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Getting Scaling Right: A Systematic Method for CrossFit Programming

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Introduction: Scaling and Intensity

Scalability is what allows athletes of all ages and abilities to gain access to CrossFit's benefits. It is also what allows CrossFit athletes to progress, as they meet and then move beyond their fitness goals. Scaling is typically considered more of an art than a science and is accompanied by certain pitfalls. For example, a haphazard approach to scaling reduces the opportunity to maximize workout intensity, thus undermining one of CrossFit's core fitness principles. Furthermore, the flipside of scaling, namely the obsessive focus on performing WODs to the defined "standard," can hamper elite athletes' development, again by making them perform at loads that are suboptimal for maximizing workout intensity.

Instead of this, I propose a systematic method of scaling designed to maximize workout intensity for all CrossFitters, which I call "Relative Intensity." The basic principle is simple: instead of scaling loads as close to the standard as possible, WOD loads and movements should be scaled *relative to* 1) the athlete's previously-measured maximum output for the movement in question; and 2) the training response desired for the WOD in question.

In order to explain the Relative Intensity method in greater detail, the article proceeds as follows. First, I specify the problems with the current common approach to scaling. Second, I elaborate the Relative Intensity scaling method. Third, I provide practical tips for incorporating the Relative Intensity method into everyday CrossFit affiliate WOD programming.

Scaling and Standards

As CrossFitters, we rightly take pride in setting high standards for ourselves, as evidenced by our benchmark "girl" and "hero" workouts, which are prescribed with standard loading parameters. These standards do play a positive role. They create a strong bond in the CrossFit community by allowing elite athletes from different affiliates, even different countries, to measure their performances against each other. For newer CrossFitters, the standards provide a measurable performance goal towards which they can build.

So standards can be a good thing. But what's the downside? To understand that, let's go back to the basic description of what CrossFit is all about: "constantly varied, *functional movements*, executed at *high intensity* across a wide array of *modal domains*." This description is made up of three parts. First, the types of movements performed; we want them to be constantly varied and functional for obvious reasons, which I won't delve into. Second, the level at which the movements are performed; while people can offer countless subjective definitions of what "high intensity" means, we in CrossFit define this mathematically as maximizing *power output*, or the amount of work (i.e. moving a given mass a specific distance) done in a given amount of time. Third, training across different modal domains; we design different CrossFit workouts to emphasize different metabolic pathways and elicit different training responses. So, for example, a 1-1-1-1-1-1-1 deadlift WOD will mostly tap the phosphogen pathway and should trigger a strong neurological response, while also training for pure strength. A "Fran" WOD will mostly tap the glycolytic pathway, while training for muscle power and stamina. Finally, a "Filthy Fifty" WOD will straddle the line between the glycolytic and oxidative pathways, while training for muscle and cardiovascular endurance.

What happens when we scale WODs by loading them as close to "the standard" as possible, without paying much attention to how long it takes the athlete to complete the WOD? We certainly satisfy the first

part of what CrossFit is about, since we're generally prescribing the same or relatively similar movements as the "standard" WOD. The problem lies with the last two parts. Loading a WOD as close to standard as possible may make for a brutal and taxing workout. However, it usually fails to maximize the athlete's power output, and it often runs the risk of eliciting a different or even sub-optimal training response than that for which the WOD is intended.

To illustrate this, let's take the example of the "Diane" WOD, defined as consecutive rounds of 21, 15, and 9 reps of 225 lbs. deadlifts and handstand pushups, measured for time. Like "Fran," "Diane" is designed to be a short, super-intense workout, tapping the glycolytic pathway and emphasizing muscle power and stamina. To elicit this kind of training response, completion times should generally be well under four minutes, and elite CrossFitters have done this WOD in under two minutes.

Now, let's take the example of a male, 5'9" 165 lbs., intermediate level CrossFitter. He has been training hard enough to the point where he can do heavy deadlifts and handstand pushups, but with difficulty. As a result, he can get through a "Diane" WOD loaded to standard, but it takes him ten minutes, as he repeatedly has to stop to catch his breath.

