Sticky Watts and Microbursting

What are the differences and how can you recognise one?

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1. Introduction

While Esports intends to be as close as possible to In Real Life (IRL) racing, given that it depends on technical factors, both hardware- and software-based, it requires a different set of specific rules, safeguards and gatekeepers in order to mitigate the inherent vulnerabilities of virtual cycling and maintain fair and authentic competitions. Regardless of the intention of a rider to artificially increase their performance or not, we should minimize the possibility that such advantages can occur.

Equally, it is a responsibility of a competitor to understand racing rules and regulations put forth by governing bodies, race organizers that can vary by platforms. In this case, there are two instances of rules that may have prevented an ill fated outcome for a competitor. These are discussed in the conclusion section.

2. What are “Sticky Watts” and Microbursting?

Sticky Watts, Microbursting or Sprint & Coast are all terms that have been used interchangeably over the years in the public space to explain certain ways of pedaling or to describe hardware behaviour in specific use cases. At their core, they're all cases in which the work (j) done by the user does not have a 1:1 relationship with the power (w) being sent by the power source or shown by the game client. If correctly defined and identified, all these phenomenons credit the rider with extra power they haven't produced.

Disclaimer: Sticky watts and microbursting are linked to user behaviours that aren't inherently wrong. Hardware limitations (smart trainers) or software limitations (e.g. Zwift[1] game client) are what enables these to become an issue to the point where they can be exploited to gain an advantage. If, regardless of how the users pedaled, the power sent to the game would 100% match the work the riders did, this would be a non-issue. Therefore, aggressively putting the blame entirely on users without a minimal attempt of education could be construed as the wrong approach.

First, let’s define them.

2.1 Sticky Watts

Eric Schlange’s article[2]: https://zwiftinsider.com/sticky-watts/

"Sticky Watts" is used to explain the end result usually found in the power graph as flat tops or observed mid race if the power values remain unchanged for more than 1-2s. All sticky watts gain an advantage.

The phenomenon will only happen on select power sources that are prone to producing sticky watts. Event based[2] powermeters are known to cause this, but some smart bikes have been observed to produce it as well. They require the user to stop pedaling abruptly. High power numbers are not required. The game will then stick to the last non-zero power value sent by the power source until either the user resumes pedaling or the sticky watts end, at which point the game will eventually show 0w. Resuming pedaling prior to that point will break the sticky watt early, with the game throwing a low value prior to catching up to the current power level. The length of the pause in pedaling is therefore directly linked to the severity of the "sticky watts" and with the advantage gained from it. If the pause in pedaling is extremely brief (~0.5s), then, at least in the case of Assioma pedals, the gain can approach zero, as observed in tests.

Because of the highly recognizable signature left in the power graph (the flat tops), sticky watts can be detected after a race and does not require a live video feed of the rider in order to be spotted. For this reason, the frequency and the part of the race where these occurred will offer a lot of info into whether they were intentional and whether the rider has benefitted massively from it.

Usual and expected spots where sticky watts might be found and accepted if the stuck power is low and if they happen sparingly are:

1) On downhills, whether going into supertuck or not.
2) Attempting to stop overshooting a group

Usual spots where sticky watts can be considered an attempt to gain an advantage are all the places where constant pressure on the pedals is expected, such as:

1) Climbing
2) During an individual time trial
3) Pulling in a team time trial
4) Riding in the wind on the flats (attacking, bridging up to someone)

Riders racing on sticky watts producing power sources should be mindful of their pedaling action and know that any abrupt stop will trigger them and that, while not being at fault for this, the advantage is nevertheless there anytime it happens.

Steps can be taken to ensure sticky watts do not happen, even if the primary source of power is a known sticky watt offender. The procedure to do so requires that, rather than abruptly stopping the pedaling motion, users need to continue turning the cranks without any pressure on the pedals. The power source will then measure positive cadence with 0 or close to 0 wattage and it will transmit that to the game, therefore avoiding the sticky watt. Tests have shown that any advantage gained while employing this technique is reduced to a minimum.

