

Knowing how to plan training stress and measure progress are issues confronting all athletes but especially self coached athletes. Power meter users definitely have a leg up on answering these questions thanks to the fact that they have more reference points to help guide them. I have written quite a bit about my personal preference when it comes to power meter software, TrainingPeaks WKO+. I use WKO+ as one of my primary tools but I also use the SRM power meter software. While the SRM WIN software does not do many of the things that endear me to WKO+ it does have a few very nice features that WKO+ does not. I know many athletes cannot afford a full time coach and even regular consultations can be a financial reach for some. It is my hope that self coached SRM using athletes will benefit from learning how to gather some very good reference points using their SRM software and the following information.

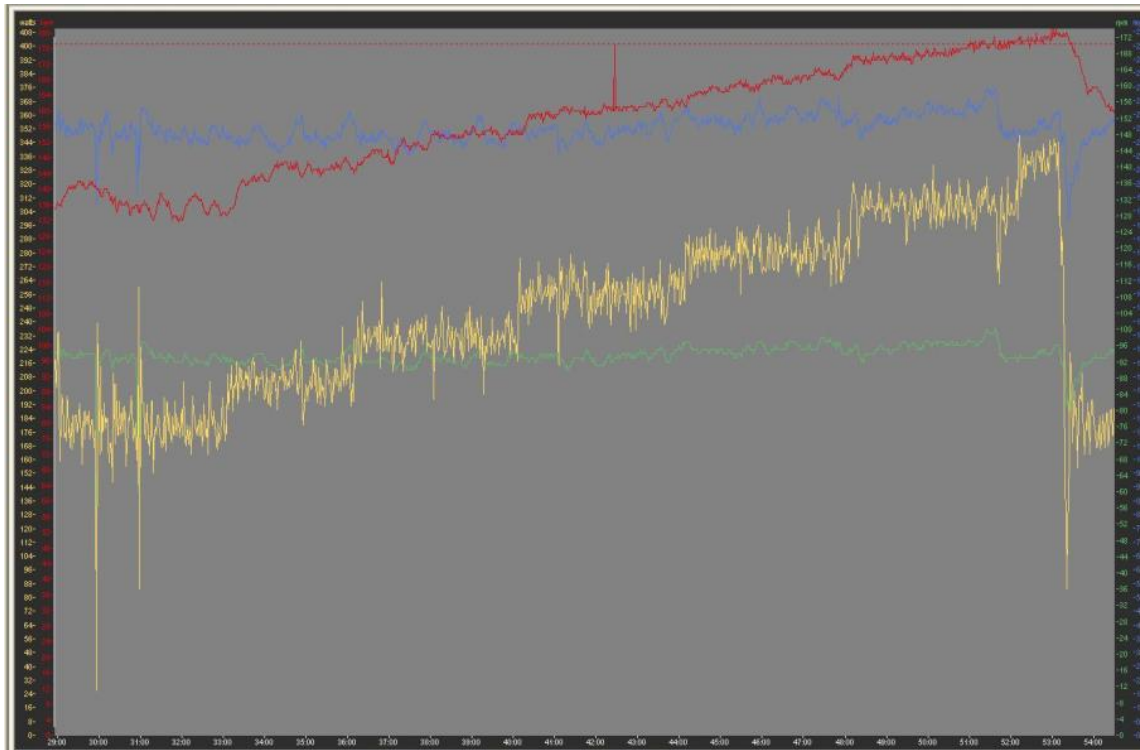
First, let's discuss the ramp test that I recommend. Reproducible test protocol and data is very important. Training with a power meter in many ways is like always testing, but a very important aspect of getting good data from a test is to reduce or eliminate variability. In the case of bike riding, variability include course differences, wind, rolling resistance, temperature, humidity, an athlete's current recovery condition, and hydration level. For this reason, I recommend doing a test like this at the same time of your training cycle. For instance, I typically like my athletes to test on the 6<sup>th</sup> day of the recovery week which takes place either after a 2 week or 3 week work block depending on the particular athletes plan. We always recover for the first few days then open the legs back up with some type of taper intervals (short intense efforts) the day before the test. I ask that athletes be well rested, well feed and that the test take place on the same trainer, with a big fan in front of them and that they are well hydrated prior to and during. By doing these things it is our hope to reduce the amount of variability in the data coming from the above mentioned issues. We do a similar warm up, preferably 20-30 minutes of aerobic riding before starting the main work section.