Some may look at this achievement and applaud the athlete for pushing through and reaching the standard load for the WOD. He can now write "as Rxed" on the board next to his time, which certainly feels good. But that comes at a cost. By stretching out the completion time for the WOD to ten minutes, he has sacrificed intensity, and has moved outside the prescribed time domain for the WOD. What was supposed to be a short, super-intense test of power and muscle stamina has essentially turned into a mid-length test of pure strength.

Now, for a case of an elite athlete, let's take the example of my associate and coach, champion powerlifter Willie Albert. After ten-plus years of competitive lifting, Willie can deadlift 675 lbs at a bodyweight of 180 lbs. In this case, doing "Diane" as prescribed means working with a deadlift load that is 33 percent of his 1RM. Such a sub-optimal load is unlikely to elicit much of a training response, and may even be counter-productive to improving his strength and power.

Here's the general problem: making consistent fitness gains requires a careful calibration and variation of workout intensity. Working at moderate intensities relative to max has the benefit of producing neurological gains through neuropathway efficiency and motor unit recruitment while also providing some potential muscle building if working at increased volumes. Using lighter weights makes you better at the skill of moving the weight through a particular range of motion, which is useful for developing efficiency and economy of movement to use when training at higher load-based intensities. However, if loads remain sub-maximal at every training session with any and all variations in volume, then athletes will remain weak at best. Conversely, working with excessive volumes at greater than optimal percentages of max significantly increases the risk of injury and taxes the nervous system excessively, which results in a negative training response.

Furthermore, in calibrating load scaling, *intensity* must match *intent*. By this I mean that it is important to match intensity relative to the desired training response and the intended modal domain for the workout in question. Simply put, "optimal intensity" will translate into different loads depending on whether the WOD is supposed to involve a short burst of raw power or a more controlled use of pacing and endurance.

The key then is to find a way to scale the load so as to *maximize power output within the prescribed modal domain* for each individual athlete. This can be a daunting task when faced with a class of athletes possessing different skills, strengths, and weaknesses. So how does one scale for a broad general audience in a professional environment like an affiliate? As I will show, the Relative Intensity method helps to do precisely this.

What Is Relative Intensity?

There is nothing particularly new about the Relative Intensity method. Much of it will look familiar to CrossFit trainers. It is essentially a synthesis and systematization of the fitness knowledge I've gained from CrossFit and other venues, combined with several years of experimentation with various forms of this method in my coaching practice. Willie Albert, twice Canadian National Powerlifting Champion, and an excellent CrossFitter in his own right, has been instrumental in helping me to refine the program. The data, observations, and interpretations discussed herein are based on my work with a small number of consistent, long-term athletes from various backgrounds ranging from 14 to 60 years of age. Our data shows that we have succeeded in producing near identical training responses in 95 percent of our athletes and members. Variations in muscle fiber type, genetic predisposition, age, nutrition, initial level of conditioning, and character traits (i.e. drive, motivation, etc.) appear to make up the 5 percent variation that is observed. Simply put, programming with the Relative Intensity method produces significant gains in strength and power output across all abilities and fitness levels.

The basic method of Relative Intensity training is simple: First, use a barbell strength training program to measure maximum power outputs for basic movements, defined as 1 RM. Second, scale WOD loads as a percentage of 1 RM for the movement in question, depending on the desired training response and modal domain being trained. Third, use the barbell strength training program to progressively increase 1 RM, and in so doing progressively scale the WOD loads higher and higher.

Taking the examples I just presented in the previous section, how would we scale "Diane" using the Relative Intensity method? First, let's consider the intermediate athlete. Let's say that, after testing, we determined that he had a 1 RM deadlift of 350 lbs. Let's also say that we determined that the maximum number of consecutive handstand pushups he could do is 14. Given that our primary concern is maximizing power output, i.e. work over time, we want to scale the WOD so that the athlete is moving as much weight as possible in as short a time as possible. That means scaling the WOD to a load where the athlete can be reasonably expected to complete the WOD in an amount of time that will match the intent of the WOD.

