Evolution of the World Triathlon Series (Olympic distance)

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Introduction

This year marks the 15th year of World Triathlon Series (WTS) racing (starting in 2009 under the title of “ITU World Championship Series”). Over this time, there have been 75 Olympic (“Standard”) distance races, and 31 “Sprint” distance events*. Even casual observers will have noticed that both the Men’s and Women’s racing has evolved, in terms of style, tactics and speed. Here, we will take a look at the data behind this evolution.

*we ignore super sprint races and the 2013 Kitzbuhel “mountain” race

It is well known that simply looking at raw swim, bike & run times is not a fair comparison in triathlon, as course lengths, terrains and race dynamics vary. Consequently, for each discipline, we consider three metrics, the last (and least important) being raw time. This will allow us to gain an understanding of the evolution of the sport over the last 15 years.

For each discipline, we define the following metrics for athletes in each race:

1. **Required position** - the position the athlete’s split (in the discipline) ranks
    - This gives us a first order understanding of the “importance” of the discipline. For example, does the winner always have the fastest swim split, or is having a top 10 swim often enough for a podium?
2. **Required time** - the difference between the fastest athlete in the discipline and the time of the athlete we are considering.
    - This adds more colour (a second order understanding) to the required position above. It allows us to understand the relative gaps between run splits. For example, if we conclude that on average having the 2nd fastest run split is enough to win the race, this metric allows us to understand (in relative time) what is needed to achieve this.
3. **Raw time**
    - As mentioned above, this metric should be taken lightly - in many ways this is a vanity metric to give a general understanding of the speed of the front of the run.

A few notes:

1. We deliberately do not mention any athletes by name. While it may seem important to understand the “context” behind a certain pattern, we want this analysis to have a high level of objectivity.

2. We break down the data in Olympic cycles, however we use the “COVID break” (2020) instead of the 2021 Tokyo Olympics.

3. For the bike, we only consider required time (2). The other metrics are rendered almost worthless due to group dynamics and course conditions.

Women’s racing

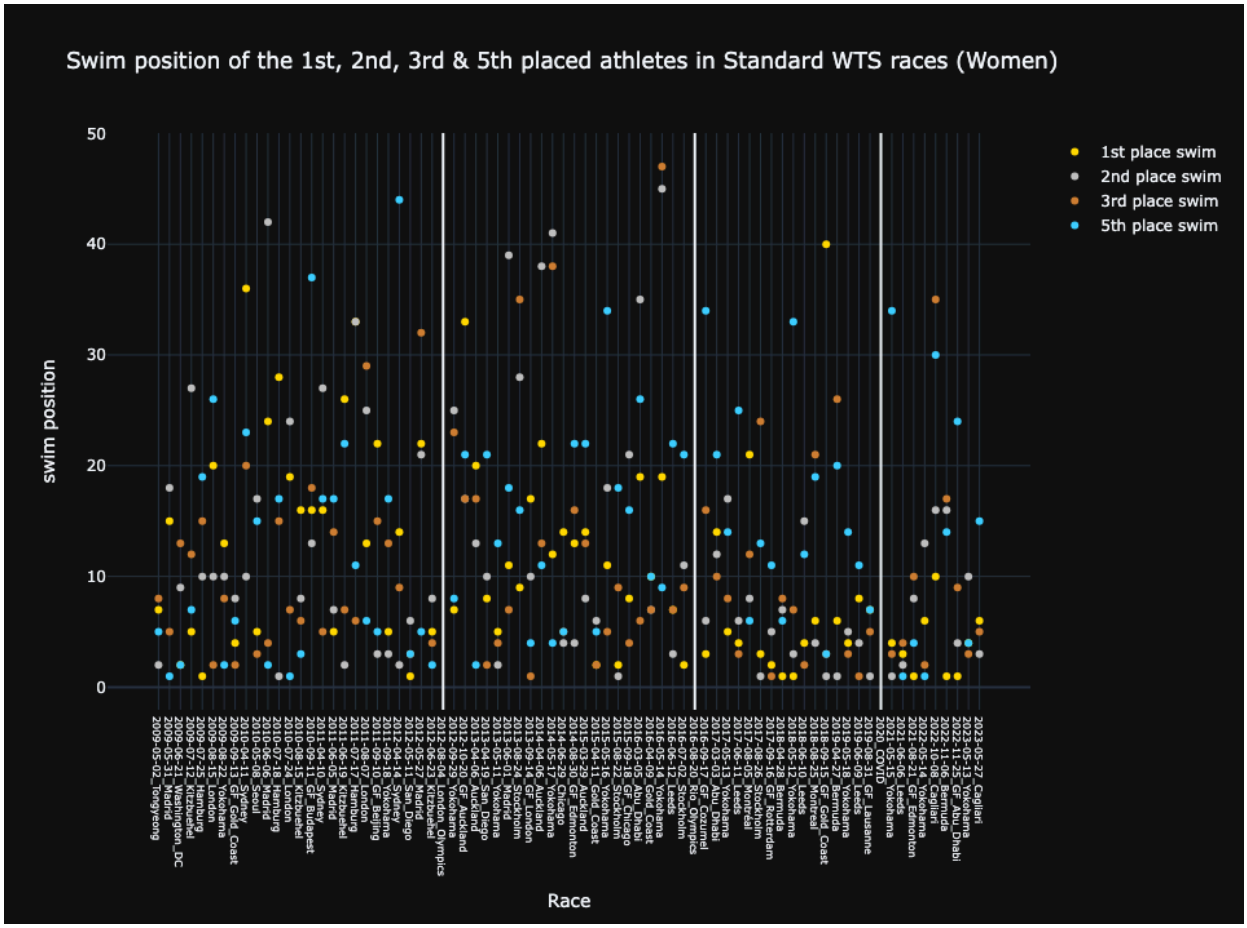
Here we consider the above metrics for all Women’s standard distance events.

Swim

Note: Cape Town 2014 and 2015 were Olympic distance races, however the swims were only 750m, we therefore discount them from this analysis - 73 races in all.

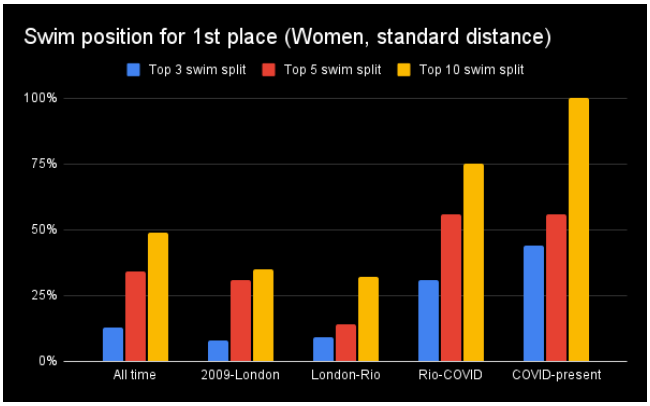
(1) **Required swim position**

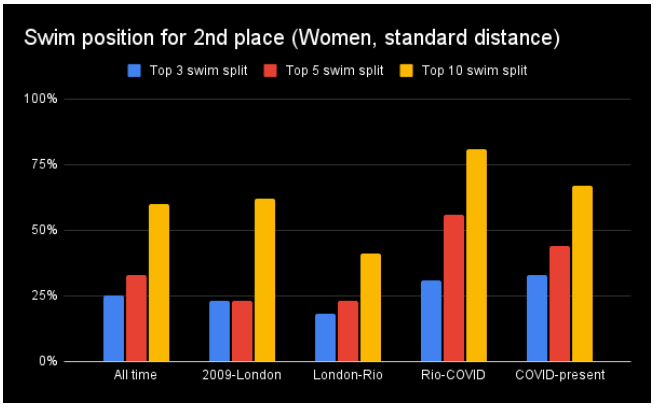
The graph below shows the swim position (coming out of the water) of the podium and 5th placed athletes. The white lines demarcate Olympic cycles.

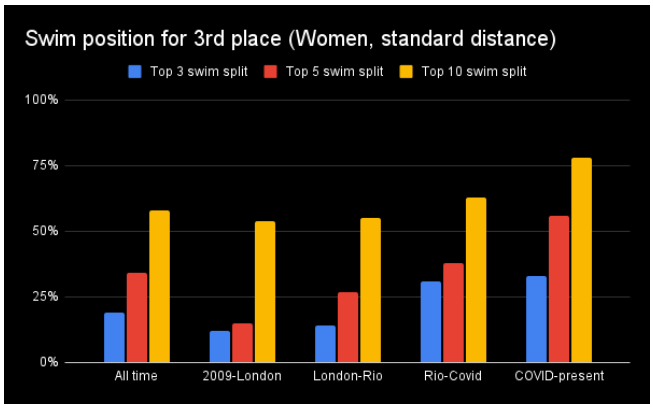


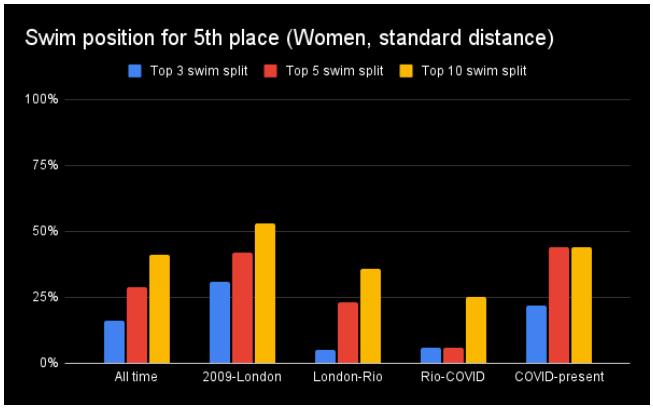
It is easier to spot trends and draw conclusions if we break it down further. The bar graphs below visualise the distribution of swim positions for the podium and 5th placed athletes across the different Olympic cycles.