As for details on the test, I recommend a simple ramp test. It really is that simple. Start at a wattage that you would consider pretty easy. For many of my male athletes we use 175 watts (females start at 100-125w). We ride at that intensity for 4 minutes. I ask them to stay at their favorite cadence for the entire test. Then every 4 minutes we ramp up the wattage by 25 watts, so, in the case of our male rider we go to 200, then 225, then 250 and so on. This ramping continues until they reach our predetermined stopping point. At this time of year (winter – Base or Foundation Period) I don't like pushing guys too intensely. I don't find it important to test their VO2max intensity when we are primarily focusing on efforts of lesser intensity and higher volume. It is my opinion that this would be much like teaching algebra and testing geometry. So, during the base period I have my athletes ride up to the point where their HR surpasses their 30 min sustainable limit. This HR correlates to 20km time trial intensity or what Joe Friel uses at zone 5a. I find this gives us more than enough data to look at for any given day and for future comparisons. Now with that said there is a time I might want to go to exhaustion. When we test at the end of the Base or Foundation Period and JUST BEFORE Race Specific Preparation or the Build Period is a good time to see where that VO2max function is. This can be considered the base line VO2Max test. That way after a good period of Race Specific training or VO2max work you can measure the improvement. So, for review, to perform the test you will need ...

- Trainer

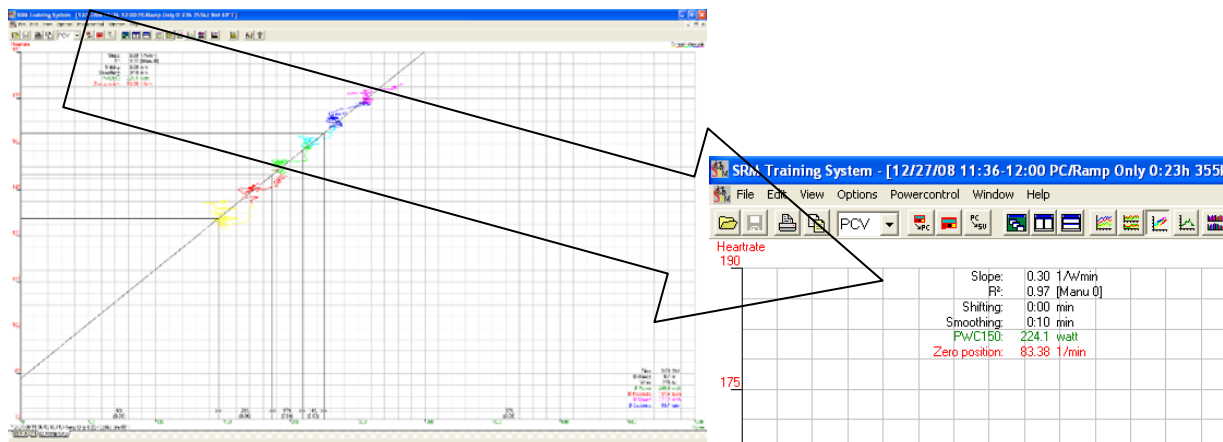
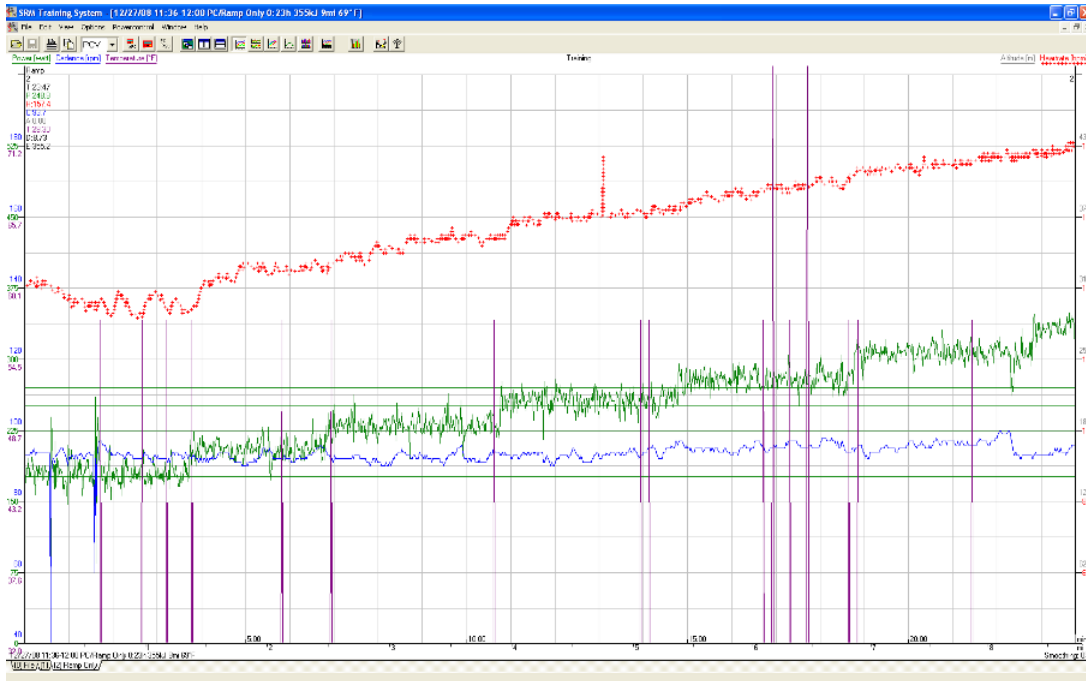
- Big Fan
- Bike with SRM – only SRM files can be used in SRM WIN software
- Water and towel
- Good warm up