In the case of Diane, as well as other similar WODs (most involving the 21-15-9 set format), I have found that athletes maximize power output somewhere between 45-55 percent of 1 RM. So for this athlete, with a max deadlift of 350 lbs., the prescribed "standard" of 225 lbs. is 65 percent of 1 RM, which is suboptimal. Instead of having him slog through the WOD "to standard," I would scale the load to 50 percent of 1 RM, which is 175 lbs. As for the handstand pushups, he can get through 14 consecutively, so instead of a 21-15-9 progression, I would prescribe a 12-9-6 progression (for the handstand pushups only, not the deadlifts).

But wait, you might ask yourself, isn't that letting the athlete off easy? Shouldn't we be pushing our athletes to work as hard as possible? To which I reply no, there's nothing easy about this approach, and yes, we should push our athletes as hard as possible, and that is precisely what this scaling method allows us to do.

We can see the difference by using a simple power output calculator, like the one available online at the Catalyst Athletics **website**. We already know that it takes the athlete ten minutes to complete "Diane" "to standard." That translates to a power output of 0.1 horsepower. In contrast, with the scaled load, the athlete is now able to complete the WOD in three minutes.[1] That translates to a power output of 0.26 horsepower, more than *two and a half times greater* than doing the WOD "to standard." Which performance looks like the more impressive accomplishment now?

1 This is a reasonable assumption for completion time, based on my observations.

Table 1. Sample Progressive Overload Weightlifting Schedule: 5 on/2 off

Week	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	Back Squat - Test for 1RM	Snatch - 75% 5x4	Front Squat - 80% 5x3	Clean & Jerk - 85% 3x3	Deadlift - 90% 5x1
Week 2	SP/PP/BP - Test for 1RM	Back Squat - 75% 5x4	Snatch - 80% 5x3	Front Squat - 85% 3x3	Clean & Jerk - 90% 5x1
Week 3	Deadlift - Test for 1RM	SP/PP/BP 75% 5x4	Back Squat - 80% 5x3	Snatch - 85% 3x3	Front Squat - 90% 5x1
Week 4	Clean & Jerk - Test for 1RM	Deadlift - 75% 5x4	SP/PP/BP - 80% 5x3	Back Squat - 85% 3x3	Snatch - 90% 5x1
Week 5	Front Squat - Test for 1RM	Clean & Jerk - 75% 5x4	Deadlift - 80% 5x3	SP/PP/BP - 85% 3x3	Back Squat - 90% 5x1
Week 6	Snatch - Tes for 1RM	Front Squat - 75% 5x4	Clean & Jerk - 80% 5x3	Deadlift - 85% 3x3	SP/PP/BP - 90% 5x1

Cycle	Day 1 - Before the WOD	Day 2 - After the WOD	Day 3 - Before the WOD
3 Day Cycle 1	Back Squat - Test for Max	Shoulder Press - 75% 3x3	Snatch - 85% 5x2
3 Day Cycle 2	Push Press - Test for Max	Front Squat - 75% 3x3	Bench Press - 85% 5x2
3 Day Cycle 3	Clean & Jerk - Test for Max	Deadlift - 75% 3x3	Back Squat - 85% 5x2
3 Day Cycle 4	Shoulder Press - Test for Max	Snatch - 75% 3x3	Push Press - 85% 5x2
3 Day Cycle 5	Front Squat - Test for Max	Bench Press - 75% 3x3	Clean & Jerk - 85% 5x2
3 Day Cycle 6	Deadlift - Test for Max	Back Squat - 75% 3x3	Shoulder Press - 85% 5x2
3 Day Cycle 7	Snatch - Test for Max	Push Press - 75% 3x3	Front Squat - 85% 5x2
3 Day Cycle 8	Bench Press - Test for Max	Clean & Jerk -75% 3x3	Deadlift - 85% 5x2

Table 2. Sample Progressive Overload Weightlifting Program Schedule: 3 on / 1 off (each lift will be tested once every 32 days and practiced 3 times every 32 days for a total of 34 times per year.)