2.2 Microbursts

Eric Schlange's article[3]: https://zwiftinsider.com/microburst-tests/

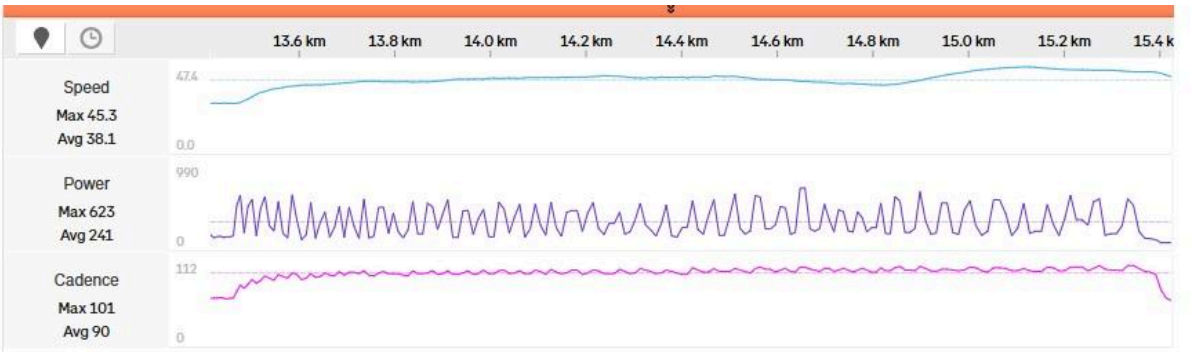
The term "microbursts" is used to explain the pedaling action in which pressure on the pedals is varied between high (or normal level) and low level (or 0), which is not inherently wrong if the power source is responsive enough to not gain the user an advantage.

Microbursts and sticky watts, while having a lot in common, are on different sides of the equation. Microbursts are part of the input, sticky watts are one of the possible outputs. Both can start the same way, but the outcome can be different. Or, in other words, all sticky watts are microbursts too, all microbursts are not sticky watts. Hence, there's a clear need to differentiate between the two since they have completely different traces in the power graph and, while all sticky watts will gain an advantage, all microbursts will not do so. Depending on the power source, you can have:

1) Microbursts where pressure on the pedals varies between normal/high and low (without stopping). This will cause:

- no advantage on highly responsive trainers (like a Wahoo[4] Kickr V6) or powermeters (like an Favero[5] Assioma Duo); obvious trace in the power graph, which will look like this, as a series of peaks and troughs:

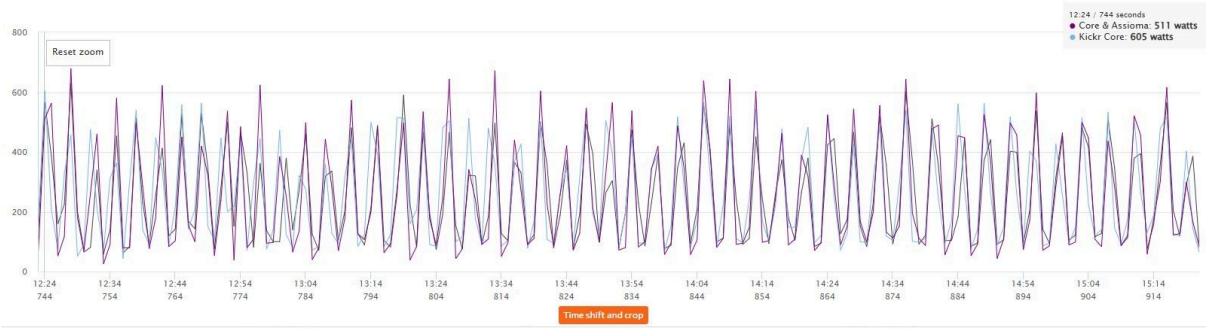
Graph-1.



A dual record will confirm this:

Note: Both the Wahoo Kickr Core & Favero Assioma were used as primary in the whole ride, hence the name. The segment below is with the Kickr Core as primary.

Graph-2.



