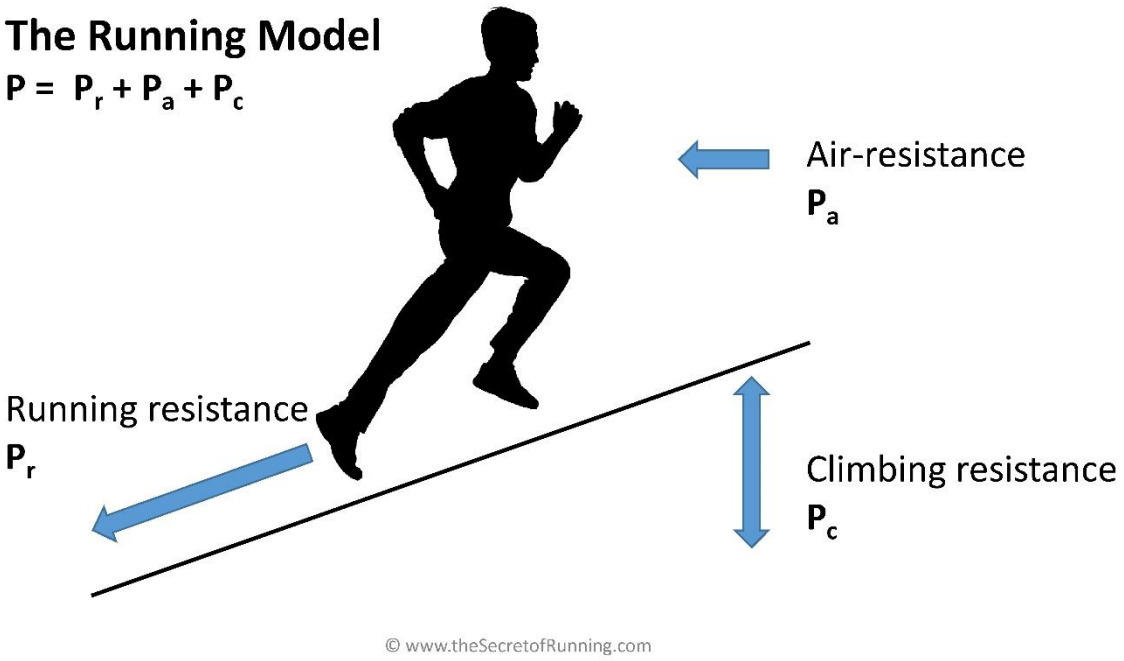
31. More tests comparing Stryd and Garmin Running Power

In our books **The Secret Of Running** (www.thesecretofrunning.com) and **The Secret Of Cycling** (www.thesecretofcycling.com) we have described our unified theory for the performance in running and cycling. Our running model is based on the premise that the power produced by the "human engine" (i.e. the leg muscles and the heart-lung system) must be equal to the sum of the power required to surmount the running resistance $\mathbf{P_r}$, the air-resistance $\mathbf{P_a}$ and the climbing resistance $\mathbf{P_c}$, as indicated in the figure below.



Meanwhile, we have tested the model in many situations (running, cycling and both in the lab and in races) and found the results very convincing and consistent. Finally, we have tested the Stryd footpod on many occasions, both in the lab and in the field and we found that the Stryd power data match our model calculations perfectly.

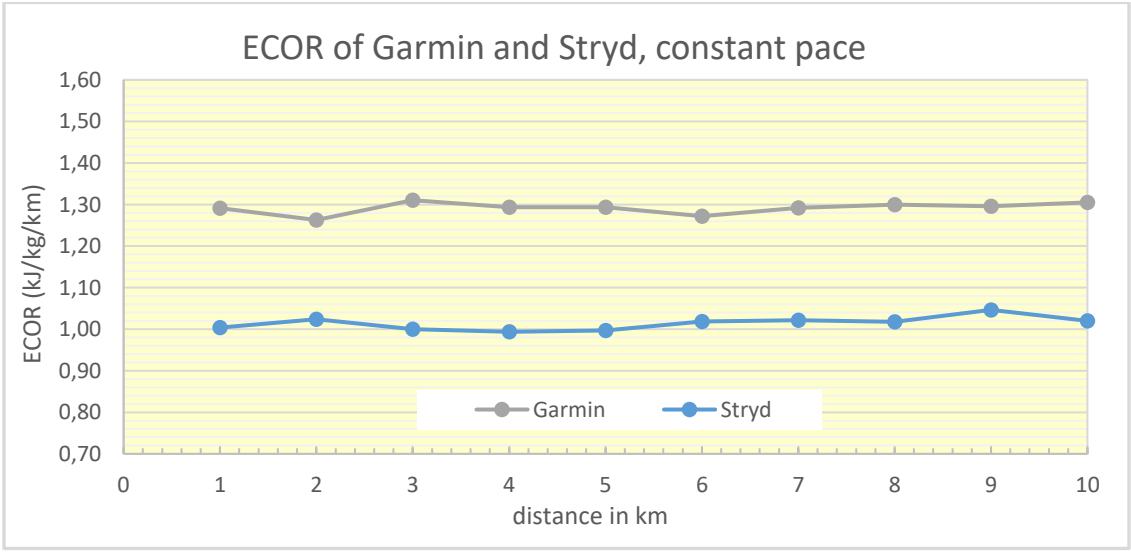
Recently, we have written a paper on our initial tests comparing the Stryd and Garmin Running Power (https://thesecretofrunning.com/wp-content/uploads/2017/12/29-Garmin-vs-Stryd-English.pdf).