With the case of Willie, the problem is slightly different; the load is still suboptimal, but it is scaled too lightly. For Willie, with a deadlift 1 RM of 675, I would have him perform "Diane" as prescribed in terms of overall reps, but with deadlifts at 335 lbs. instead of 225 lbs. Here the difference in power output is much smaller, generating 0.41 horsepower if Willie performs a "standard" "Diane" in 2:30, as compared to 0.44 horsepower if he does the "up-scaled" version in 3:00.[1] The difference lies more in the training response, which will be negligible in the "standard" case but beneficial in the "up-scaled" case.

Progressive Overload: Setting the Bar, Raising it Higher

By now the basic concept behind Relative Intensity of scaling loads as a percentage of 1 RM should be clear. The next step is to explain how to go about testing for 1 RM, as well as how to progressively increase an athlete's 1 RM.

At CrossFit Ottawa, we do this by coupling a progressive overload weightlifting program with a CrossFit WOD at every training session. The weightlifting program consists of eight core lifts which lie at the heart of virtually all CrossFit movement patterns: Back Squat, Front Squat, Deadlift, Shoulder Press/Push Press/Bench Press (often grouped together for convenience), Clean & Jerk, and Snatch. We record the performance of our athletes in the lifts according to the schedule and rep schemes delineated in Table 1.

As you can see, the template above operates on a 5 on / 2 off cycle with a total duration of 6 weeks. However, it can easily be applied to a 3 on / 1 off cycle (as illustrated in Table 2) or any other variation thereof. The key is to make it consistent. Some have argued that a 5 on 2 off schedule is too difficult for anyone but the most advanced athletes. However, in my experience I have found that 80 percent of my membership attends my program 5 times per week, Monday through Friday. As a result of our programming, we've had no overuse injuries, no adrenal fatigue, and no negative side effects whatsoever. In fact, every metric we can measure indicates improved performance across the board. This includes advanced and beginner athletes alike.

Tables 1 and 2 appear to be nothing more than strength training tables for eight specific lifts. But remember, the goal of this process is not only to get stronger at the lifts in question. The goal is also to measure power outputs that can subsequently be input into the scaling process for the workout of the day. In other words, if deadlifts

1 As is well known, once you get to elite times, it becomes much harder to shave off seconds.

Percent of 1RM	Optimal Reps/Set	Optimal Total	Rep Range
55-65%	3-6	24	18-30
70-75%	3-6	18	12-24
80-85%	2-4	15	10-20
>90%	1-2	7	4-10

Table 3. Prilepin's Optimal Training Ranges (ref. Supertraining - Mel Sif.)

Percent of 1RM	Optimal Total	Rep Range
30-35%	N/A	>60
40-50%	45	30-50
55-65%	25	20-30
70-75%	15	10-20
80-85%	10	5-15
>90%	5	1-10

Table 4. Optimal rep totals and ranges as a function of a percentage of 1RM for CrossFit WODs

are prescribed as part of a WOD, then you will be using a load based on a percentage of your best deadlift, tested once every 6 weeks on a Monday. Our program borrows aspects of the "black box" method as well as Jason Bagwell's powerlifting program. The difference lies in the feedback loop between the lifts and the WODs: the performances on the former are employed to scale the latter.

How then did we go about relating weightlifting performance to WOD scaling? Having developed a progressive overload program to accurately test 1 RM and ensure progressive increase of 1 RM, the challenge was to figure out optimal ranges for scaling as a function of 1RM and repetition range. Fortunately, we were able to turn to a 1974 study by A. S. Prilepin. His research showed that specific rest intervals were optimal for certain rep ranges. The goal was to allow for optimal recovery by giving adequate time for ATP regeneration to occur through the Krebs cycle. Based on this finding, he proposed some optimal training ranges for Olympic weightlifters, which I have reproduced in Table 3.

With Table 3 in mind, the task then was to identify rep ranges that would yield maximum power output as a function of 1RM for CrossFit WODs. The data that I accumulated, with help from Willie Albert, allowed us to refine and expand Prilepin's Table to create Table 4. Based on our observations, we have found that peak sustained power output for CrossFit-style WODs occurs at the intensities and volumes indicated in this table. In nearly every case, we have found that optimal loads fall between 40 to 55 percent of 1RM. I am applying this same table in the training of my competitive Olympic weightlifters, and they are doing a good job of winning medals after only a few months of training.