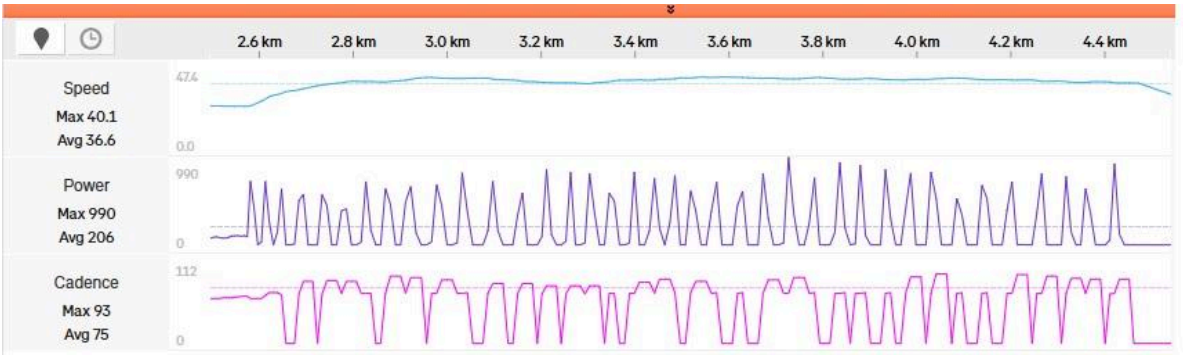
	Core & Assioma	Kickr Core		Assioma DUO	
Average Power	253.6 watts	257.3 watts	(+1.44%)	254.6 watts	(+0.39%)
Normalised Power	242.8 watts	247.4 watts	(+1.86%)	243.8 watts	(+0.41%)
Maximum Power	678 watts	605 watts	(-12.07%)	630 watts	(-7.62%)

- an advantage on very laggy trainers (like an Frassene[6] Elite Direto); potentially undetectable on a power graph if the frequency of the peaks is high enough

2) Microbursts where power on the pedals varies between normal/high and complete rest (with >0.5s stops)

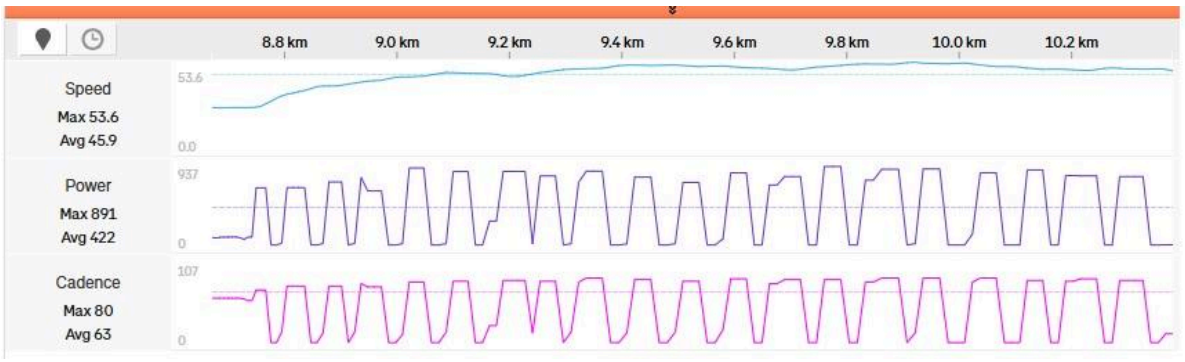
- no advantage on high responsive trainers (like a Kickr V6); obvious trace in the power graph, which will look like this:

Graph-3.



- sticky watts on powermeters (like an Assioma Duo); obvious trace in the power graph showing as flat tops, looking like this:

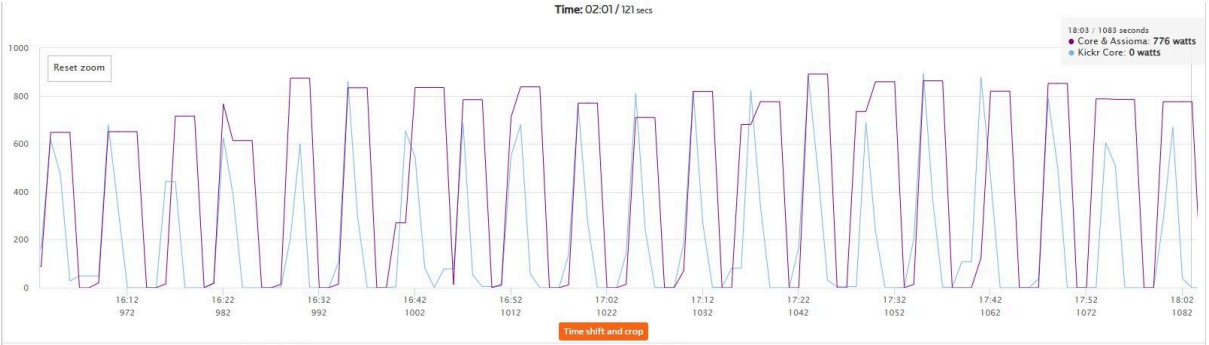
Graph-4.