For example, the top left graph shows the % of races where the winner has had a top-3, top-5 and top-10 swim split. The other graphs show exactly the same data for the 2nd, 3rd and 5th placed athletes.







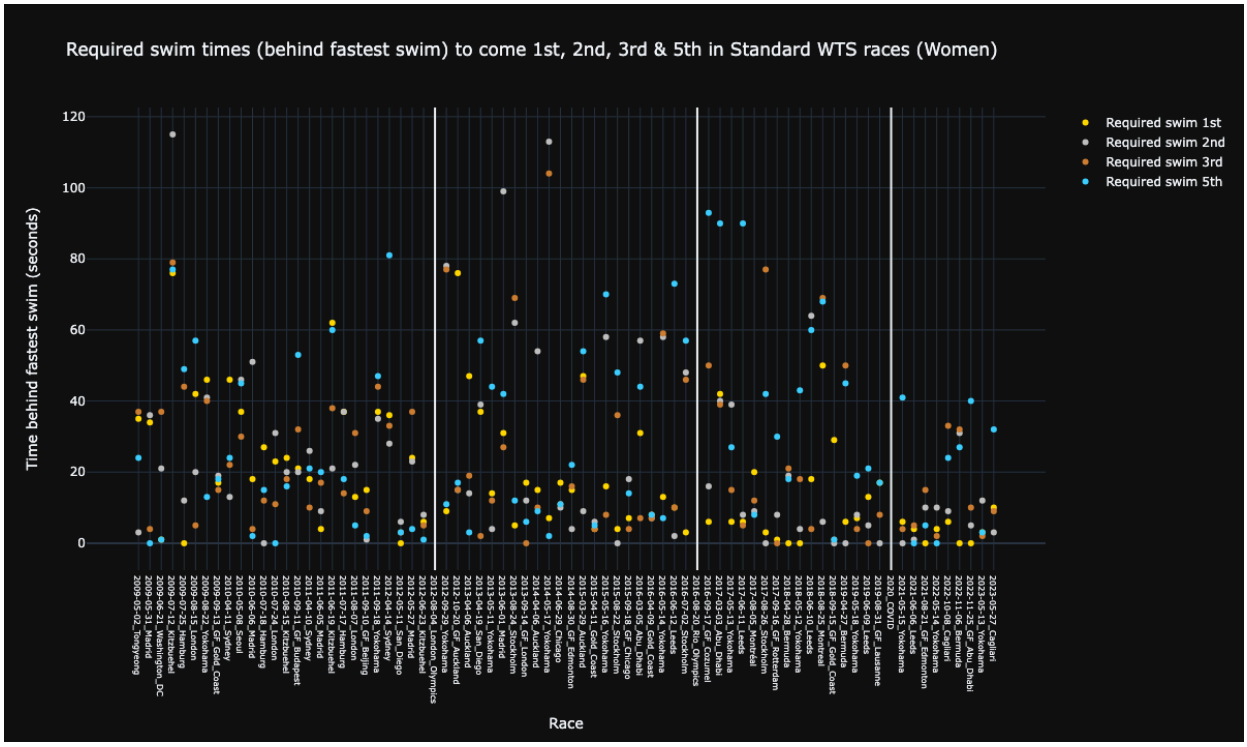


Some takeaways:

- There is a significant shift in the race winner's (top left graph) swim position in the last two Olympic cycles. In the London and Rio cycles, the winner rarely had a top-10 swim exit (35% & 32%), whereas in the Tokyo and current cycles the winner has a top-10 swim exit 75% and 100% of the time respectively.
- A similar, yet slightly dampened, trend can be seen for second and third placed athletes (top right & bottom left graphs). It is interesting to note that in the London & Rio cycles the 2nd and 3rd placed athletes were ~20% (raw increase) more likely to have a top-10 swim split than the race winner.
- Both of the above point to the swim becoming a much more important factor in races in recent times. In the London and Rio cycles, an athlete could recover from a non top-10 swim, whereas to win a race now, a top swim exit is vital.
- Interestingly, the 5th placed athlete's swim position distribution (bottom right graph) does not display the same "upward" trend the others do. Instead the importance of the swim decreased in the Tokyo cycle, and while it has risen slightly in the current cycle it is still less than the London cycle.

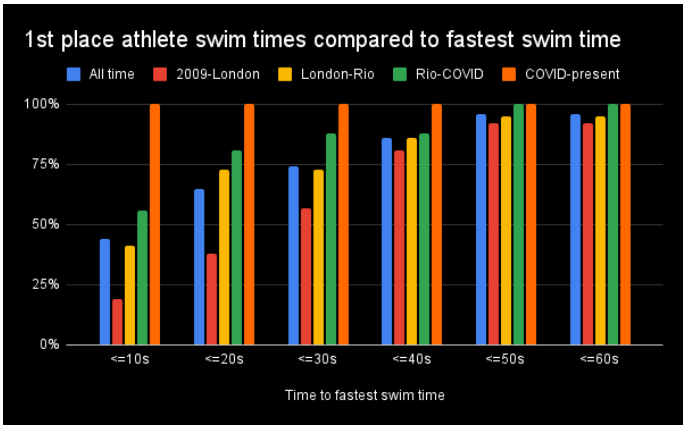
2 Required swim time

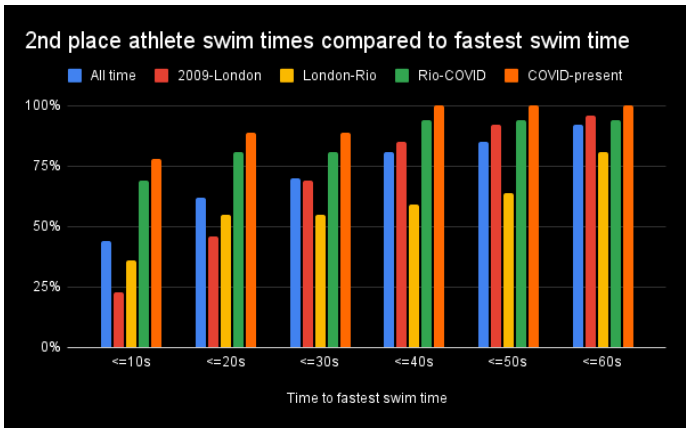
The graph below shows the required swim time for the podium and 5th placed athletes. Recall this is the time difference between the athlete concerned and the fastest swim of the race. Occasionally the fastest swim is produced by the winner (or another podium athlete), which can be seen when there is a data point at "0" on the y axis.

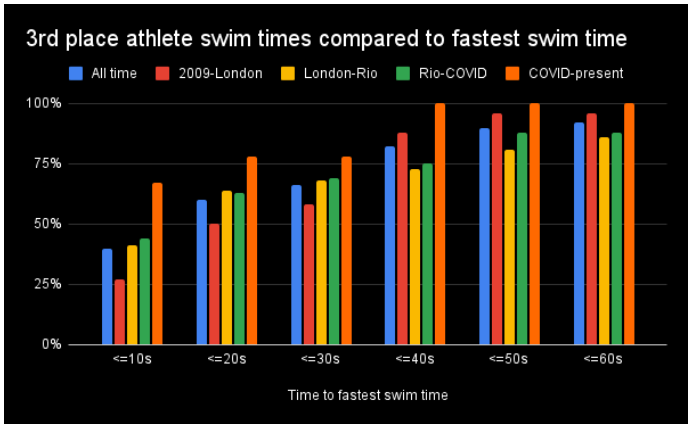


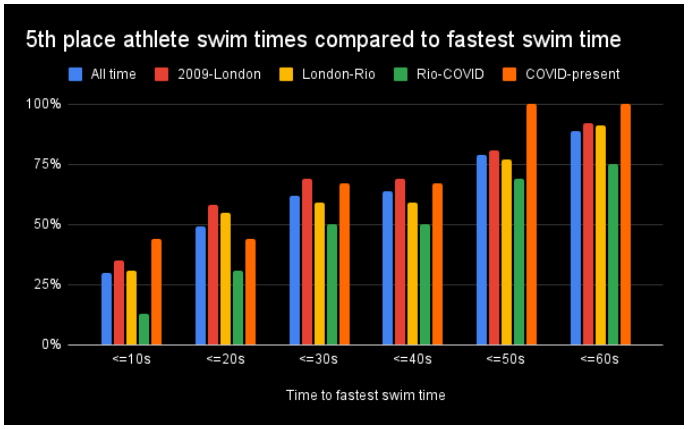
As above, to better understand the data, we plot the distribution of time gaps from the fastest swimmer for the 1st, 2nd, 3rd and 5th placed athletes.

For example, the top left graph below shows the % of races where the winner has had a swim split within 10, 20, …60 seconds of the fastest swim.







