

METCONs, Dick Butkus, The Forgotten West Point Experiment, and Why You're Doing Fitness Wrong



By Tyler Inman

Amateurs do unfocused, poorly-defined “metcons.” Professionals deliberately develop energy systems with a targeted, goal-oriented approach.

Fort Bragg, NC - 2008

SFC Been-around-awhile asks: What in the hell is a “metcon?”

1LT Young-and-zealous answers: A metcon is a type of workout, but it's not just any old run down Ardennes followed by some push-ups and sit-ups. A metcon is a high-five at the end of a gritty training session; it's a platoon full of panting Soldiers after two-hundred tire-flips;

it's a "sweat angel" on the hot Carolina pavement.

Despite his own training and knowledge, the experienced platoon sergeant has endured several "brands" of fitness over the years. As platoon leaders passed through the platoon, he ran with the high school cross country star; he lifted weights with the collegiate football player; and he did high-intensity, functional movements with the CrossFitter. After years of training cardiovascular endurance and muscular strength separately, the CrossFitter introduced the platoon sergeant to a way to combine the two different domains in a grueling "new" style of training: Metabolic Conditioning, or metcon for short.

"Greg Glassman, who founded CrossFit in 2000, invented the metcon, right?"

Wrong. His brand of fitness is a great tool, but contrary to what some believe, Glassman didn't invent gymnastics, burpees, Olympic weightlifting, the kettlebell, or even the metcon. In fact, the United States Military Academy at West Point commissioned the metcon into service in 1975.

Project Total Conditioning

Can significant strength gains be achieved from intense but relatively brief workouts? What effect does strength training have on an individual's level of cardiovascular fitness? How often should an individual train to achieve maximum results? What application does high-intensity strength training have to functional performance?

It sounds like the setup for a hilarious punchline, but it's true: In 1975, Dick Butkus, Don Shula, Arthur Jones (the guy who invented Nautilus strength training machines), and a group of medical experts converged on the United States Military Academy (USMA) to team up with the Academy's Department of Physical Education. During a mission they dubbed [Project Total Conditioning](#) — "the most productive and inclusive field research endeavor ever undertaken in the area of strength training" — they aimed to provide answers to each

of the aforementioned questions.



Project Total Conditioning participants (Cadets) flew to Rochester, New York for testing at the Rochester School of Medicine. Photo screen clipped from: Athletic Journal Volume 56, September 1975. Accessed from: <http://arthurjonesexercise.com/Athletic/Total.PDF>

“Muscular strength can be built to a very high level with little or no improvement in cardiovascular ability. And it is well established that the exercises and activities that have traditionally been used for the improvement of cardiovascular condition will do almost nothing in the way of increasing muscular strength; in fact, it frequently happens that cardiovascular training actually produces a loss in muscular strength.” – [Arthur Jones](#), circa 1975

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Contrary to his era's traditional wisdom, Arthur Jones suspected he could produce an athlete that possessed not only a high degree of cardiovascular condition, but also the ability to sustain high intensity effort for a prolonged period of time. He believed that muscular strength and cardiovascular ability were not mutually exclusive, and his strength training machines might be the key to unlocking athletic performance yet unfathomed. At the conclusion of Project Total Conditioning, [Jones believed](#) they'd discovered the holy grail: "Contrary to widespread opinion, it now appears that there are three separate levels of condition... 1) muscular strength... 2) cardiovascular ability... and 3) a previously mentioned unsuspected level of condition that I have named **metabolic condition.**"

