

the **CrossFit** JOURNAL

September 2004



Medicine Ball Cleans

The clean and jerk and the snatch, the Olympic lifts, present the toughest learning challenge in all of weight training. Absent these lifts, there are no complex movements found in the weight room. By contrast, the average collegiate gymnast has learned hundreds of movements at least as complex, difficult, and nuanced as the clean or snatch. In large part because most weight training is exceedingly simple, learning the Olympic lifts is for too many athletes a shock of frustration and incompetence.

Sadly, many coaches, trainers, and athletes have avoided these movements precisely because of their technical complexity. Ironically, but not surprisingly, the technical complexity of the quick lifts exactly contain the seeds of their worth. They train for, that is, they simultaneously demand and develop strength, power, speed, flexibility, coordination, agility, balance, and accuracy.

When examining the reasons offered for not teaching the Olympic lifts we cannot help but suspect that the lifts' detractors have no first hand (real) experience with them. We want to see someone, anyone, do a technically sound clean or snatch

at any weight and then offer a rationale for the movement's restricted applicability. Were they dangerous or inappropriate for any particular population, we'd find coaches intimate with the lifts articulating the nature of their inappropriateness. We do not.

At CrossFit everyone learns the Olympic lifts – that's right, everyone.

We review here the bad rap hung on the Olympic lifts because we've made exciting progress working past the common misconceptions and fears surrounding their continued page ... 2

The Kettlebell Swing

“CrossFit is a great system, but they don't utilize kettlebells well because of a lack of qualified kettlebell instruction.”

- T.C., RKC

At CrossFit we swing the kettlebell overhead while the kettlebell community swings to eye or shoulder height. No matter how many times we're admonished for our excessive swing we proceed unabated? What gives? Are we in need of additional, more “qualified”, kettlebell instruction?

While admitting a penchant for iconoclasm, we are not contrary solely for the sake of being

continued page ... 5

Medicine Ball Cleans

Editor

...continued from page 2

introduction, execution, and applicability to general populations. The medicine ball clean has been integral to our successes.

In the June 2003 issue of the CrossFit Journal we covered the foundation of one of the lifts, the clean. In that issue we made brief mention of our use of the medicine ball to teach the clean. This month we revisit and update that work.

The [Dynamax](#) medicine ball is a soft, large, pillowy ball that ranges in weight from four to twenty-eight pounds available in two-pound increments to twenty pounds. It is unthreatening, even friendly.

Working with Dynamax balls we introduce the starting position and posture of the deadlift then the lift itself. In a matter of minutes we then shift our efforts to front squatting with the ball. After a little practice with the squat we move to the clean. (A similar approach is used to teach the shoulder press, push press, and push jerk.)

The clean is then reduced to “pop the hip and drop – catch it in a squat” and it’s done. The devil’s in the details, but the group is cleaning in five minutes. It’s a legitimate, functional clean. This clean may in fact have clearer application, than cleaning with a bar, to heaving a bag of cement into a pick-up or hucking up a toddler to put in a car seat.

The faults universal to lifting initiates are all there in as plain sight with the ball as with the bar. Any subtleties of matured and modern bar technique not possible with the ball are not immediate concerns, and their absence is plainly justified by the imparted understanding that this is functional stuff and applicable to all objects we may desire to heave from ground to chest.

In a group of mixed capacities the newbies get the light balls and the veterans get the heavy ones. In thirty rep doses whoever ends up with the twenty-eight pound ball is going to get a workout regardless of their abilities. The heavier balls impart a nasty wallop far beyond the same work done

with a bar or dumbbell of equal weight; considerable additional effort is expended adducting the arms, which is required to “pinch” the ball and keep it from slipping.

We use the medicine ball clean in warm-ups and cool downs to reinforce the movement and the results are clearly manifest in the number and rate of personal records we’re seeing in bar cleans with all our athletes. Yes, the benefit transfers to the bar - even for our better lifters!