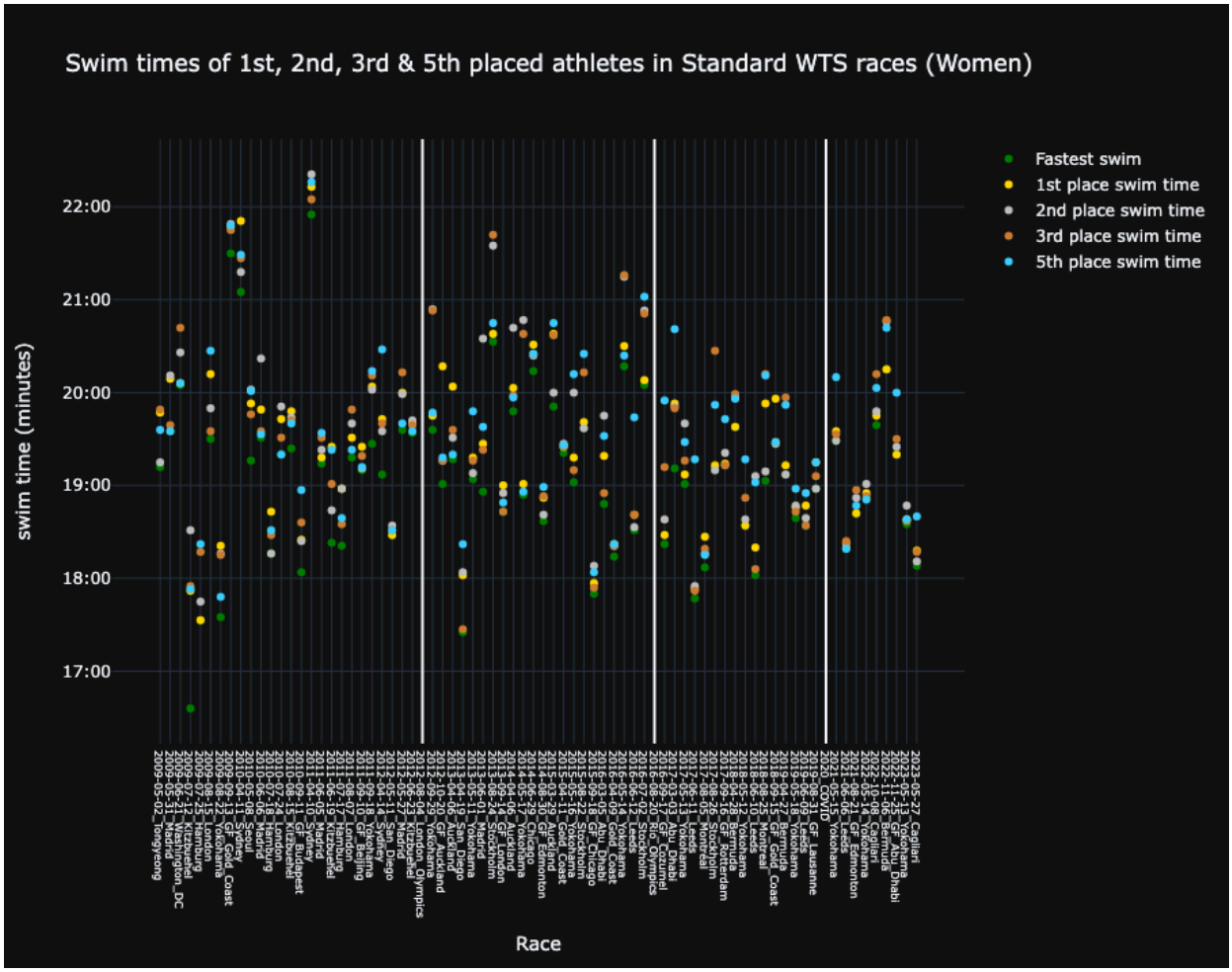


Some takeaways:

- Quite remarkably, in all races since COVID, the winner has had a swim within 10 seconds of the fastest swim. This fits with 100% of winners having a top 10 swim position from above. This is a significant increase on the previous Olympic cycles where only 56%, 41% & 19% of race winners have had such a swim.
- A similar trend is visible for 2nd & 3rd place athletes also - albeit not as exaggerated.
- Interestingly, for 5th placed athletes the trend is barely visible at all. In fact, the post COVID era has, in general, seen no increase in % of 5th placed athletes coming out the water within 10, 20, 30 & 40 seconds of the lead swimmer compared to previous eras.

3️⃣ **Raw time**

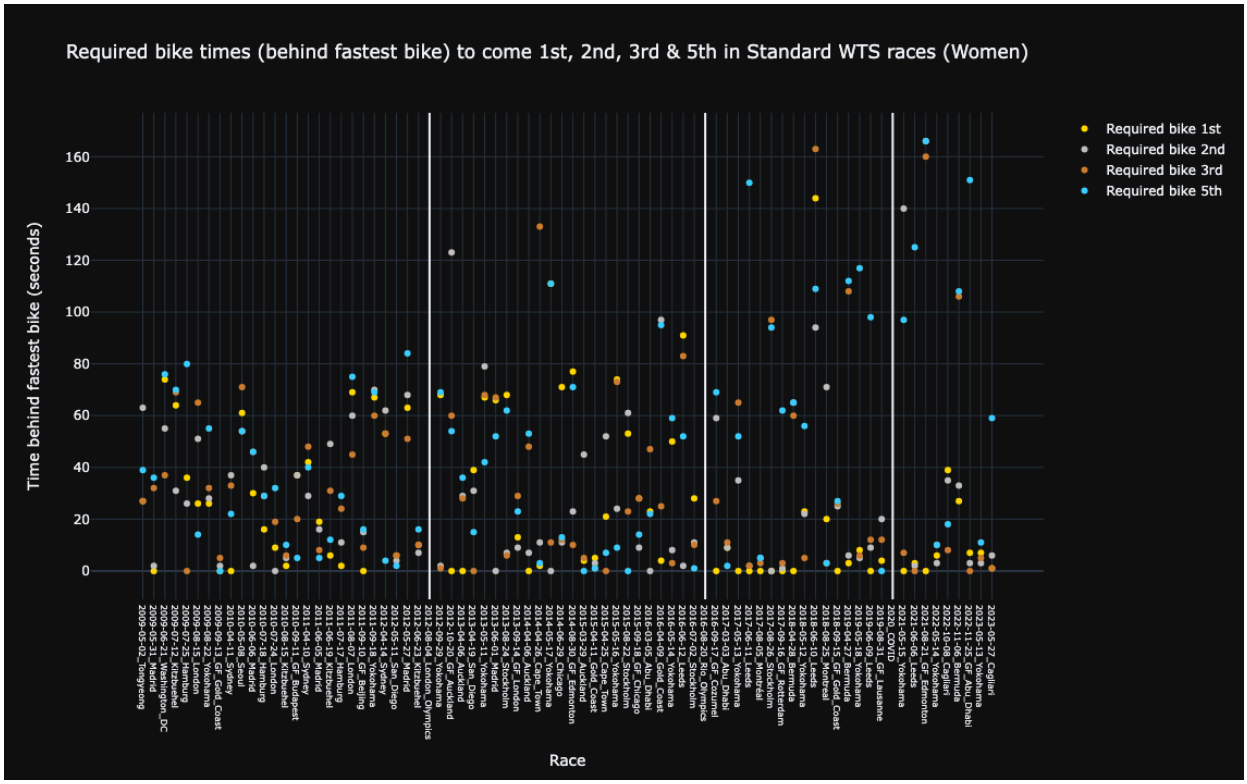
The graph below shows the raw swim times for all Standard distance female events since 2009. We do not pass any comment on this data, it is purely a vanity metric as water conditions, wetsuit-eligibility and many other factors are at play.



Bike

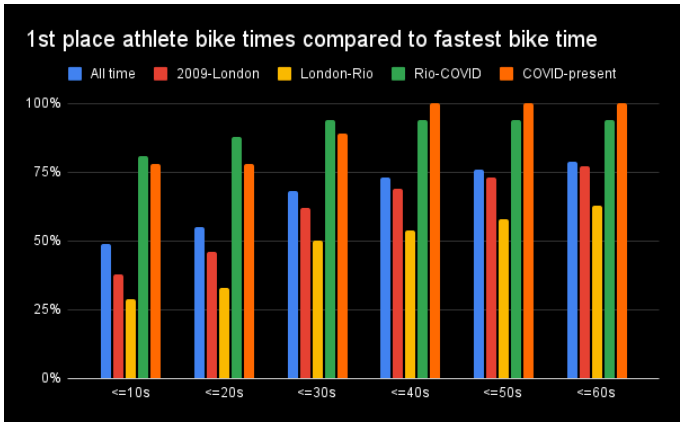
We only consider the required bike time here as the other metrics are virtually worthless, as explained in the introduction.

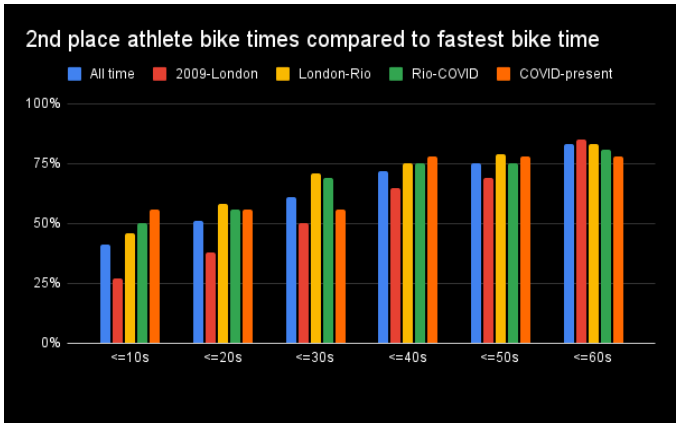
Below is the required bike time graph for 1st, 2nd, 3rd and 5th placed athletes. Recall this shows the difference between the athlete's bike leg time and fastest bike time of the day.