A dual record will make the advantage obvious:

Note: Both the Kickr Core & Favero Assioma were used as primary in the whole ride, hence the name. The segment below is with the Favero Assioma as primary.

Graph-5.



	Core & Assioma	Kickr Core	
Average Power	465 watts	197.1 watts	(-135.92%)
Normalised Power	93.1 watts	63.7 watts	(-46.15%)
Maximum Power	891 watts	892 watts	(+0.11%)

- an advantage on very laggy trainers (like an Elite Direto); very little evidence in the power graph and hard to use as a diagnostic.

3) Microbursts where power on the pedals varies between normal/high and none (with <0.5s stops)

- no advantage on high responsive trainers (like a Kickr V6); obvious trace in the power graph, looking like this:

Graph-6.

- can reach a point where there's minimal or no advantage on powermeters (like an Assioma Duo); power graph might look like this:

Graph-7.

A dual will confirm the lack of advantage, despite the microrests being short enough that they don't register as 0w on a device that doesn't use RaceMode.

Graph-8.

	Core & Assioma	Kickr Core	
Average Power	314.3 watts	315.6 watts	(+0.41%)
Normalised Power	295.5 watts	294.5 watts	(-0.34%)
Maximum Power	517 watts	641 watts	(+19.34%)

- an advantage on a very laggy trainer (like an Elite Direto); undetectable on a power graph, unless the ride was dual recorded, which will show the powermeter dropping to 0w while the smart trainer completely misses the microrests and stays at high power. (Powermeter in blue below capturing the drops in power).

Graph-9

To confirm whether sticky watts or microbursts offer an advantage, two tests were conducted with multiple two and three minute sections where the sole focus was on testing one thing at a time.

Power Source 1: Kickr Core on the latest firmware
Power Source 2: Favero Assioma Duo on the latest firmware
Platform: Zwift
Additional head units: 2 x Garmin[7] Edge 830 cycling computer

Note: while the sticky watts were present on the Edge paired to the Assioma powermeter when observing them live, the head unit did not write them to the .fit file and in fact the averages were abnormally low, most of the peaks being cut from the file.

The results are as follows:

Test 1.

Primary Power on Zwift	Goal of the analyzed section	Kickr Core with Edge 830	Assioma with Edge 830
Kickr Core	Baseline	-0.2%	+1.3%
Kickr Core	Attempting sticky watts	-3.8%	Edge struggles to capture the short highs and lows
Kickr Core	microbursting, no pauses	+1.6%	+0.5%

Kickr Core	microbursting, 1-1.5s pauses	-2.7%	-2.2%
Favero Assioma	Sticky watts	-126.1%	Edge struggles to capture the short highs and lows
Favero Assioma	microbursting, no pauses	+3.2%	+1.3%
Favero Assioma	microbursting, 1-1.5s pauses	-20.2%	-18%

Test 2.

Primary Power on Zwift	Goal of the analyzed section	Kickr Core with Edge 830	Assioma Edge with Edge 830
Kickr Core	Baseline	-0.1%	+3%
Kickr Core	Sticky watts	+0%	Edge struggles to capture the short highs and lows
Kickr Core	Microbursting, no pauses	-2.9%	-1.7%
Kickr Core	Microbursting, 0.5s pauses	+1.1%	-4.3%
Favero Assioma	Sticky watts	-135.9%	Edge struggles to capture the short highs and lows
Favero Assioma	Microbursting, no pauses	-4.6%	-4.5%
Favero Assioma	Microbursting, 0.5s pauses	+0.6%	-3.2%
Favero Assioma	Same pedaling behaviour as the sticky watts test, but this time actively seeking to avoid the sticky watts through the special technique described in the Sticky Watts section at each ramping down of power	-6.1%	-2.9%

3. Discussion:

1) Attempting sticky watts with a responsive smart trainer seems to produce no statistical advantage.
2) Attempting sticky watts with Assioma powermeters can have massive gains, as expected.
3) Users racing on powermeters as primary power are advised to use the technique described above to reduce the advantage of Sticky watts to a minimum.
4) Microbursting, with or without shorter/longer pauses produces no advantage when racing with a responsive smart trainer.
5) Favero Assiomas produces no statistical advantage when microbursting without complete pauses in pedaling.
6) Microbursting with complete pauses in pedaling on Favero Assiomas will produce an advantage directly proportional to the length of the rest, but can reach 0 if the rests are short enough, breaking the sticky watt early.