So, you finish your ramp test, what do you have? Well below is a look at a ramp test in the WKO+ software. As you can see the steps of the ramp are very pronounced and the HR response is shown as well. You may also be able to see the linear correlation between power (yellow) and the HR response (red). As power increases so does HR. This linear correlation was used by Dr. Francesco Conconi to train Moser for the Hour Record. In Conconi's version of the test, Conconi claimed that this correlation can be used to establish an athlete's Maximum Sustainable output. If you graphed this relationship (power to HR) Conconi felt that there was a very discernable point at which this correlation breaks down and the HR will deflect (down and to the right) off of this established line. Conconi called this the Deflection Point. Many physiologists argue Conconi's assumption but I find the test to be very helpful in many respects.



So, now that you have done the ramp test what does it tell you? Well, if you are using WKO+ you have few things you can do to analyze this test. You can compare Power to HR response to each level each time you do the test; you can look at how high your power got before hitting your HR goal, and/or a few other things. As I said, SRM WIN has a few other very simple steps you can take to analyze a test like this that will tell you a lot. Below is the same Ramp test in the SRM Win software. This first view is called the "one line" view. It is showing you the data recorded in continuous lines just like the WKO+ view above. The view we are interested in is called the Analysis view. Below the "one line" view you will see the

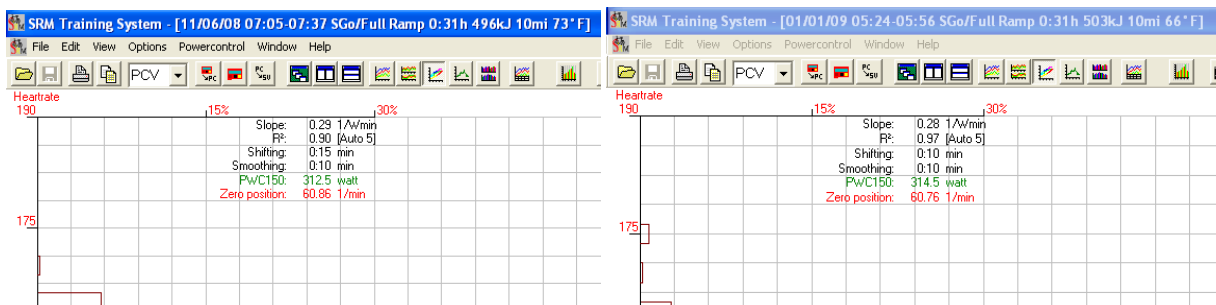
same ramp test shown in the Analysis view. As you can see it is much different and instantly gives the user a few very key pieces of information. The info in the upper left hand corner is hard to read but important so I blew it up and placed it to the right of the analysis view.