In the duration of a warm-up there are uncountable opportunities to weed out bad
continued page ... 4

Common Faults | ...and their corrections



Heels up



Back rounded



Head down



Corrected starting position:
heels down, headup, and back arched

Medicine Ball Cleans

Editor

...continued from page 3



Arms bent



Pulling too high



No hip extension



No shrug



Curling the ball



Corrections:

Arms locked, full extension, shrug, not pulling too high, ball kept close to body

Medicine Ball Cleans

 Editor

continued from page ... 4

mechanics. Pulling with the arms, not finishing hip extension, failing to shrug, pulling too high, lifting the heels in the first pull, curling the ball, losing back extension, looking down, catching high then squatting, slow dropping under, slow elbows... all the faults are there.

With several weeks practice, a group will go from "spastic" to a precision medicine ball drill team in perfect synch. In fact, that is how we conduct the training effort.

We put the athletes in a small circle, put the best clean available in the center as leader, and ask the athletes to mirror the center. Screw-ups are clearly evident by being in postures or positions out of synch. Attention is riveted on a good model while duplicating the

movement in real time. The time required for "paralysis through analysis" is wonderfully not there. Thinking becomes doing.

Individuals generally impervious to verbal cues become self-correcting of faults made apparent by watching and comparing to others. It is not uncommon for shouts of correction to be lobbed across the circle from participant to participant. The number of coaching cues and discussion becomes reduced to the minimum and essential as the process is turned into a child's game of "follow the leader".

Where this becomes "dangerous", "bad for the joints", "too technical to learn" or any other nonsense routinely uttered about weightlifting we don't know.



Low, slow elbows in the catch



Correction:
Catch with elbows high



Arms bent overhead



Arms not straight overhead



Corrected overhead position

Kettlebell Swings

Editor

...continued from page 1

contrary. Rational foundations for our programming, exercises, and technique are fundamental to CrossFit's charter. We swim against the current only when we believe that doing so delivers a stimulus truer to our product – elite fitness.

In the March 2004 issue of the CrossFit Journal we stated that, "Criteria for (exercise) selection include, range of joint motion, uniqueness of line of action, length of line of action, strength of line of action, commonness of motor pattern, demands on flexibility, irreducibility, utility, foundational value, measurable impact on adherents, and, frankly, potential for metabolically induced comfort."

This month we apply some of these criteria to an analysis of the two kettlebell swings and then assess two other CrossFit staples, the clean & jerk and the "thruster" for comparison and further elucidation of our thinking in selecting exercises for regular inclusion in our program.

Examining why we've rejected the shorter, "Russian", swing, and adopted the longer, "American", swing offers an opportunity to examine and share the thinking that is part and parcel of the CrossFit method.

A little background is in order. The modern era of the kettlebell is largely the work of Russian émigré, Pavel Tsatsouline. Long ignored in the West, kettlebell training has a long and distinguished history in Russia <http://www.cbass.com/Kettlebell.htm>.

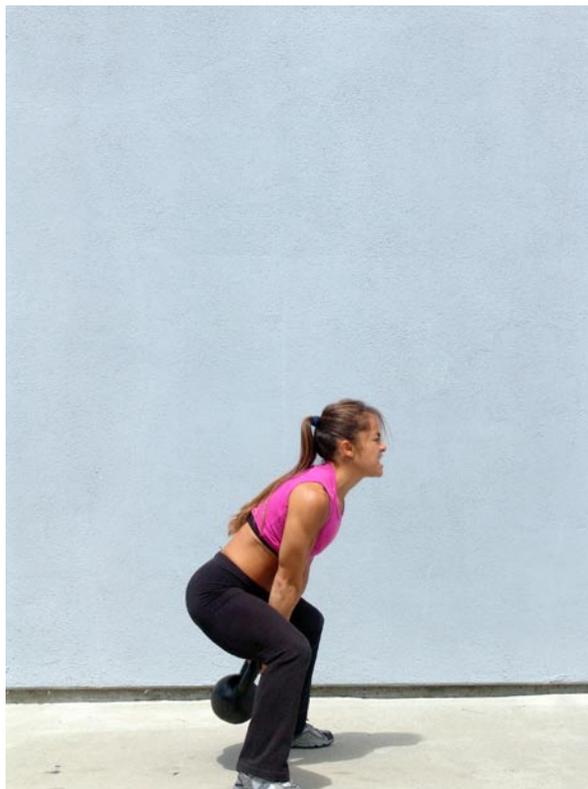
At CrossFit the rise of the kettlebell movement was cause for excitement. The kettlebell itself was somewhat unfamiliar; the kettlebell movements we'd long known from their dumbbell analogs, but Mr. Tsatsouline brought

something more important than the kettlebell or kettlebell movements to the U.S. He came with a forceful and compelling rationale for high-rep weightlifting in elite strength and conditioning.