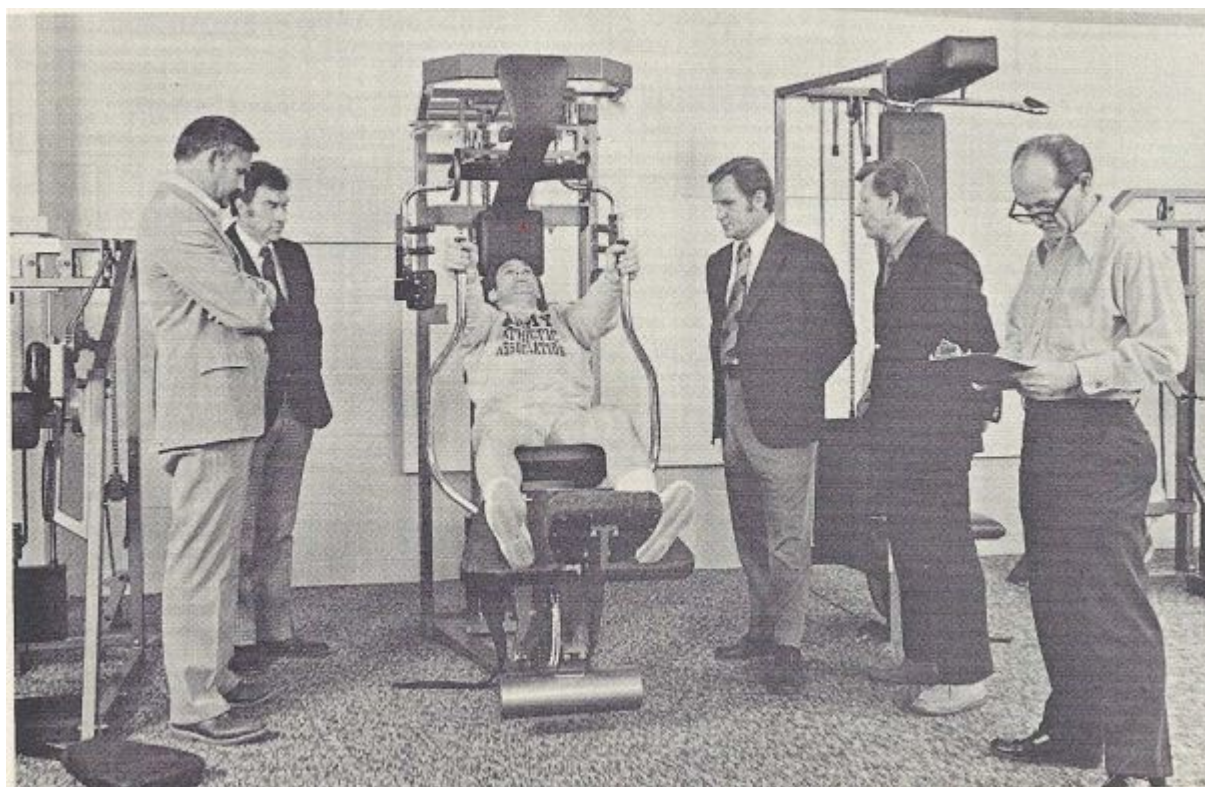


Photo:

Coach Don Shula observes Major Alfred Rushatz (USMA DPE) use a Nautilus Double Chest Machine. Photo screen clipped from: Athletic Journal Volume 56, September 1975.

Accessed from: <http://arthurjonesexercise.com/Athletic/Total.PDF>

The Holy Grail of Exercise?

The Project Total Conditioning [protocol](#) required three training sessions per week, one set of each different exercise per training session, and fifteen to thirty minutes to complete an entire workout. Participants performed each set of exercises to failure with a machine load that allowed for seven to twelve repetitions, and they rested as little as possible between exercises. Over time, the participants (all members of the West Point football team) were able to perform heavier loads with less rest in between exercises. Arthur Jones considered this improvement an increase in metabolic conditioning; today's competitive exercisers might also call it improved work capacity. Nomenclature aside, this training method should look familiar: Project Total Conditioning was a high-intensity strength training circuit. Perhaps revolutionary in 1975, Jones' version of metabolic conditioning and closely-related derivatives are nearly ubiquitous now.