N/A reflects the fact that there is no law within CrossFit that says you have to perform any given number of sets and reps for optimal performance at this percentage of 1RM. "*Aim to blur the lines between strength and cardio.*" *Glassman* Interestingly, if we look at the performance of elite-level CrossFitters, we see this exact same dynamic at work.

Notice that almost all the WOD load percentages of the top performers in Table 5 fall immediately within the suggested optimal range described in Table 4 [see below for a discussion of those that don't]. We derived our numbers from observing our own beginner, intermediate, and advanced athletes at CrossFit Ottawa, not from calculating percentages based on the performance of elite CrossFitters. Nevertheless, the numbers for the elite CrossFitters in Table 5 are fully consistent with our observations. Practically speaking, what this suggests is that the Relative Intensity scaling method allows all CrossFit athletes to experience intensity levels similar to those of elite athletes, scaled to each athlete's individual fitness level.

Metrics	Pat Barber	Jeff Tincher	Josh Everett
Deadlift:	395lbs	487.5lbs	570lbs
Shoulder Press:	180lbs	185lbs	198lbs
Push Press:	225lbs	220lbs	240lbs (Estimate based on SP & Jerk)
Back Squat:	330lbs	405lbs	440lbs
Front Squat:	315lbs	?	363lbs
Snatch:	180lbs	180	270lbs
Clean and Jerk:	245lbs	232.5	346.5lbs
WODs	WODs	WODs	WODs
Fran:	2:20 - 42% - PP	2:17 - 43% - PP	2:25 - 39% - PP
Diane:	3:01 - 56% - DL	2:53 - 46% - DL	3:44 - 39% - DL
Grace:	2:58 - 55% - C&J	2:45 - 58% - C&J	~2:10 - 38% - C&J
Fight Gone Bad:	463 - 33% - PP	403 - 33% - PP	406 - 31% - PP

Table 5. Performances of Selected Elite CrossFitters

A Note On Scaling Gymnastic Movements Using Relative Intensity

While the progressive overload weight training program described above is good for scaling WOD movements involving external loads, it is less helpful for scaling gymnastic or bodyweight movements, such as pull-ups, handstand push-ups, etc., since there is no load to adjust. For these movements, where the training intent is to develop muscular stamina, the key to optimizing intensity is to scale the *volume* to a level where the athlete can complete the sets *without stopping*. While the method here is somewhat less precise than for loaded movements, what I do is scale WOD volume based on a consideration of 1) the maximum consecutive reps of the movement in question that the athlete can do; and 2) the percentage of 1RM being prescribed for the corresponding barbell movement in the WOD.

Let's take a look at how this scaling method works, using the "Fran" combination of thrusters and pull-ups as an example, with our subject being the male intermediate CrossFitter described near the beginning of the article. The first step is to test the athlete for maximum consecutive pull-ups (MRPLU, or Max Reps Pull-ups). In this case, let's say the athlete can string together 14 consecutive pull-ups without letting go of the bar. Let's also say that the athlete's 1RM push press is 130 lbs. Given that optimal intensity for 45 reps lies between 40 and 50 percent of 1RM, according to Table 4, the prescribed load for the thrusters would be 65 lbs. Similarly, as a baseline I would calculate the scaled volume of pull-ups as a percentage of the standard volume. In this case the volume of scaled pull-ups would be approximately 23 (just over 50 percent of 45), which could be broken up into sets of 11-8-4. This volume pushes the athlete close to his current MRPLU of 14 consecutive pull-ups while also ensuring that the workout will be completed as intensely as possible.

Another option for those whose MRPLU is below the total volume of the workout is simply to substitute the athlete's MRPLU for the number prescribed in the

This will still help the athlete develop a strong pull-up without sacrificing intensity or putting the athlete at risk of injury.