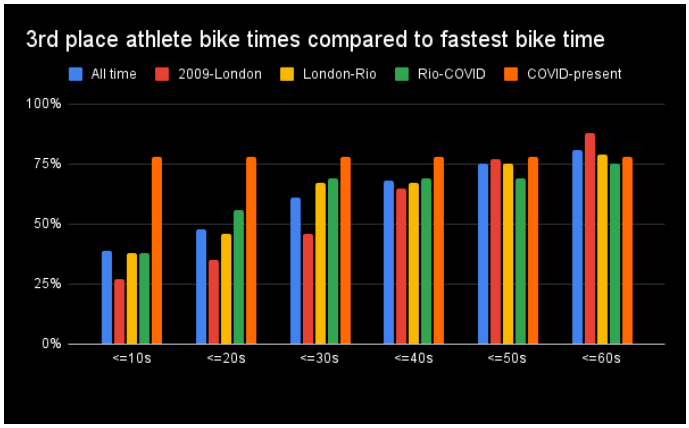


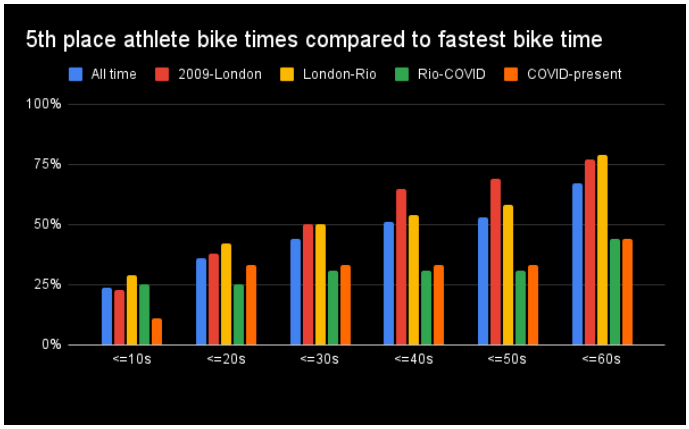
The general trend is for a higher concentration of data points in the bottom right of the graph. That is, in recent times (post COVID), the athletes on the podium are having bike splits that are close to the fastest bike splits in the race compared to previous Olympic cycles.

Again, we breakdown the data to understand it better. The plots below show the % of races where the 1st, 2nd, 3rd and 5th placed athletes come within 10, 20, …60 seconds of the fastest bike split in the race.


1st place athlete bike times compared to fastest bike time
All time
2009-London
London-Rio
Rio-COVID
COVID-present
100%
75%
50%
25%
0%
<=10s
<=20s
<=30s
<=40s
<=50s
<=60s


2nd place athlete bike times compared to fastest bike time
All time
2009-London
London-Rio
Rio-COVID
COVID-present
100%
75%
50%
25%
0%
<=10s
<=20s
<=30s
<=40s
<=50s
<=60s





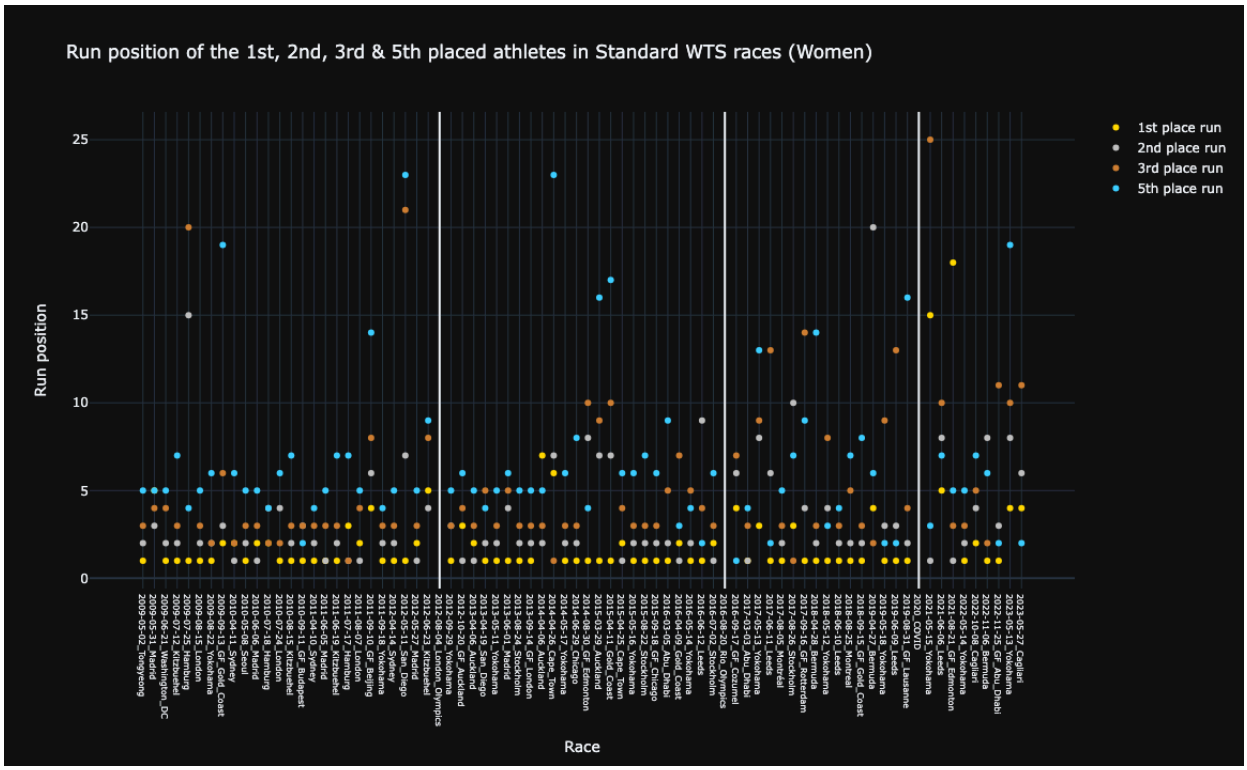
Some takeaways:

- Looking at race winners (top left graph), there is a large increase in the number of times they are biking within 10, 20 and 30 seconds of the fastest rider. For example, in the 2009-London and London-Rio cycles, only 38 and 29% of the time did the winner have a bike split within 10 seconds of the fastest bike split. However, this increased to 81 and 78% respectively in the subsequent two cycles.
- The likely reason for this is the breakaway being more successful and riding faster than the main group, and also containing the race winner.
- Interestingly, looking at 5th placed athletes, we see that there is a significant drop off in the Rio-COVID and COVID-present cycles - the opposite to what we observed above for 1st place athletes. In fact, in only 44% of the races in this time has the 5th placed athlete ridden within 60 seconds of the fastest bike split. This shows that even though others are biking considerably faster, some athletes are still able to run through to strong finishes.

Run

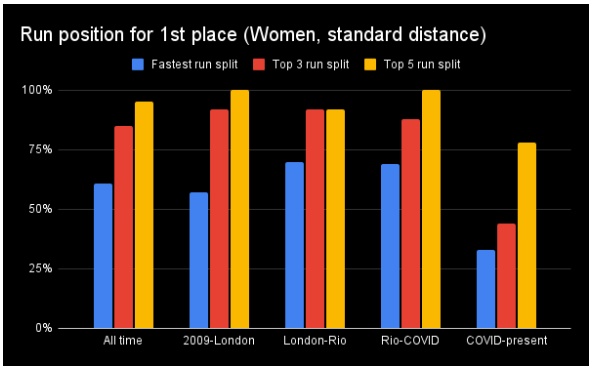
1️⃣ **Required run position**

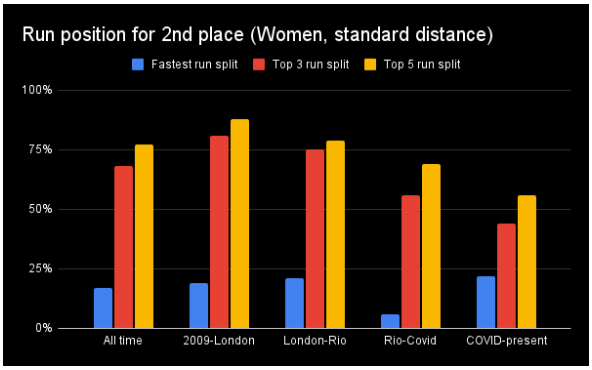
The graph below shows the required run position for the podium & 5th place athletes. Recall the required run position for an athlete is the position their run split ranks compared to all other athletes in the race.

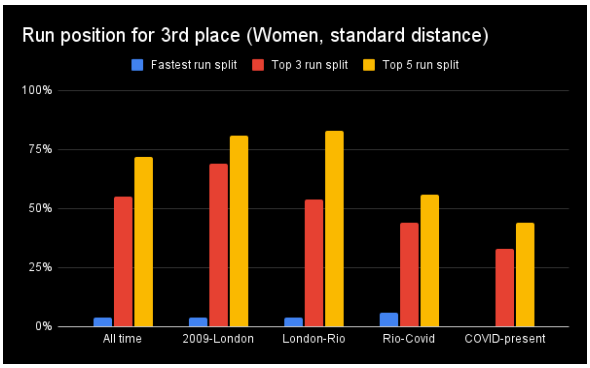


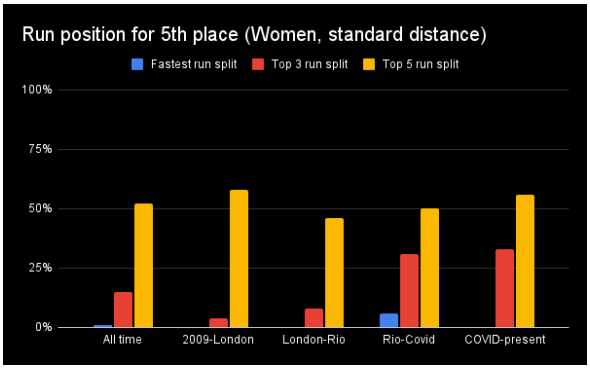
As a general trend we can see there are more podium athletes running outside the top 5 run splits in recent years - indicated by more data points in the top right of the graph. However, as before, to get a better understanding of these trends, we break the data down further.