More data is obviously required to be able to reach any type of consensus on the issue, but, as shown above, the matter is at least more complicated than it looks since most of the hardware in use in 2025 seems to avoid most if not all of the issues above.

a) If the primary power source is a powermeter, any advantage gained from it will only be in the form of sticky watts, which should be easy to detect and need to be addressed by event organizers.
b) If the primary power source is a highly reactive smart trainer, there will be no advantage gained from “sticky watts” or “microbursts”.
c) If the primary power source is any smart trainer with a strong smoothing algorithm in calculating power which slowly ramps down measured (in fact, estimated) power long after the rider has reduced their actual produced power, then microbursting not only can gain an advantage, but it can be potentially undetected if the power graph isn’t corroborated with a live feed from the rider. Most of these power sources take a longer time to wind down the power than to bring it back up upon resuming high power, so the argument of what you’re gaining in the ramp down you’re losing in the ramp up is often inaccurate.

The difficulty in dealing with microbursts is that:

- If the microbursts are present in the power graph, there’s no way of telling whether they brought an advantage or not without knowing or testing the user’s power source. The lows in the power graph might happen simultaneously with the rider reducing their actual produced power or they might happen with a lag, offering an advantage. No way of telling whether the two are synchronized or not.
- If microbursts are not present in the power graph, there’s no way of telling whether microbursts were actually used by the rider or not. Basically, any time the user will

ramp down the power, residual watts might completely smooth out the power graph to the point where anyone observing the graph will think the rider has maintained constant pressure on the pedals when they have not. Microrests are therefore hidden.

Eric Schlange of Zwiftinsider.com has performed a test to verify whether the style itself, removing the extra watts gained from the equation, would have an added benefit over steady state riding.

On flat terrain, all 5 tests where power was varied between high burst of power and low power (or 0w) have shown to offer an average time gain of 4.13s or 0.65% over steady state riding on a 10 minute segment. This is likely explained through a recent Pack Dynamics 4 .cda (coefficient of drag) bonus offered to those that raise their power enough over their last 10s average. Note this requires no draft, so repeating the same test inside a group is likely to nullify differences.
On a climb, the 2 tests performed showed either an identical time or a slower time (for microbursting) when varying the power compared to steady state riding.

The tests above conclude that microbursting, as a style of pedaling, offers little (less than 1% on flats) to no advantage/a penalty (on climbs) compared to steady state riding. Thus, an argument can be made that microbursting (with no obvious sticky watts traces) on a modern highly reactive power source offers no advantage.

4. Definitions or mentions in the various E-racing rulesets:

1) The Zwift World Series Rules and Regulations Version 1.0.0- 2024/07/17[8]

" 2.5.9. Riders shall use equipment in a manner that is consistent with online cycling events being broadly analogous to real-world cycling events. Use of techniques or equipment (other than a smart trainer or smart bike, devices for holding a smart trainer or smart bike in place, or those relating to body heat management- fans, towels, etc.) that would not be permitted or not be effective, in real life cycling events, shall be prohibited.

Note: This rule is not intended to prevent innovation but simply to avoid the exploitation of "non-sporting" loopholes presented by the nature of esports. This includes but is not limited to, exploitation of disconnections/lag / dropouts/software bugs, unusual pedalling styles such
as micro-bursting / Sticky Watts, or use of equipment that is beyond what might reasonably be considered "sporting". Any riders who are concerned that an innovation may be limited by

this rule are strongly encouraged to seek the advice of the Independent Commissaire before using it in competition"

2) The Zwift Games 2025 Elite Championships Racebook Elite/Community Racing Rules & Regulations (20 Feb 2025)[9]

"Non Standard Cycling Techniques
Usage of non standard cycling techniques (for example, ‘micro-bursting’/ ‘sticky watts’) is strictly prohibited. Please see section 5.1.03 of the Elite Community Rules and Regulations for further context."

The aforementioned section 5.1.03 only adds:

"5.1.03 Riders shall not attempt to manipulate their equipment in any way including using nonstandard cycling techniques and all other known exploits."

