Rennen.Tech.Talk

with George Costa

Performance Math: Averages

This month I would like to talk about a subject that very rarely gets any attention in the BMX racing scene, Performance Math. What is this and why should we care to learn about this you may ask? Well we all know that in order to get faster on the track a rider must train. This can be as simple as just taking laps around your local track or it can lead to the most serious of racers who utilizes a G-Cog in addition to hiring a personal coach to help them achieve their dreams.

How do you know your improving? Do you look Faster? Can you or your parents know just by watching you? Do all of a sudden have more BMX groupies? Maybe you wait for race results to prove to you that your improving? Or you do what many have become accustom to and you collect data and evaluate your performance based on your numerical results. .

Now Data can come from many sources. Some of the following may be familiar to you and if you've made it this far into a BMX article talking about math then you are probably guilty of measuring any of the following:

- Stopwatch times
- Max Speed from a Cyclometer
- Max cadence from a Cyclometer
- Timing strips
- Brower light gates
- G-Cog BMX data measuring system

What do we do with all this data? We look at it and try to understand how we performed and then we react to the information. This is called data feedback, based on what these numbers tell us we will adapt our training routine to try to improve our results.

I am going to now show you some techniques and terms that can help guide you on your path understanding and making sense of all these numbers that a BMXer can be faced with.

Average value:

Quite simply as the name implies when we compute the average of a data set we take all the numbers we are concerned about add them together and divide by how many individual items we have.

Example. Dad takes ten stopwatch times to the first jump for little Johnny they are as follows:

Run 1; 3.10	Run 6; 3.90
Run 2; 3.50	Run 7; 3.75
Run 3; 3.70	Run 8; 3.35
Run 4; 3.60	Run 9; 3.55
Run 5; 3.30	Run 10; 5.5

Ave time =(3.10+3.50+3.70+3.60+3.30+3.90+3.75+3.35+3.55+5.5)/10

Ave time = 3.73 seconds

Now technically this is perfectly acceptable as an average although looking at the data there is a better way that we can compute the average to better represent how little Johnny performed.

Looking at the data we notice that on the first run our racer had his best result at 3.1 seconds. On his last run he must have been tired of hearing his dad yell PEDAL, PEDAL and he had his worst run at 5.5seconds. These are Outliers in the data and it is common in statistics to remove these results as they tend to skew the true averages.

Removing data outliers is easy so long as we unbiasedly remove an equal number of high and low results, in this case we will only remove one from each just be sure that the amount of data you collect allows you to justify how many outliers you remove (Hint don't remove 18 of 20 data points to get the numbers you want). Remember removing equally good/bad results is necessary if you want to really show how you are performing.

Back to our example:

Ave time =(3.50+3.70+3.60+3.30+3.90+3.75+3.35+3.55)/8

Ave time = 3.58 seconds

This is a difference of 0.15 seconds from these two methods. Maybe your thinking, what's the big deal? Well at 20mph 0.15 seconds is 4.4 feet. Now do you think its important?

On our next installment of Rennen Tech Talk I will take you further into the land of data analysis and for those of you looking to pass some time at your next national come by the Rennen Design Group booth and lets have a Chat.