The visualisations below show the % of races in each Olympic cycle where the 1st, 2nd, 3rd and 5th placed athletes have the fastest, a top-5 or a top-10 run split.







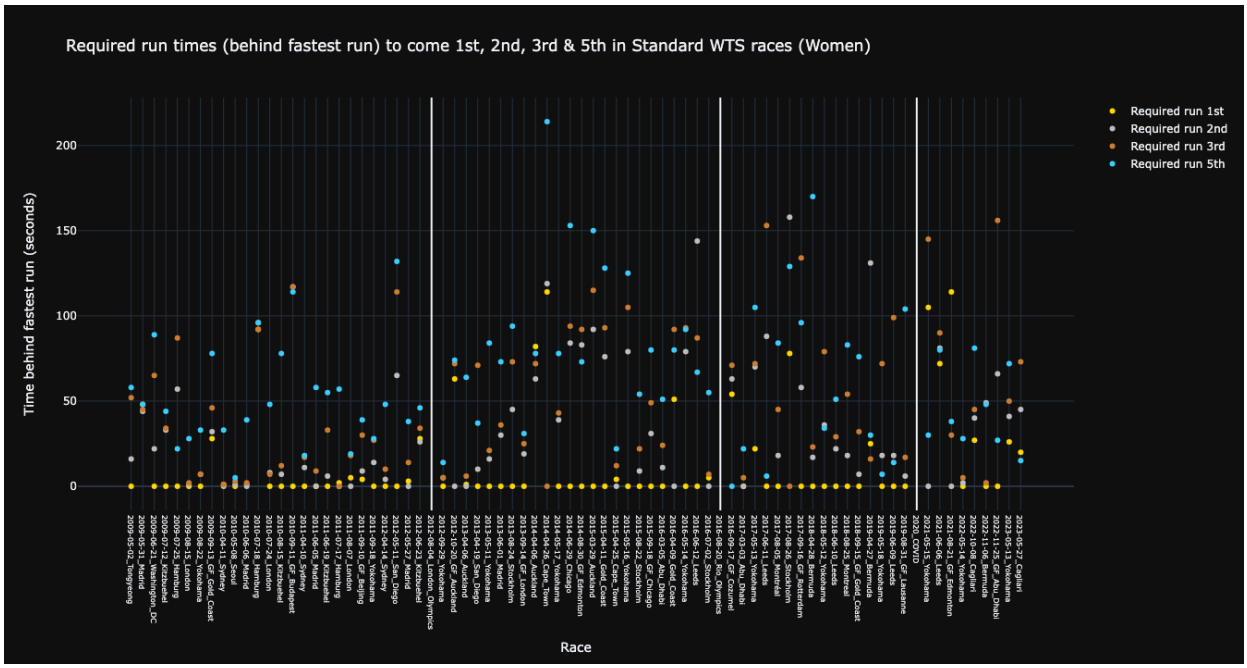


Some takeaways:

- In the post COVID era, 1st place athletes less regularly having the fastest (or top 3 and top 5) run splits. This can be seen in the graphs by shorter bars in the post COVID section compared to the previous time periods.
- For example; between London and COVID, 70% of the time, the winning athlete also had the fastest run split, compared to only 33% of the time since COVID. This hints at the trend of the breakaway succeeding. The winner is the fastest runner of the small breakaway group, who is not necessarily the fastest runner in the race.
- A similar trend can be seen for 2nd and 3rd placed athletes. In particular; these athletes no longer have to have top 3 and top 5 run splits to get on the podium.
- A slightly different pattern can be seen for the 5th placed athlete however. Namely, there is a significant increase in these athletes having a top 3 run split in the Rio-COVID and post COVID time periods. In particular; in the Rio-COVID and post COVID time periods, ~32% of the time the 5th placed athlete has a top 3 run split, compared to only ~6% before this. This indicates that you can still make the top 5 from the chase pack - with one of the fastest (top 3) runs of the day.

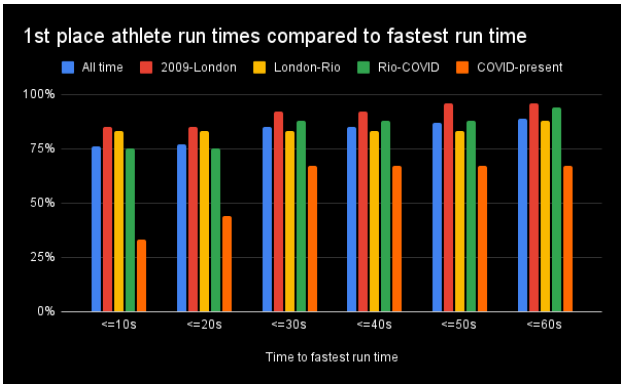
2️⃣ Required run time

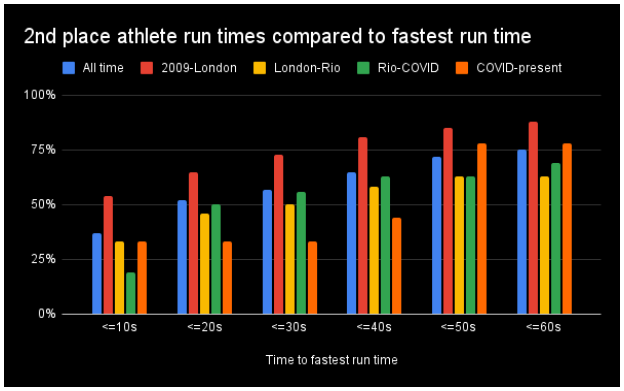
The women's required run time graph can be seen below. It shows the time differences between the podium & 5th placed athletes compared to the fastest run of the day.

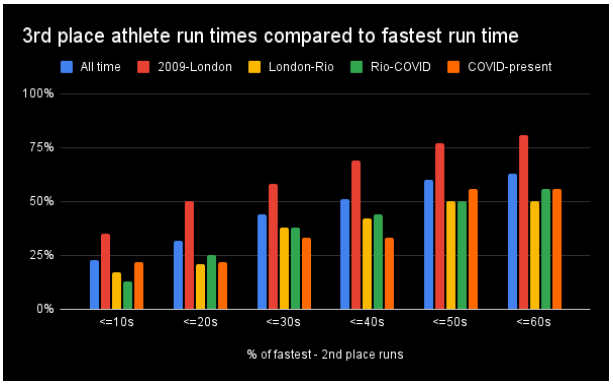


From the graph above we can see there is a slight “upward” trend in recent years. In particular, podium athletes appear to be running slower compared to the fastest run splits, however It is hard to interpret precise trends from the graph above.

As before, we break the data down further. In particular, the graphs below provide a breakdown, across time periods, of the % of runs for podium athletes that are within certain time intervals (≤10 seconds, ≤ 20 seconds etc) of the fastest run of the day. Of course, sometimes, the winner also has the fastest run of the day, if this occurs, the data is captured (as expected) in the <= 10 second bucket.





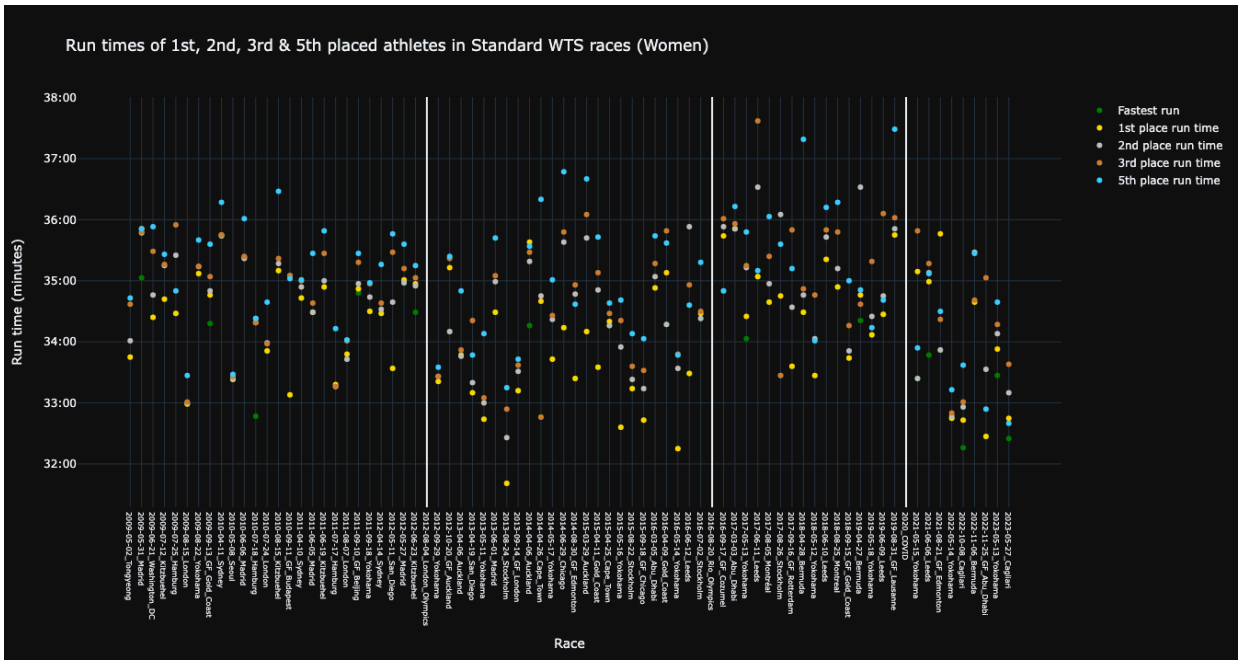


Some takeaways:

- For race winners, there is a clear and interesting trend. The % of runs within a certain time is always significantly lower since COVID (the orange bar is always lower than the others). This means the fastest runner is often running considerably faster than the winner - again hinting at the trend for the breakaway succeeding.
- This trend is also visible for 2nd and 3rd place athletes, however not as apparent compared to race winners.

