dips. Regular CrossFit training has eliminated the extra work you used to do when you used a bunch of extra muscles to stabilize your body on the rings. Reducing the amount of working muscle reduces metabolic cost (calories burned and oxygen consumed). This will result in either the ability to perform an activity for a longer period of time or, in this instance with firefighters, in consuming less oxygen per unit work.

Another factor that contributes to the improvement in efficiency is the increase in strength that results from CrossFit training. It is not intuitive, but it is strongly evident in the research literature that strength training increases running performance without increasing VO₂ max. It is frequently thought that strength training somehow improves running economy by subtly altering technique. However, I find it difficult to believe, except in instances of gross strength imbalances and deficits, that one could hone technique for a specific skill with a general activity. I would propose that after you get stronger, the aerobic activity now represents a lower level of intensity and requires fewer motor units (less active muscle) to accomplish the same amount of work. Less muscle activity requires less ATP and requires less oxygen.

So, my explanation of the observed phenomenon in the firefighter competitions is that CrossFit-trained firefighters become more neurally efficient and stronger. Both of these phenomena contribute to a lower muscular demand for oxygen and leave more of it in the bottle. Both also contribute to winning competitions. While these results are from competitions that simulate the real world of firefighting, they point strongly to the fact that CrossFit training prepares firefighters for the rigors of the profession better than other training systems.

But let's go beyond the individual firefighter. Let's consider the missions of fire departments. Within the context of those missions, maximizing the safety of employees is important, as is having equipment and personnel capable of safeguarding the public. Administrators are also concerned with the fiscal bottom line as they have

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only so many dollars to provide a critical public service. If we think about these firefighting competition wins from the administrator's perspective (beyond the PR perks), two observations of specific interest arise here:

1. Because they can do more work in less time, these firefighters can be in harm's way for a shorter period of time.
2. By expending less energy and consuming less oxygen, these firefighters are able to do more repeated bouts of work.

So the relevance of CrossFit to administrators is that their firefighters can do more work in less time, have a higher overall work capacity, are less likely to be injured, and consume fewer purchased resources (oxygen). This means healthier, more effective firefighters at a lower operating cost. Everyone wins: firefighters, administrators, and the public.

And beyond the realm of firefighting, just think of the stunning importance of this—of being able, merely through effective physical training, to actually decrease the amount of oxygen required to fuel physical activity—for divers, astronauts, mountaineers, and anyone else who needs to work in low-oxygen environments. The implications are potentially staggering.



<http://media.crossfit.com/cf-video/Parker-fire.wmv>



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