In this paper we concluded that the Garmin power data and consequently also the ECOR (Energy Cost of Running) were too high as compared to the theory as explained in our books. This applied to both the data on a flat course as well as the data on hills. As can be understand, we were not very satisfied yet with the wattage numbers of Garmin Running Power. We hope Garmin will improve their software in future upgrades. However, we were very positive about the fact that they incorporate the impact of the wind resistance on the required power. We believe this is a very important aspect for runners to optimize their performance in windy conditions.

After these first tests, we have done many more and in this paper we will report a structured analysis on different aspects of Garmin Running Power. Once again, we have compared the Garmin power data with our theoretical model as well as the Stryd power data.

1. **Flat asphalt course, no wind correction, constant pace**

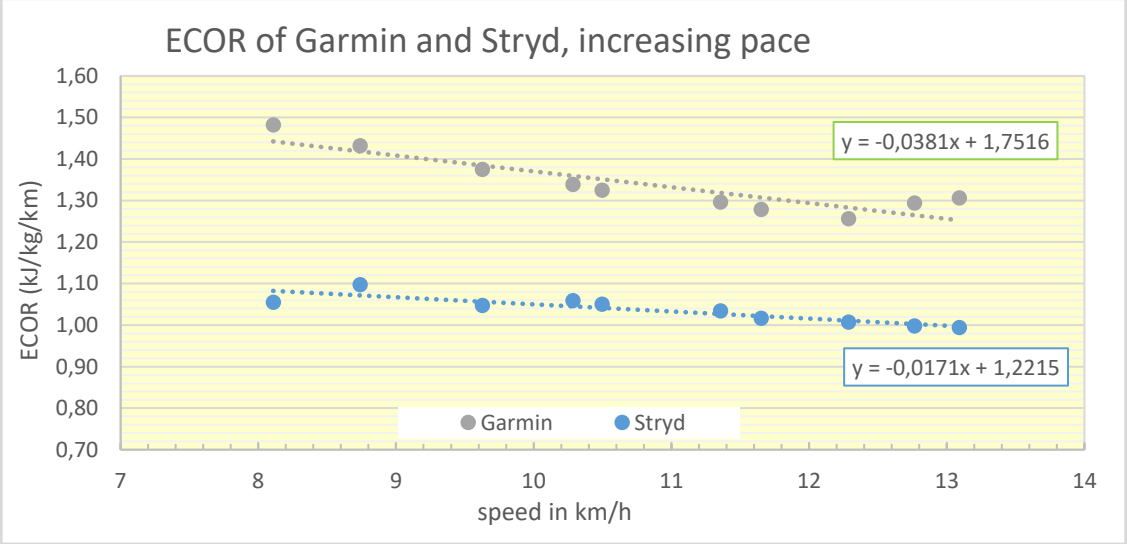
In this test, author Ron ran a flat 10K asphalt paved course at a pace of around 5:12/km. He had switched off the wind correction of Garmin Running Power, so the results were not influenced by the wind. We have calculated the ECOR (Energy Cost of Running) per km section of the run as shown in the figure below.



Once again, the figure confirms that the Stryd ECOR data (average during the run 1.01 kJ/kg/km) match our theory very well and the Garmin are too high (average 1.29 kJ/kg/km). The good news is that both data sets are very consistent and reproducible. We have found similar results in all of our training runs.