3️⃣ Raw run times

Recall that we should not put too much emphasis on raw run times as course lengths, terrains and conditions vary. However we can pick out some general trends over time - to give an indication of how fast the front of the race is moving on the run.



Note: fastest runs are represented by green dots except when the fastest run is set by a podium athlete, here the podium dot (gold, silver, bronze) takes precedence.

The London-Rio time period produced some fast runs (we all know who produced them), however, it is interesting to note that since COVID, there has been a significant speed-up in run times, compared to the Rio-COVID period.

This data would become more valuable if it could be matched with accurate course lengths. A fair comparison could then be made between races. World Triathlon and Federation Governing bodies are likely to hold this data, however it is not publicly available.

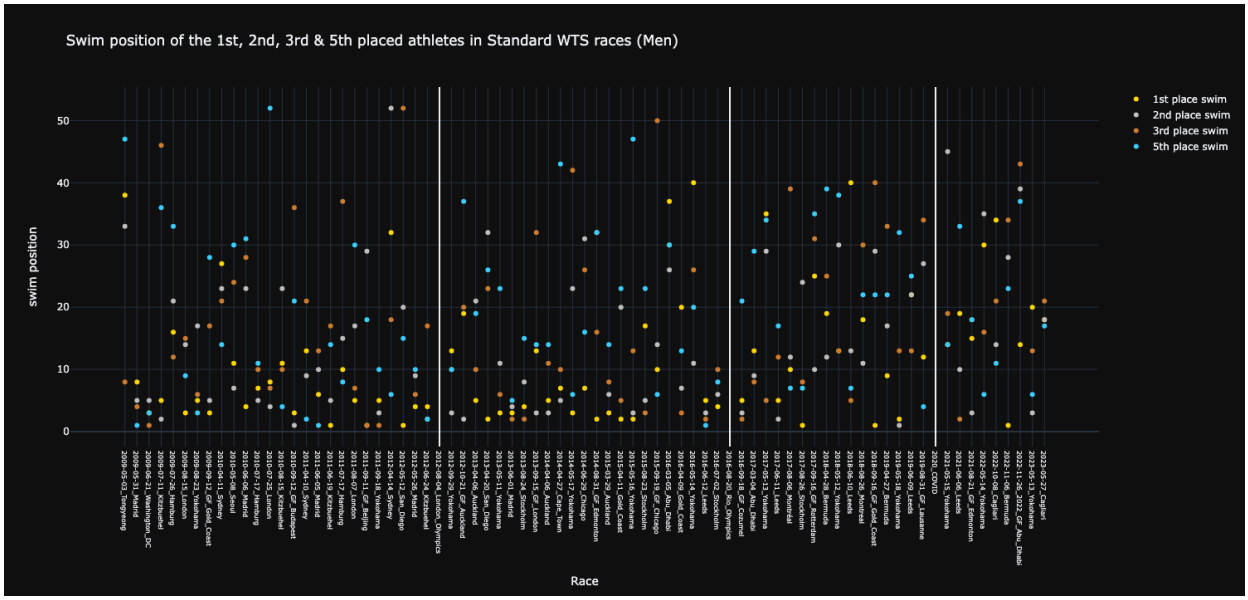
Men's racing

Swim

Note: Cape Town 2015 was an Olympic distance race, with a shortened (750m) swim, we do not include it here.

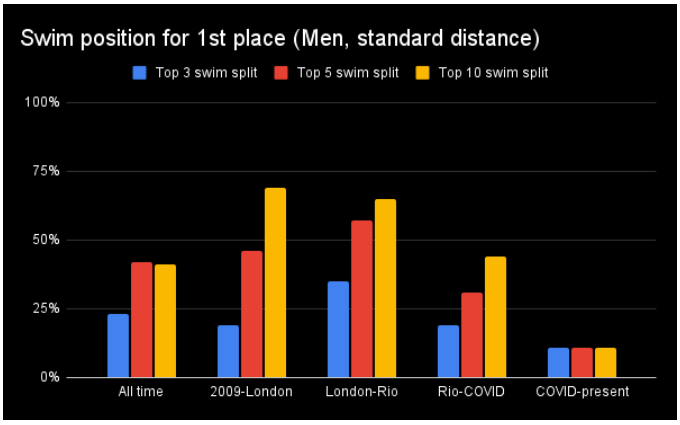
1️⃣ Required swim position

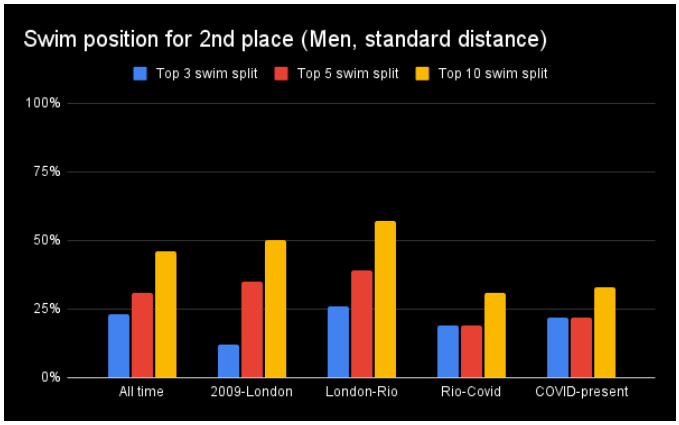
The graph below shows the swim position (position coming out of the water) of the podium and 5th placed athletes. The white lines demarcate Olympic cycles.

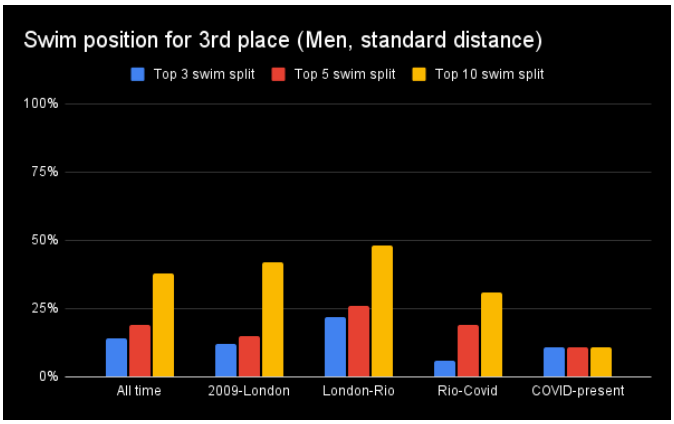


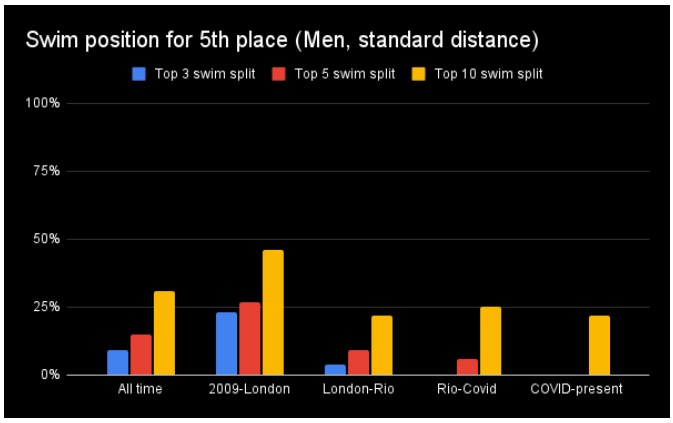
Unlike in the women's swim graph there are few obvious trends or correlations visible from the graph above, the data appears fairly uniform and homogeneous.

As before, we break the data down and plot the % of podium and 5th place athletes that achieved top-3, 5 and 10 swims.