Of course, the formulas described above are mainly for those who are still working at developing efficient pull-ups, or whichever gymnastic movement is being prescribed. However, those who are already proficient at the movements in question can use the same volume scaling formula to increase overall performance by developing more optimal breakdowns of WOD work. Take for example an athlete with a MRPLU of 55 reps, and who is trying to figure out the best way to approach a WOD of 100 pull-ups for time. Looking at Table 4, we see that total volume for the WOD is greater than 60 repetitions, meaning that optimal intensity is 30 percent of 1RM. For this athlete, MRPLU 50 reps X 30% = 16.5 reps. In this case, the recommendation would be to break up the pull-ups into consistent sets of no more than 15 reps. Going any higher would break down the athlete too early and force him/her into lower rep sets with more breaks, thus hampering performance. Starting within the optimal range of scaled volume would allow the athlete to go faster, maintain consistency, increase power output, and achieve superior performance.

Putting It All Together

So how does this all fit together? Here is what a sample class at CrossFit Ottawa would look like, using the Relative Intensity method:

- February 1, 2009 (Example)
    - Skill: Shoulder Press - Test 1RM
    - Push Press - Test 1RM

WOD: Perform as many rounds as possible of the following in 20 minutes:

- 5 overhead squats
- 5 thrusters
- 5 pull-ups

    Use one bar for both overhead squats and thrusters and load it with 50 percent of your best snatch.

As already mentioned above, you can see that we perform the strength cycle during the same session as our WOD. We call this the skill portion of our class. Because we are CrossFitters and we are trying to blur the lines between strength and cardio we don't program separate strength days in our program. Every day is a strength day. Every day is also a cardio day, every day requires coordination, every day requires accuracy, balance, speed, flexibility, agility, speed, stamina, but most importantly power. Every day is a peak power day. In order to achieve this, a balance must be struck and some common sense must be used. If we are doing a "girl" WOD on Tuesday than it behooves us to finish the session with the lift as opposed to starting with it. This will give us a much better representation of a "Fran" time for instance. It also stands to reason that we would limit the instances where we perform a heavy lift and then follow it up with a WOD including the same lift. Yes it happens, and we allow it to happen, but we do our best to limit this kind of thing because it runs the risk of causing retrograde performance if done frequently.

Another aspect of our training at CrossFit Ottawa is that we include a week off between barbell cycles. We use that week for one of two things: either for active rest or to test athletes' performances on a few of the "girl" WODs.

Finally, a key part of our programming involves coupling our prescribed movements antagonistically, i.e. involving opposing muscle groups. Often for us this involves simply using or modifying the WODs from CrossFit.com, because more than anything, Greg Glassman is an artist when it comes to coupling and combining movements. It is likely near impossible to find anyone anywhere who can pair up movements quite like Coach himself; therefore when in doubt, we defer to the master.

Mixing It Up With Relative Intensity

A. Using Relative Intensity For Targeted Training

One added benefit of the Relative Intensity method is that it allows for optimal modification of WODs to target specific fitness goals. For example, for an athlete who wants to focus more explicitly on strength gains, it can be a good idea to load WODs with a higher percentage of 1RM than what is originally recommended, while also modifying the volume (i.e. reps) to optimize the intensity of the workout.

Let's see how this would work with "Fran" as an example. Let's say we have an athlete trying to improve his/her "Fran" time by "going heavy," and the athlete intends to work with 135lbs. thrusters. Furthermore, let's say that 135lbs is equal to 70 percent of the athlete's best push press. In this case, we would lower the volume correspondingly. But what volume is appropriate considering the load? The authors of the *CrossFit Strength Bias* article suggest a WOD volume of 12-9-6 135-lb. thruster/24-18-12 pull-ups, but is this optimal?