As you can see we get a few things and numbers to look at. First take note of the line with the squiggles of color being drawn by the analysis, this is our reference line. Next, in the upper left corner is the data for this test - Slope, then R2, Shifting, Smoothing, PWC150 and Zero position. These numbers can be used to compare subsequent ramp tests and instantly give you some very interesting data. Slope refers to the Slope of the line created by your HR to power relationship, the lower this number the better. The value is telling you how much your HR changed for each watt increase in power. In this case the number is .30. So, in other words as this number decreases the more power you can create for similar HR's. The R2 refers to the "fit" of the data to the line that is being drawn. The closer this number is to 1 the better

all your data fit to the line. As you can see this graph has a .97 which is a pretty darn good fit. Shifting refers to how far the heart rate data is being shifted. As you may know there is a lag time in the HR response. In this example the data hasn't needed to be shifted to get a good R2 number. We have a good fit so playing with the Shift isn't important in this example. Smoothing is an averaging of the data. In our example we have smoothed the data to be averaged every 10 seconds. This gives us more data points than if we averaged it every 30 seconds or more. Again, we are looking for a good R2. This R2 tells us the quality of our data and the reliability of the Slope and other numbers. The PWC150 is a very important number for this test. It represents the predicted work capacity in watts that can be produced at 150 bpm. I believe the number 150 was chosen because for most people it falls in a range of Medium to High Aerobic output and for VERY few will fall into the cusp of threshold type intensity. If they (SRM software creators) chose anything lower than 150 for some riders it would be too low and any higher and it would represent a number too close to threshold. I believe what was being looked for was a high end aerobic type effort. In our example you can see for 150 bpm it is predicted that this athlete would be able to produce 224 watts. Our last reference point is Zero Position. With this number the software is predicting an "On the Bike" resting HR or the Y-intercept of our graph.

If you take a few minutes to think about it this very reproducible test and the SRM software is a very easy to use tool for those looking for feedback as to whether their training is working. My athletes make use of my years of experience looking at such data but for those looking for a solid, easy to use tool this ramp test and SRM software can be invaluable. Let's look at a recent comparison example I have. Below is one of my athletes November ramp test numbers compared with his most recent January ramp test numbers.



As you can see, I "smoothed" the numbers by 10 seconds so we are getting 12 data points per 4 min ramp section and the software "shifted" the data 15 and 10 seconds respectively. The slope of the line only dropped slightly (.01) between tests but that constituted a 2 watt increase at PWC150. Let me remind you this is the Predicted Work Capacity at 150 bpm. While initially that might not seem like much, remember we are talking about a 2 watt increase at 90% of this athlete's FTP heart rate (166bpm) in just 55 days. That works out to almost 4 watts at FTP in 55 days and more importantly, at this same time last year this athlete's PWC150 was only 302 watts. That is almost a 5% improvement in his Predicted Work Capacity at 150 bpm as compared to last year at the same time. Take it from me, if you can get a 5% improvement in aerobic work capacity when you are an experienced endurance athlete from one year to the next you are doing very well. Improvements of 5% are seen with athletes in earlier stages of development but hard to come by in 3 time Masters State Time Trial Champions.

As you can see, if you have invested in an SRM power meter, have a trainer, a fan and can perform a ramp test periodically even a self coached athlete can get solid, valuable feedback as to whether or not their program is getting the results they expected. Being able to compare results from test to test will help motivate you and insure you are progressing. With solid reference points at least you will know where you are.



Peter Cummings specializes with training with Power meters and the use of the TrainingPeaks platform and WKO+. He was certified by the American College of Sports Medicine in 1993. He is a Certified and Licensed USA Cycling Level II (Expert) Coach, and Certified USA Cycling Skills Instructor. As a health club owner and coach he has directed and overseen the programming of over 10,000 individual and has been racing bicycles since 1991. His athletes have won 5 Nationals Championships, over 15 State championships and many other Local championships and races. He is available for consultations, presentations, testing, programming or coaching. Those interested can contact him at [Peter@Plan2Peak.com](mailto:Peter@Plan2Peak.com). For more articles on training and racing with power and other cycling specific topics by Coach Cummings visit [www.Plan2Peak.com](http://www.Plan2Peak.com).