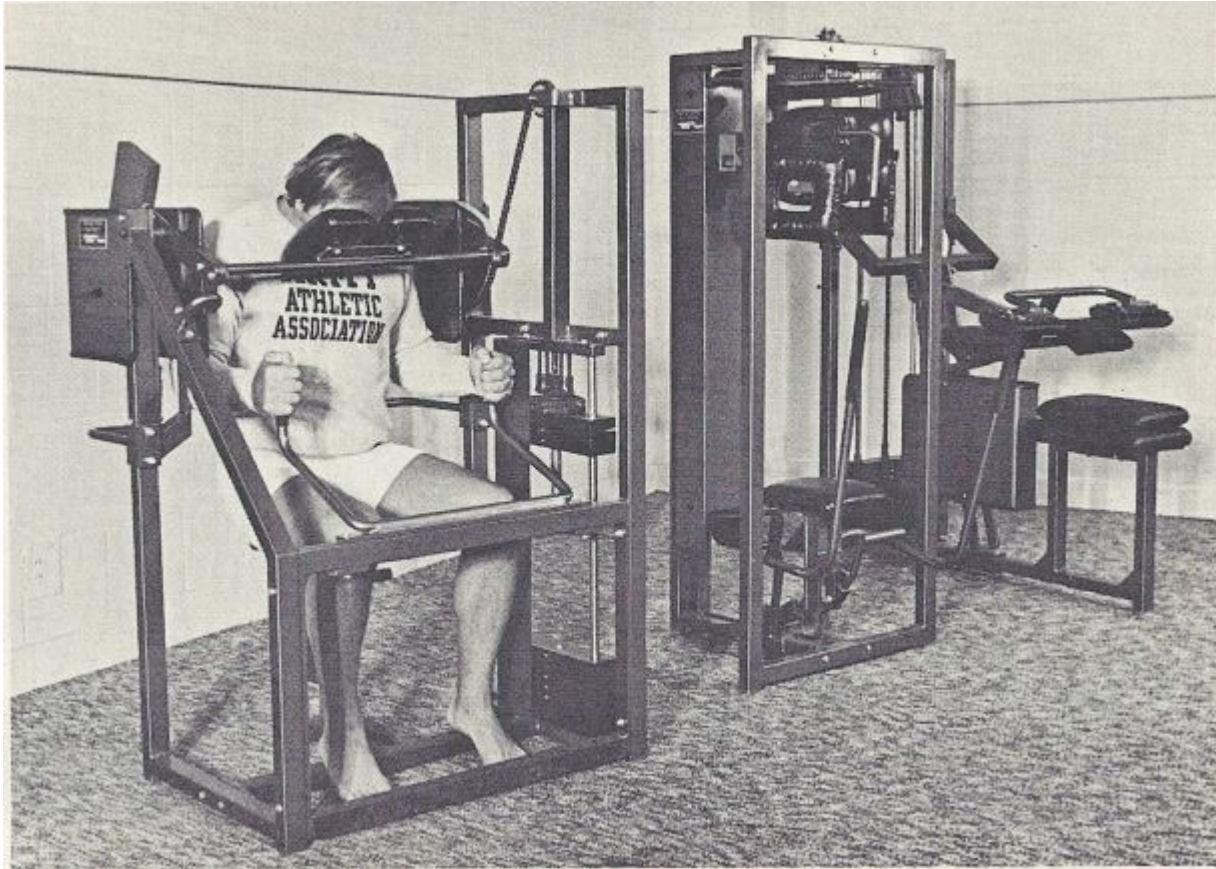


Photo: Dick Butkus uses the Nautilus 4-way Neck Machine. Photo screen clipped from: Athletic Journal Volume 56, September 1975. Accessed from: <http://arthurjonesexercise.com/Athletic/Total.PDF>

Arthur Jones, Indiana Jones, and the three metabolic pathways

Both Arthur and Indiana sought the grail. Only Indiana found it. The difference? Indiana had his dad's map, the equivalent of today's understanding of exercise physiology. Arthur Jones' intuition permitted his passage to the Grail Knight, but Arthur ultimately lacked the hard science to complete his mission. Regarding the limiting factor for continued high-

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intensity exercise, [Jones wrote](#): "Just what is lacking? I don't really know, but it is obvious that a demand is being made that the body cannot meet... perhaps the body cannot provide the metabolic changes at such a pace." Jones was correct again. The speed at which metabolic processes generate energy in the form of adenosine triphosphate largely determines the metabolic pathway or energy system most relied upon to meet physical demands. The table below describes each energy system in detail.