3) Zwift Racing League WTRL Technical Guide & Rules Ver. 4.10[10]

"4.5. Banned Racing Techniques
4.5.1. The use of unconventional cadence techniques is strictly prohibited and will lead to results annulment. Further information about these techniques can be found in the WTRL Support Centre.
4.5.2. A key banned cadence technique is defined as follows:
● Cadence and power are seen to increase to >100 RPM and > % of zFTP for up to 4 seconds.
● Cadence and Power are then seen to fall to <40 RPM and < % of zFTP for up to 4 seconds.
● This cycle is seen to repeat 4 or more times per minute."

Definitions above are either vague, incomplete or misleading by allowing offenders to defend their case by arguing they haven’t breached those rules, since:

Counter Argument A:

If your sole argument against microbursts relies on it not being analogous, permitted or effective pedaling techniques in real world racing, then some defences will be rightfully brought up. Power graphs of elite cyclists regularly show that, in high speed or high draft situations, they resemble what would otherwise be called as “microbursts” on Zwift.

Data from UAE Tour 2025, showing pedaling behaviour across 3 different power levels:

Low power (but relatively high speed, analogous to a Zwift race) in the beginning of a stage:

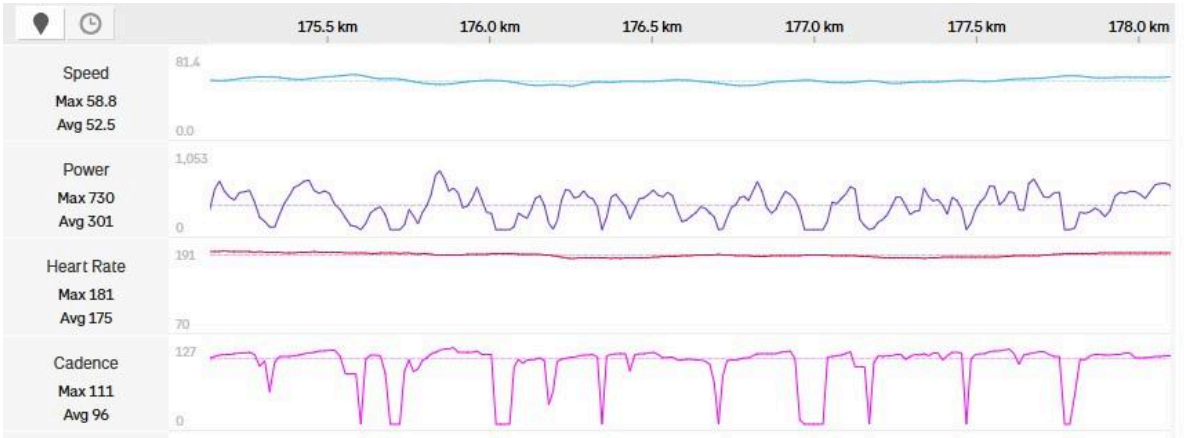
Graph-10.

Medium power (analogous to the typical average wattage in a Zwift race for the median Zwifter) at high flat speeds:

Graph-11.

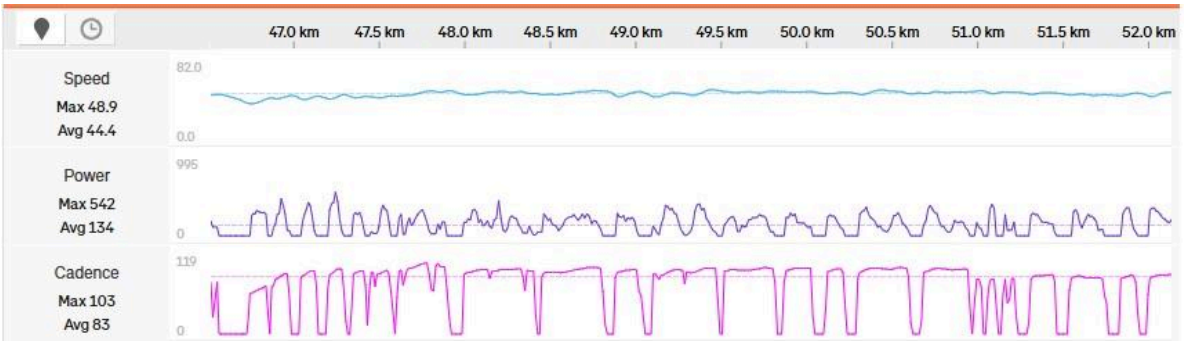
High power in a 3 kilometer section at the end of a sprint stage:

Graph-12.