Understanding the unique potential of high rep weightlifting puts the kettlebellers and CrossFitters in rare company. Whatever else distinguishes our approaches this commonality is more important than our differences. Our two communities are, in our opinion, separated more by the number of tools we use than anything else.

On first being introduced to the kettlebell swing our immediate response was, "Why not go overhead?" Generally, we endeavor, somewhat reflexively, to lengthen the line of travel of any movement. Why?

There are two reasons. The first is somewhat intuitive. We don't do half rep pull-ups, we don't do half rep squats, and we don't do half rep push-ups. If there is a natural range of motion to any movement we like to complete it. To do otherwise seems unnatural. We would argue that partial reps are neurologically incomplete. The second reason deals with some fundamentals of physics and exercise physiology.



continued page ... 6

"Russian Swing"

Kettlebell Swings

Editor

...continued from page 5

From physics we know that the higher we lift something, and the more it weighs, the more “work” we are performing. Work is in fact equal to the weight lifted multiplied by the height we lift the object. Work performed divided by the time to completion is equal to the average “power” expressed in the effort. Power is exactly identical to the exercise physiologist’s “intensity”. Intensity, more than any other measurable factor, correlates to physiological response. So more work in less time, or more weight moved farther in less time, is largely a measure of an exercise’s potency.

When we swing the kettlebell to overhead, the American swing, we nearly double the range of motion compared to the Russian swing and thereby double the work done each stroke. For any given time period, the power would be equivalent only if the Russian swing rate was twice the American swing rate.

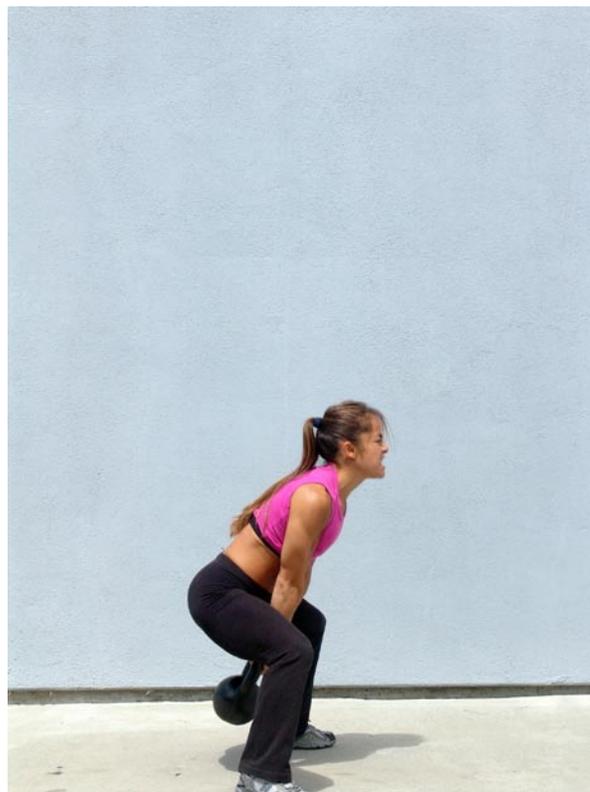
In fact, “T.C.”, the gentleman who decried our lack of “qualified” instruction, recently claimed, “you will be able to get two low swings in for every one overhead.” Were this true, and all other things equal, the two swings would require equal power to perform and consequently be similar in effect.