Energy System	Also known as	Fuel Source / Location	Requires oxygen?	Provides energy for:
Immediate	Phosphagen or ATP-PCr	Phospho-Creatine in the working muscle	No - this process is alactic and anaerobic	High-intensity work up to 10 seconds
Intermediate	Anaerobic Glycolysis or Fast Glycolysis	Glucose in the blood / glycogen in the muscle	No - this process is anaerobic, but it does produce lactate	High-intensity work up to 2 minutes
Long-term	Oxidative or Aerobic	Carbohydrates and fat	Yes	Low intensity work and exercise over 2 minutes in duration

Image from armycombatfitnesstest.com. Energy Systems defined with resources from the National Strength and Conditioning Association found at: https://www.nsc.com/contentassets/116c55d64e1343d2b264e05aaf158a91/basics_of_strength_and_conditioning_manual.pdf

Redefining Intensity - the problem with the 20 minute grind

Intensity is a training variable and often determines which energy system is most stressed for a given type of training. Training variables should be systematically and intelligently manipulated to bring about the desired physiological response at the most appropriate time. In order to intelligently manipulate intensity and deliberately develop each of the body's energy systems, tactical athletes need to clearly understand intensity as a training variable.

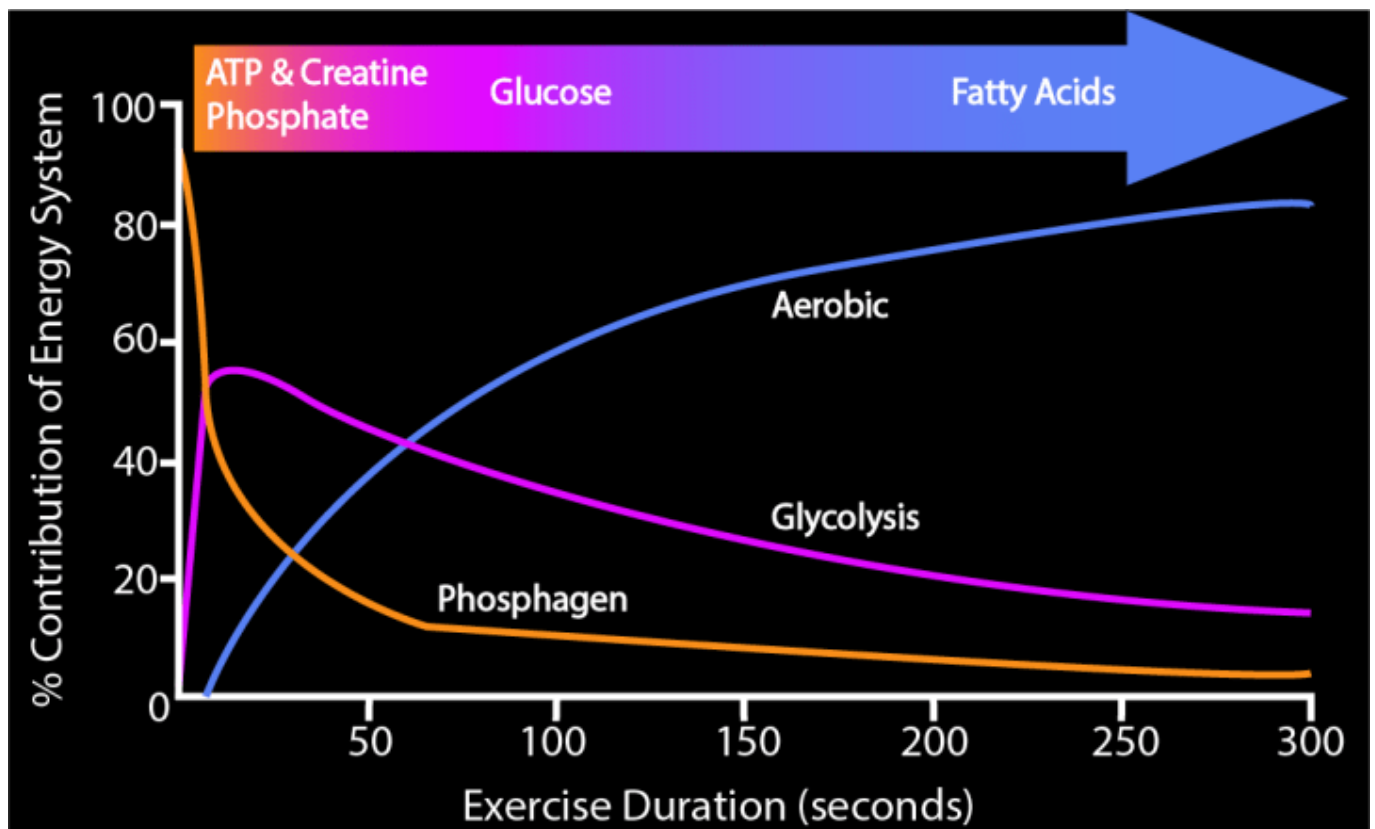


Image from armycombatfitnessstest.com. Original graphic developed with resources from the National Strength and Conditioning Association found at: https://www.nsc.com/contentassets/116c55d64e1343d2b264e05aaf158a91/basics_of_str

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During loaded movements, intensity is usually communicated using a percentage of an individual's one-repetition maximum (1RM). Three sets of five squats performed with 85% of a 1RM (3×5 @ 85%) and 4 minutes of rest between sets is more intense than performing three-hundred air squats as quickly as possible. The air squats may *seem* more intense, and the performer may sweat, grunt, and scream more during the air squats, but by definition, it is less intense because the load is lighter. This is an important distinction because muscular strength training should occur with a high intensity. In fact, [research indicates](#) that strength is best developed using greater than 80% of 1RM in sets of four to six repetitions.