2. **Flat, asphalt course, no wind correction, increasing pace**

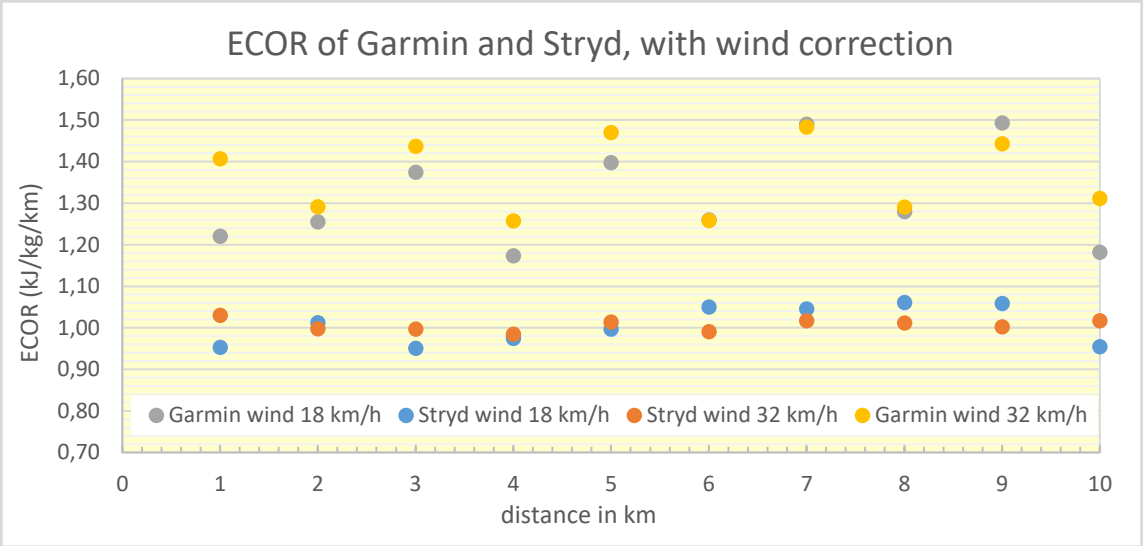
This test was similar to the first one, but now Ron increased the pace at every km. From earlier research, we know that the ECOR reduces slightly with pace/speed. The figure below shows that once again the Stryd ECOR data match the expectations from theory very well. The Garmin data are too high and they also show a peculiar increase with speed at speeds above 12 km/h. This might be a measuring error: we do not know how to explain this.



3. **Flat, asphalt course, with wind correction, 2 wind speeds, constant pace**

We tested the impact of the wind and the wind correction of Garmin Running Power on 2 consecutive days. According to Garmin Connect, the wind speed was 18 km/h on the first day and 32 km/h on the second day. During the runs we did not notice string deviations in the wind speed or direction, so we feel that the wind was relatively constant.

For these wind tests Ron ran on a flat, asphalt road in open exposed terrain. On both days, he ran 4 times 1 km with tail wind and then he turned to run the same km facing head wind. The first and the last km of the run were run with cross wind. The average pace was 5:10/km and 5:12/km respectively. The results of the ECOR data are shown in the figure below.



As could be expected the Stryd ECOR data are quite constant (and close to the theoretical number of 0.98 kJ/kg/km) and not influenced by the wind. It is well known that Stryd does not have a wind correction in their algorithm.

The figure clearly illustrates the impact of the wind correction in the Garmin ECOR data. The ECOR data at the tail wind sections (2, 4, 6, 8) are considerably lower than the data of the head wind sections (3, 5, 7, 9). This reflects Ron's perceived effort, as he struggled on the head wind sections and he was really flying on the tail wind sections. Clearly, a wind correction is a very valuable asset in running with power. However, much to our surprise, the Garmin ECOR data at a wind speed of 32 km/h were in the same order of magnitude as the data at 16 km/h! Obviously, this cannot be true as the impact of the wind speed is proportional to the square of the wind speed. So we hope that Garmin will improve the algorithm for their wind correction to make it more realistic.

Conclusions

The power data of Garmin Running Power on flat terrain are consistent and reproducible, but too high. The wind correction is a promising asset to reflect the impact of the wind on the perceived effort of a runner. However, the current algorithm did not differentiate between wind speeds of 18 and 32 km/h, so it needs to be improved. We hope Garmin goes forward with their power development and we will continue to test any future improvements which may benefit the running community. As we have shown before, the Stryd power data reflect the theoretical requirements very well, so they remain the 'golden standard'. However, we hope that Stryd will develop a wind correction algorithm as well as this is important for runners to optimize their performance in windy conditions.

To be continued!

We intend to perform many more tests on all power meters. Runners will definitely benefit from power meters, so we hope that many readers will join us in the effort. Let's share our data and conclusions on how we can use power meters to improve our running! We are curious to the reactions and experiences of the readers, we welcome you to share these at www.thesecretofrunning.com.

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https://www.youtube.com/channel/UCZD6RjE9d17TsXpB-TDCCrg

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