We have, however, tested the “period”, or time to complete each swing, for both the American and Russian methods and we’ve found that the American swing rather than being half the rate of the lower Russian swing was closer to eighty-five percent of the Russian swing. This would require that the advocates of the lower, shorter, Russian swing perform the movement with nearly twice the load to improve on the power of the American swing. We don’t think that is very likely to occur. Most of our guys can swing the 2-pood (36 kg or 64lb) to overhead with control and precision.

After measuring the swing height and displacement for both the American and Russian swings we had several athletes swing 1.5 pood kettlebells, counting the repetitions, for one minute employing the Russian method. After an extended rest, we repeated the test with the same size kettlebells while employing the American swing. What we found was that the Russian swing demanded only sixty-five percent of the power required of the American swing - hardly close.

Power a measure of intensity can certainly be perceived, and it is the perception of all our athletes who have tried both swings that the longer American swing is substantially harder than the shorter Russian swing. Many offered, “it’s twice as hard”.

Curious about other physiological measures we repeated the tests with a downloadable heart rate monitor. Heart rate being a reliable correlate of power or intensity, we’d expect the American swing to generate higher heart rates compared to the Russian method. Consistent with our calculations and our athlete’s perceived exertion, the heart rates recorded while employing the American swing averaged nearly twenty-five beats per minute higher than recorded



“American Swing”

continued page ... 8

Kettlebell Swings

Editor

	Natural Frequency (reps/min)	Range of Motion (feet/reps)	Velocity (feet/min)	Load required to match Power (pounds)	Average Power (footxpounds/min)
American Kettlebell Swing	40	6.5	260	X	260X
Russian Kettlebell Swing	47	3.25	153	1.7X	260X
Barbell Thruster	38	3.25	124	2.1X	260X
Barbell Clean & Jerk	18	6.5	117	2.22X	260X



"Russian Swing"



"American Swing"

Kettlebell Swings

Editor

...continued from page 6

employing the Russian swing.

We analyze most of our exercises in this way. Vertical displacement, load, and period or rate of repetition are critical to measuring power or determining intensity and, collectively with heart rate and perceived exertion, lend themselves to our determination of whether an exercise is worthy of regular inclusion in our workouts. On this basis alone, the half or Russian kettlebell swing doesn't make the cut.

In examining the mechanics and physics of exercises it is readily apparent that range of motion or line of action are fairly fixed. What is less apparent but generally the case is that our exercises also have a natural period or frequency of repetition.

The natural frequency or period of an exercise can be found by performing it deliberately and quickly with an insignificant load. As we gradually increase the load what we see is that the period long remains fixed until, eventually, sufficient load slows the movement precipitously. The rate of performance prior to this threshold is the natural period or frequency of the movement.

We've seen videotape where U.S. Olympic weightlifter Shane Hamman is juxtaposed side by side clean and jerking both an empty bar and eighty percent of his max. The two movements are in perfect synch. The clean and jerk like many exercises has a natural period.

From watching videotape we've determined the natural frequency of the American kettlebell swing, the Russian swing, the thruster, and clean and jerk.

For the Russian Swing this rate is forty-seven strokes per minute, for the American swing it was forty, for the "thruster" (front squat/push-press) thirty-eight, and for the "touch and go" clean

and jerk it was 18 strokes per minute.

Similarly, we analyzed the range of motion for these movements and found that the Russian kettlebell swing and thruster both traveled about three and a quarter feet and that the American swing and clean & jerk both traveled about six and one half feet. All of these measures were averaged from two male athletes standing nearly six feet tall.

Knowing the range of motion and natural period of these exercises we can determine what loads would be required to produce equivalent expressions of power among the four exercises. The answers are revealing.

Using this information we can show that the Russian kettlebell swing would have to be performed with loads nearly twice that of the American swing to exact similar power and intensity demands. This may not be possible.

In the case of the thruster and the clean & jerk the loads would have to be a little over twice as large and this is readily doable.

Indeed, it is our considered opinion that the Russian kettlebell swing becomes too heavy before it approaches the power of our preferred American kettlebell swing and that the thruster and clean and jerk are both vehicles for outpacing the power demands of the American swing. Physical analysis, measured heart rates, observed impact, and our athlete's perceived exertion support these contentions beautifully.

end.

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