Like strength training, intensity of aerobic and anaerobic work is never measured with sweat or "burn." Instead, intensity is determined by percentage of maximal oxygen uptake (VO₂max). This is where it gets tricky; VO₂ is measured in a lab, which makes "train at 90% of VO₂max" an inappropriate prescription for a field setting. The next best tool may be heart rate, but most Soldiers aren't outfitted with heart rate monitors either. That leaves communicating intensity requirements using a subjective measurement of "maximum effort."

"I went as hard as possible for a 20 minute AMRAP. I did air squats, pull-ups, box jumps, flutter kicks, and then I ran 400 meters; I repeated that circuit as many times as possible in 20 minutes. I didn't rest. I gave it max effort, and I was totally smoked at the end. That was intense, right?"

Wrong again. Consider the 400 meter runs conducted in the 20 minute workout above. How fast did this person run on the first lap? What about the second lap? The third, fourth, and fifth laps? The lap time likely dropped substantially each round until the pace matched the individual's 2-mile pace (or slower). The 400 meter runs were actually low intensity because the run pace failed to reach a significant percentage of the single best effort pace. Instead,

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each run was likely performed near 70% of maximum effort. Twenty minute grinds like this circuit may contribute to improved aerobic and muscular endurance, but this is not the most effective technique for getting stronger, faster, or more powerful. Moreover, when performed at the unit level, workouts like this often reinforce imprecise movement patterns and lack full range of motion. In other words, not only is the 20 minute grind a sub-optimal technique for developing fitness, it likely contributes to negative performance outcomes as well.

Correcting Course and Restoring Intensity – Energy System Development

More effective physical readiness training requires a paradigm shift. When developing a plan, leaders must consider which energy system they intend to develop. Most strength and power training should occur in the domain of the immediate energy system. This means brief efforts near maximal intensity with long rest periods in between sets. Anaerobic endurance training should occur in the domain of the intermediate energy system. This also requires high intensity efforts and longer rest periods between efforts. Aerobic endurance training may occur with lower exercise intensities and higher volume efforts with less rest. The table below describes several different protocols for energy system development.