Table 6. Results for "Isabel" at different loading levels, holding time then power output constant[1]

Percent of Max	30%	40%	***50%***	60%	70%
Power Output Generated in 1:30	0.5 horsepower	0.59 horsepower	***0.66 horsepower***	0.75 horsepower	0.82 horsepower
Loads Used	80lbs	110lbs	***135lbs***	165lbs	190lbs
Time vs Power	**1:10 - 0.65HP**	**1:20 - 0.66HP**	***1:30 - 0.66HP***	**1:40 - 0.67HP**	**1:50 - 0.67HP**
Observation	Too light	Adequate	***Optimal***	Notgoing to happen!	Have fun with that!

4 All power output figures are based on Josh Everett's height and weight.

Ignoring the pull-ups for now, let's examine the thrusters in light of the Relative Intensity loading parameters described in Table 4. The 135 lbs. load is 70 percent of 1RM push press, and total optimal volume at 70-75 percent is 15 reps. The suggested 12-9-6 progression equals a total of 27 reps, which from my experience is still far too much. The WOD will certainly be hard, but it will also be far enough removed from the original intent of "Fran" that its effect and transferability may be negligible in the actual performance of the originally prescribed WOD. Using Relative Intensity scaling, I would prescribe a volume of 9-6-3 reps at this percentage of 1RM. Eighteen total reps is right within the range of 10-20 reps at 70-75 percent and a bit at the top end. At this load, the volume of the workout is now tailored for optimal intensity and therefore it will make the athlete stronger, more efficient, and generally more capable of handling greater than average loading. Working at optimal intensities assists in improving more quickly than performing at lower than or greater than optimal intensities.

B. Using Relative Intensity to Increase WOD Variation

Similarly, the Relative Intensity method can be used to add further variation to CrossFit workout programming in a systematic way by modifying loads and volumes while keeping power output at an optimized level. For the calculations below, I have used elite CrossFitter Josh Everett as a case study. Here are his relevant stats:

Josh Everett
Snatch: 270lbs
Clean & Jerk: 346.5lbs
Bodyweight: 185lbs
Height: 5'9"

Workout: "Isabel" - Snatch 30 Reps for time, CrossFit standard is 135lbs.

The prescribed standard weight for Isabel of 135 lbs is 50 percent of Josh's best snatch, falling perfectly within the prescribed loading parameters given the number of reps for this WOD. Josh has completed this WOD as prescribed in 1:30 [*Shortly following the writing of this article, Everett performed Isabel in 1:11 —Ed.*]. Row 2 of Table 6 shows variations in power output as a function of load while holding the time to completion constant. For the five different intensity ranges that I analyzed, we see that peak sustained power output occurs somewhere right around 50 percent of 1RM.[1] However, notice in row 4 that the same optimal power output of approximately 0.66 HP can be achieved with loads that fall below 50 percent, depending on completion time. Thus it is possible to maximize power output with lighter loads, although the focus has to be on significantly besting the completion time relative to the more optimally scaled load. But also note that with loads above 50 percent of max, the likelihood of generating a power output of 0.66 HP in Isabel decreases dramatically. In fact, Josh has informed me that he has performed Isabel with 155 lbs (57 percent of 1RM) in 2:37, resulting in a power output of 0.41 horsepower. This dramatic drop in power output is exactly what my research would have predicted.

Of course, this does not mean that it isn't possible to load "Isabel" above 50 percent of 1RM without sacrificing intensity; it is simply a matter of scaling the volume properly. Table 7 demonstrates how the optimal power output of 0.66 HP can be achieved at different loads by modifying the total number of reps in the workout. The results are identical even though the loads are different. This suggests that scaling the volume as well as the load of a workout is a great way to train at a specific intensity and constitutes a powerful training tool that is fully consistent with CrossFit's constantly varied nature.

1 Again, power outputs are based on calculations from the Catalyst Athletics website's power output calculation tool: http://performancemenu.com/resources/powerOutput.php

Percent of Max - Load	40% - 110lbs	50% - 135lbs	60% - 165lbs	70% - 190lbs
Time vs Power	2:00 - 0.66HP	1:30 - 0.66HP	1:25 - 0.66HP	0:56 - 0.66HP
Modified "Isabel" Volume	45	30	25	15
Repetition Cycle	1Rep/3Seconds	1Rep/3Seconds	1Rep/3.4Seconds	1Rep/3.7Seconds

Table 7. Evenly distributed power outputs for "Isabel" based on volumes that meet optimal max rep ranges.