Swim position for 1st place (Men, standard distance)
Top 3 swim split
Top 5 swim split
Top 10 swim split
100%
75%
50%
25%
0%
All time
2009-London
London-Rio
Rio-COVID
COVID-present


Swim position for 2nd place (Men, standard distance)
Top 3 swim split
Top 5 swim split
Top 10 swim split
100%
75%
50%
25%
0%
All time
2009-London
London-Rio
Rio-Covid
COVID-present


Swim position for 3rd place (Men, standard distance)
Top 3 swim split
Top 5 swim split
Top 10 swim split
100%
75%
50%
25%
0%
All time
2009-London
London-Rio
Rio-Covid
COVID-present

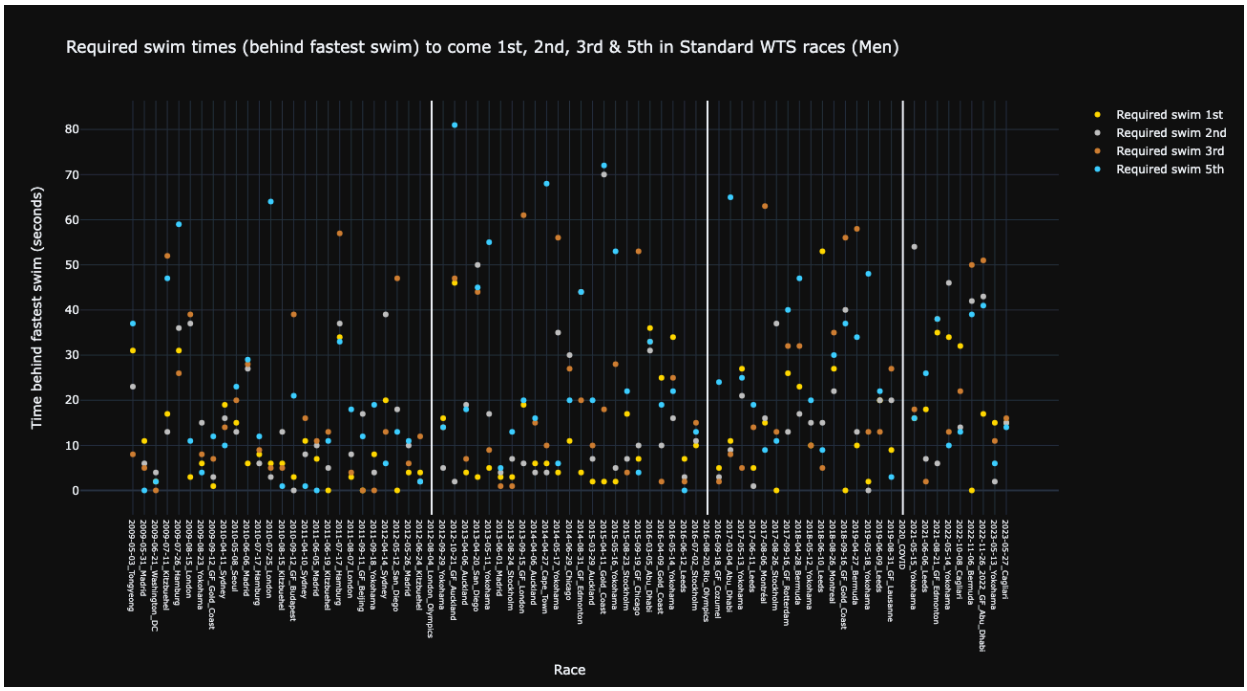

Swim position for 5th place (Men, standard distance)
Top 3 swim split
Top 5 swim split
Top 10 swim split
100%
75%
50%
25%
0%
All time
2009-London
London-Rio
Rio-Covid
COVID-present

Some takeaways:

- All the graphs have a “decreasing” trend over time. There is generally little difference in the 2009-London and London-Rio data, however the most recent two cycles see a drop off.
- For example, in the London-Rio cycle, race winners were exiting the swim in the top 10 in 65% of races. However, in the most recent cycle (since COVID), this is down to 11%.
- This is opposite to the trend in women's racing, meaning that currently athletes can still produce very strong results even when they are not right at the front of the swim.

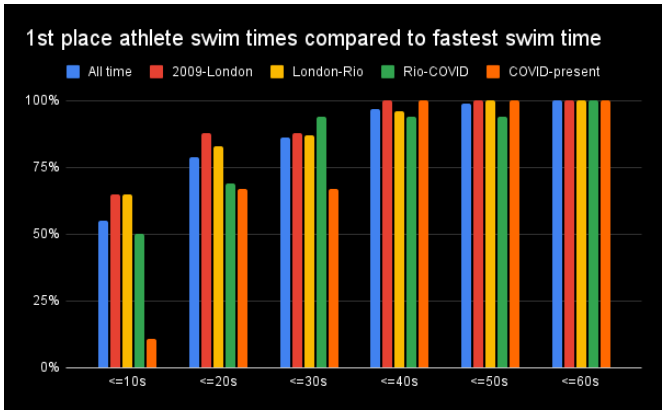
2 Required swim time

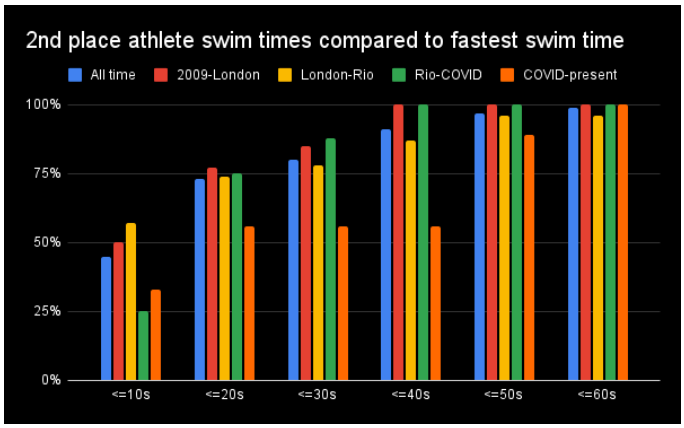
The graph below shows the required swim times for 1st, 2nd, 3rd and 5th placed athletes.

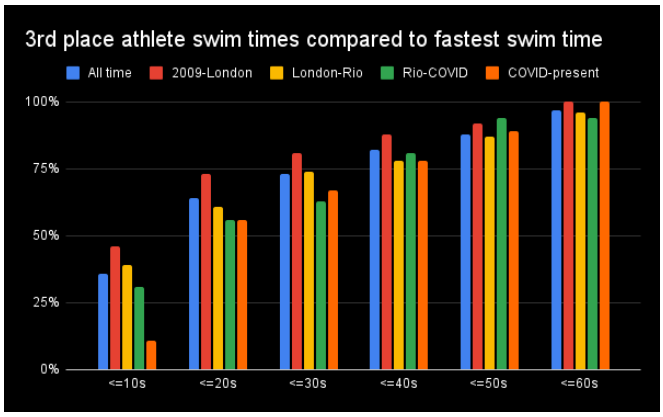


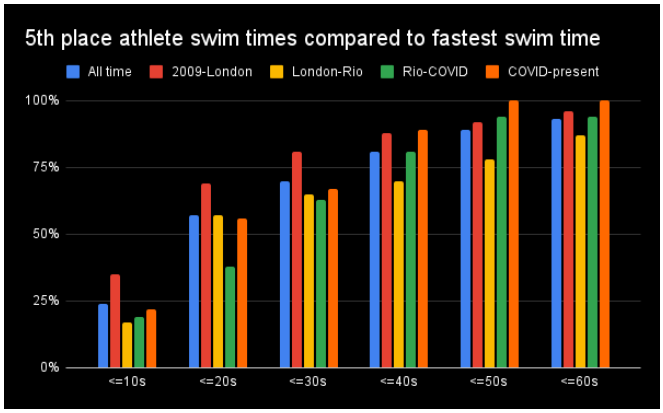
Having just seen the trend in the required swim positions it is possible to pick out a similar trend in the above graph (but likely only because our eye is drawn to it). In particular there is a lower density of data points in the bottom right of the graph - meaning the athletes finishing at the front of the race are not swimming as close to the front of the race as in previous Olympic cycles.

As usual we break the data down further below.


1st place athlete swim times compared to fastest swim time
All time
2009-London
London-Rio
Rio-COVID
COVID-present
100%
75%
50%
25%
0%
<=10s
<=20s
<=30s
<=40s
<=50s
<=60s


2nd place athlete swim times compared to fastest swim time
All time
2009-London
London-Rio
Rio-COVID
COVID-present
100%
75%
50%
25%
0%
<=10s
<=20s
<=30s
<=40s
<=50s
<=60s


3rd place athlete swim times compared to fastest swim time
All time
2009-London
London-Rio
Rio-COVID
COVID-present
100%
75%
50%
25%
0%
<=10s
<=20s
<=30s
<=40s
<=50s
<=60s