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Energy System	Type of Training	Duration	Intensity	Rest Time
Immediate	Plyometrics / Maximum Effort Olympic and Power Lifts	Up to 10 seconds of work	Near maximal to maximal	Long rest between efforts allowing for a near full recovery - up to 7 minutes
Intermediate	High-intensity Interval Training	Up to 2 minutes of work	Near maximal intensity	1 : 2 to 1 : 6 work : rest (rest up to 6 minutes for every 1 minute of work)
Long-term	Traditional Aerobic Training	Greater than 20 minutes of steady-state conditioning	Low to moderate	n/a
	Aerobic Interval Training	Ranging from: Classic Tabata 20s on, 10s off for 4 minutes To: 1 mile repeats	Moderate to near maximal	2 : 1 work : rest (rest for half as long as work)

Image from armycombatfitnessstest.com. Exercise Prescriptions developed with resources from the National Strength and Conditioning Association found at: https://www.nsc.com/contentassets/116c55d64e1343d2b264e05aaf158a91/basics_of_strength_and_conditioning_manual.pdf

Doing More with Less

High-intensity Interval Training (HIIT), first [proven effective](#) in 1996 by Japanese scientist Izumi Tabata, is a great way to train both aerobic and anaerobic energy systems. Contrary to the 20 minute grind, HIIT protocols offer athletes enough rest to duplicate high intensity efforts. Since Tabata's research, [numerous studies](#) have demonstrated that HIIT protocols with supra-maximal intensity, lower overall volume, and less time commitment are an

equally effective alternative to traditional aerobic training. In fact, [a 2015 study](#) concluded “that a [sprint interval training] protocol involving 3 minutes of intense intermittent exercise per week, within a total time commitment of 30 minutes, is as effective as 150 minutes per week of moderate-intensity continuous training.”

5 Ways to incorporate more training intensity

Use the Tabata Method for sprint interval training on an Assault Bike or Concept 2 Rower.

- 20 seconds on, 10 seconds off, for a total of 4 minutes
- Go as hard as possible for each 20 seconds of work. Remember your total calories.
- Rest 5-8 minutes and do it again
- Try to meet or beat total calories from effort 1.

Run 30:60s or 60:120s on the track

- Straight out of FM 7-22, run at 85-90% of maximum effort (30 seconds on, 60 seconds off)
- Don't forget to time the first few efforts; when you can no longer maintain a pace that is within 10-15 seconds of the original effort, you've done too many

10-minute sled push or drag EMOM (start a new set of work at the top of every minute)

- Use a load that can be pushed/dragged the prescribed distance in 10-20 seconds
- Push or drag for 20-25 meters; rest for the remainder of the minute
- Perform another push/drag at maximal intensity every minute, on the minute

Reverse-Tabata Russian kettlebell swings

- Use a kettlebell that can be swung with maximal intensity for at least 10 seconds
- Swing for 10 seconds, rest for 20 seconds, for a total of 4 minutes
- Rest at least 4 minutes and try to meet or beat the number of swings from effort 1
- Experienced strength athletes may experiment with [over-speed kettlebell swings](#)

100-meter repeats

- Sprint 100 meters
- Rest 90 to 120 seconds
- Work up to 10 x 100m efforts in a single session; when you can no longer maintain a pace that is within 2-3 seconds of the original effort, you've done too many

"In today's society, it is impossible to find any topic on which there is a shortage of rhetoric. Certainly, strength training is no exception. Unfortunately, much of this dialog has been based on innuendo, superstition, and/or misinformation." [This statement](#) from Arthur Jones in 1975 proves prescient. The metcon, commissioned in 1975, is still alive, but it is not well. The next time someone says "let's finish with a metcon," ask them to provide a training objective. "*Which energy system will this metcon stress? What is the desired intensity for this training?*" The fact that many senior leaders have shifted from long-distance runs to a more functional style of training is commendable; however, as long as weights stay light and rest periods are too short to allow for maximal intensity, we're just trading one modality of "cardio" for another.

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Masters in Kinesiology, is passionate about physical readiness training, leader development, and getting better everyday. Tyler frequently shares actionable tools and tips for improving performance via [Training For 600](#). You can connect with Tyler on Facebook: @TF600acft, and Twitter: @TrainingFor600

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