Data from Tour de France 2024:

Graph-13.



Graph-14.

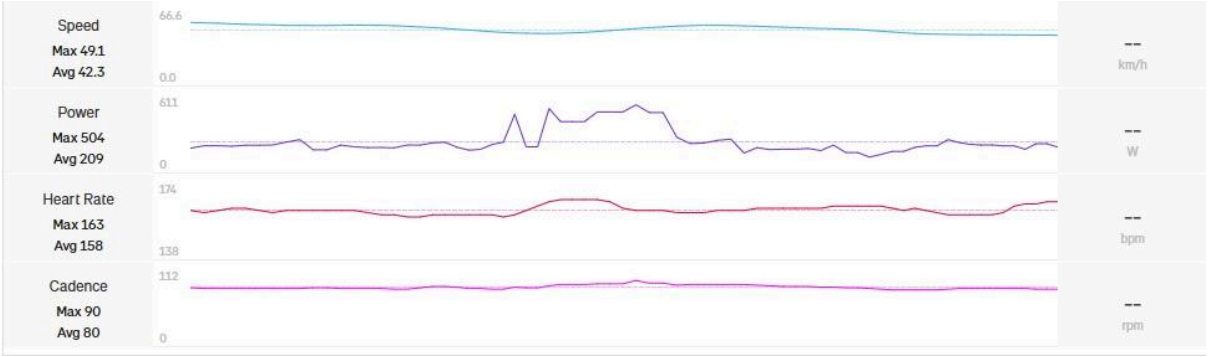
All of the above contain big sections that would otherwise be deemed as microbursting on Zwift despite being normal pedaling technique in high draft and high speeds situations.

Counter Argument B:

WTRL's cadence constraints are not required to trigger or benefit from microbursts. An advantage can be had without spiking your cadence above 100 rpm nor by dropping it below 40.

Here's a section of a power graph that contains microbursting:

Graph-15.



This particular section above contains 4 microbursts with 4 pauses of approximately 1.5s each. No drops in cadence and not an obvious trace in the power graph either, with the only thing confirming the microbursts being the live feed of the rider.

And therein lies the issue. While sticky watts are obvious, microbursts come in all shapes and flavours, from some that are absolutely undetectable on a power graph (if the breaks in pedaling are short enough on a laggy trainer) and bringing plenty of advantage to some that are detectable on a power graph but don't bring any advantage. Which is why, in tackling the sticky watts / microbursts issue, alongside better defining the phenomenon, solutions might be a combination of the following:

1) ***Ban the use of powermeters as primary power*** in order to get rid of sticky watts, therefore enforcing the use of any smart trainer as primary power, including wheel-ons or very laggy ones that will gain an advantage without leaving any trace.
2) ***Ban all microbursts***. Due to the limitations of the superficial verification process present in most community races and not knowing whether microbursts present in a power graph have actually brought any advantage or not, force everyone to have constant pressure on the pedals, therefore eliminating both the "good" microbursts (those that brought no advantage) and the "bad" ones (those gaining an advantage). You can see how this is a rather unfortunate rule that fails to address the real issue while penalizing everyone, including riders that are racing in good faith. Limited microbursts exist in everyone's power graph, whether going into supertucks, going to 0w in the draft on descents multiple times a race or modulating power (which might resemble microbursts) on a stepped climb or on the flats in high speed, high draft scenarios to either maintain position or avoiding overshooting a group.

3) ***Deal with every case individually,*** which is both time consuming and unrealistic for regular community races. Some power sources that gain an advantage will therefore slip in.
4) ***Improve the hardware***[11] (some smart trainers) ***or software*** (game platforms).

Some of the solutions above are less than ideal and some are still years away from real progress. In the meantime, the best we can do as race organizers, team managers or riders is to do a great deal of education and exercise a lot of caution in giving away easy verdicts. Just because someone appears to do regular rests in pedaling on youtube does not automatically make them a microburster/cheater. The opposite is also true. A power graph that looks normal might hide a lot of advantages gaining microbursts.

References:

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3) “Sprint-Coast/Microbursting Speed Tests: are Zwifters cheating by pedaling in spurts?”, Schlange, E., Dec 13, 2023. URL: https://zwiftinsider.com/microburst-tests
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