C. Relative Intensity Scaling for Elite Athletes

Much of what I have been talking about so far involves scaling WODs for CrossFit athletes who are still working up to CrossFit standards. However, as I suggested earlier with the example of my associate Willie Albert, Relative Intensity scaling can also be beneficial for improving performance in elite athletes. Or modifying CrossFit for the needs of niche athletes, such as my weightlifters.

To illustrate this, let's once again examine the case of Josh Everett with the Relative Intensity method in mind. Looking at his metrics as described in Table 5, along with how those metrics translate into load percentages for the standard loaded CrossFit workouts I have listed, actually indicates that he is working at sub-optimal intensities when performing most of these workouts. "Isabel" and Fight Gone Bad are the only examples I have given where the loads used are near optimal for his performance. As such, I would make the following recommendation: for Josh to optimize his performance, he should "up-scale" his loads and bring them to optimal intensities for the task at hand. Otherwise, in my opinion, he is holding himself back by sticking with the prescribed "standard" loads. An optimal "Fran" load in Josh's case would be 110lbs (45% of PP) while 155lbs (45% of C&J) would be optimal for "Grace." An optimal weight for "Diane" would be 285lbs (45% of DL). Based on volume, 75lbs is already optimal, at 30% of his push press, for Fight Gone Bad. Regardless of level of athleticism, the important thing is to optimize power output by selecting loads that are optimal for the volume and training response intended.

Conclusion: Putting Relative Intensity To Work

Now that I've laid out the Relative Intensity method, it's time to review the basic principles so you can put them to work. The rules are as follows:

- Follow a progressive, consistent strength training cycle. (Consistency is key for strength development)
- Record the loads and test for a new 1RM regularly, more often for newer athletes, less often for elite level lifters. The following schedule provides a general rule of thumb:
    - New lifter - 1 to 3 times per lift every 6 weeks
    - Advanced Lifter - 1 to 3 times per lift every 12 weeks
    - Elite Lifter - 1 to 3 times per lift every 6 - 12 months
- Scale load and volume based on percentages of 1RM, depending on the intent of the WOD and the number of reps involved.
- Keep the 80/80 rule in mind when training for maximal strength: Train at 80 percent of 1RM, 80 percent of the time.)
- Remember that 90 percent of the time, athletes should be able to perform at 90 percent of max. If performance is below this threshold then it is important to check for deficiencies in training protocol or nutrition. Conditioning will depend on the athlete's ability to recover from a true maximal effort.

To conclude; CrossFit is unique in its efficacy as a broad general inclusive strength and conditioning program, but it can be better. It must be better. The Relative Intensity method I have laid out here is my effort to make CrossFit better, but I know that it too can only benefit from further experimentation and discussion. Let's keep moving forward.

Significant contributions have been made to this article by the following individuals:

Mathieu Lalonde (Ph.D., Organic Chemistry, Harvard University Department of Chemistry and Chemical Biology) has been responsible for the peer review, scientific scrutiny, edit and third party testing (on himself) of the methods outlined in this program. Mathieu's scrutiny and arguments have been crucial in my ability to articulate the program in a meaningful way.

Barry Eidlin (Ph.D. Candidate, Department of Sociology University of California, Berkeley) has contributed to this article by translating whatever it was myself and Mathieu wrote into the english language. Barry gained first hand knowledge of the program as a client of CrossFit Ottawa during his extended stay in our Nations Capital while researching material for his Ph.D. thesis. Barry is a considerably better writer than either Mathieu or myself.

Josh Everett (Head Strength & Conditioning Coach University of California Riverside) made me reconsider many of my arguments which has contributed to the final draft of this article. Throughout our recent discussions the program which I have been developing has really revealed its potential. His contribution as devils advocate more than once has helped to clarify and consicely delineat the arguments outlined in this article. The contribution of his performance based numbers have truly helped in defending my arguments. And his willingness to test these principles in his clinic practice is incredibly reinforcing.

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