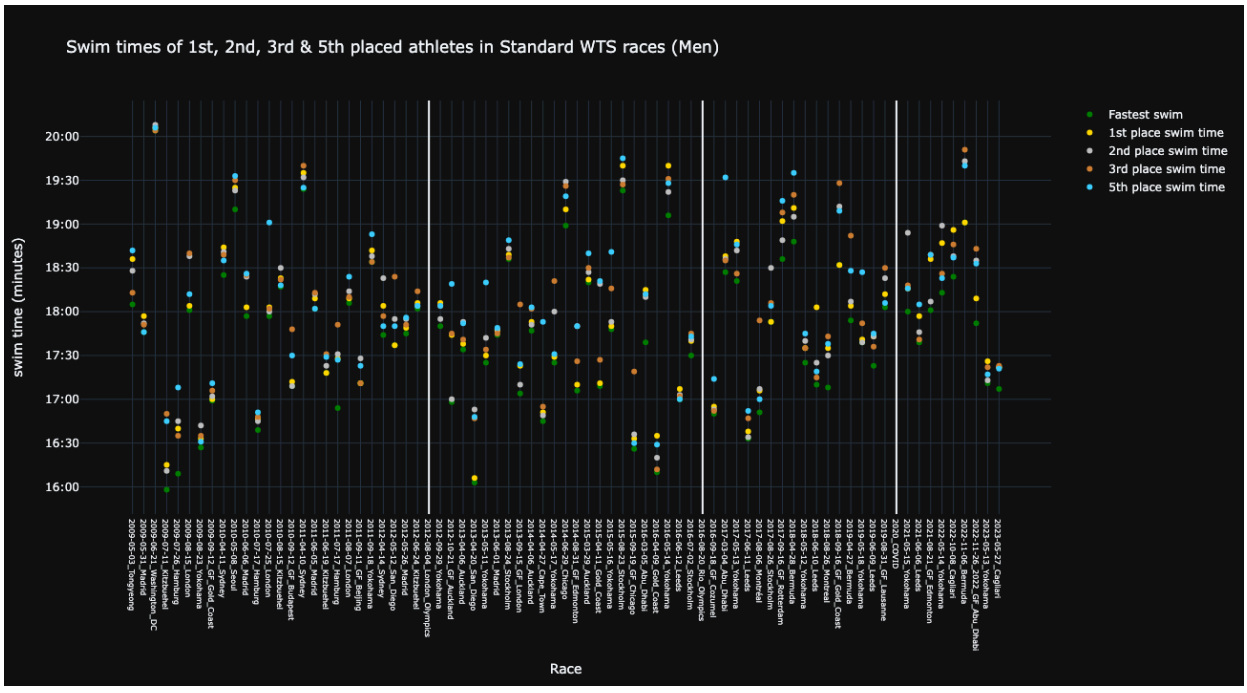

5th place athlete swim times compared to fastest swim time
All time
2009-London
London-Rio
Rio-COVID
COVID-present
100%
75%
50%
25%
0%
<=10s
<=20s
<=30s
<=40s
<=50s
<=60s

Some takeaways:

- The outlier in the data is the relatively small (11%) number of races since COVID in which the winner has swum within 10 seconds of the fastest swimmer. This is compared to 55% over all races.
- This may partially be due to the relatively small number of races in this cycle (only 9), but also adding evidence to the idea that a lightning fast swim (within 10 seconds of the front) is currently not vital to victory. This trend is also observed for 2nd and 3rd placed athletes.
- In fact looking at both the 1st and 2nd placed athletes we see that their % in the post COVID era is lagging behind previous eras up to 30 and 40 seconds behind the fastest swimmer. Showing that athletes are now consistently able to recover after losing time in the water.
- This backs up the data from above (required swim position) where we saw in recent times race winners were only in the top 10 out of the water 11% of the time.

3️⃣ Raw swim time

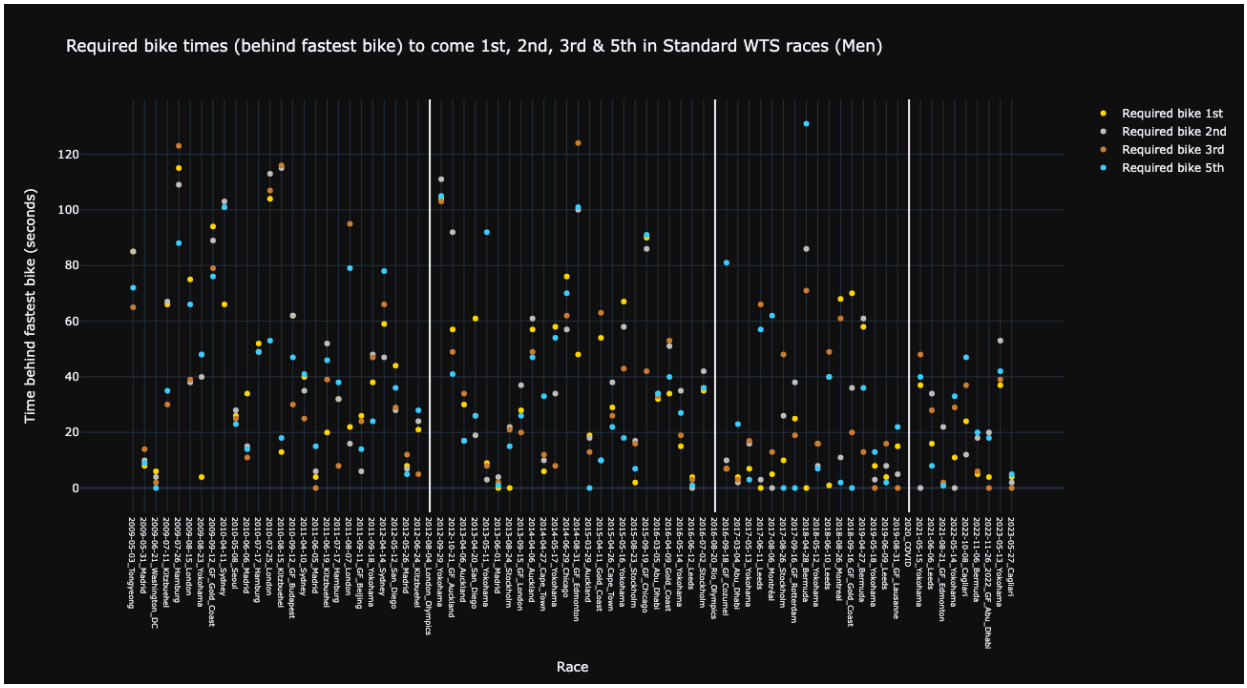
The graph below shows the raw swim times. We do not pass any comment on this data, it is purely a vanity metric as water conditions, wetsuit-eligibility and many other factors are at play.



Bike

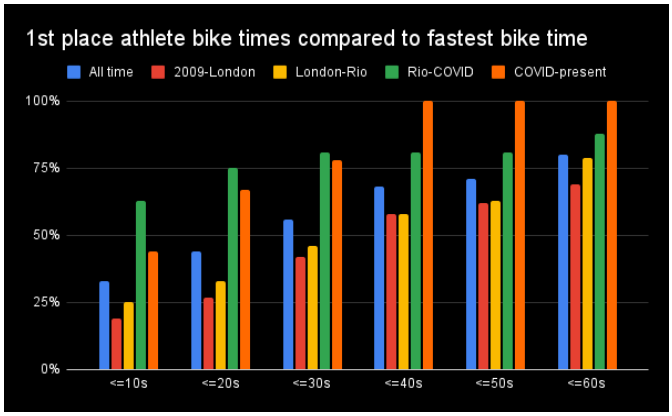
We only consider the required bike time (time behind the fastest bike leg) here, and not the other metrics (required position, and raw time).

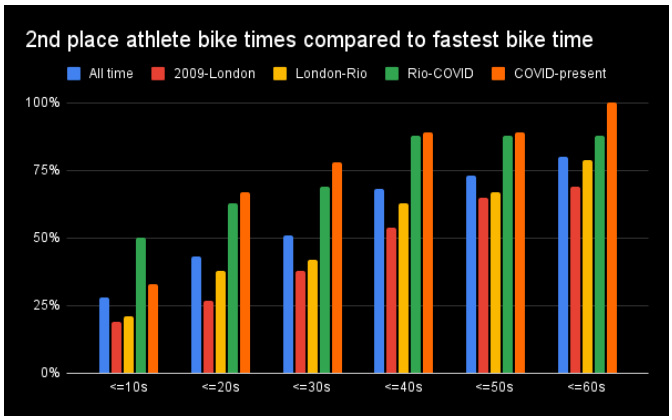
Below is the required bike time graph for 1st, 2nd, 3rd and 5th placed athletes. Recall this shows the difference between the athlete's bike leg time and fastest bike time of the day.

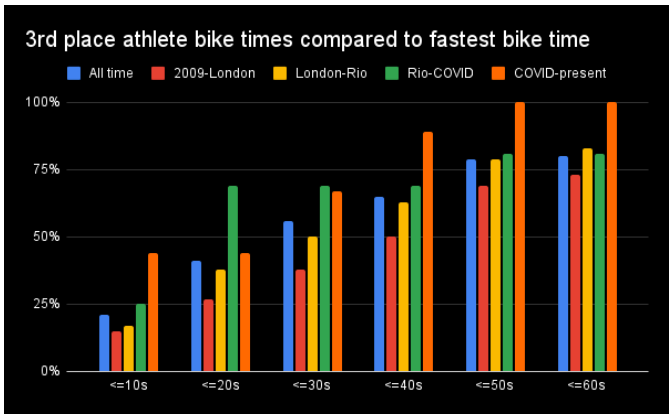


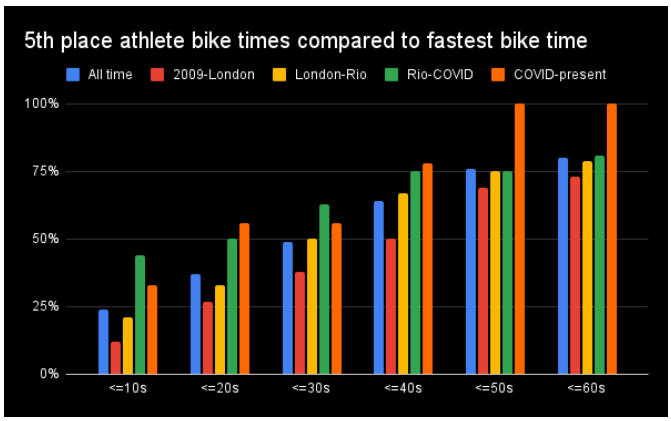
There is a slight trend for a higher concentration of data points in the bottom right of the graph. That is, in recent times (post COVID), the athletes on the podium are having bike splits that are close to the fastest bike splits in the race.

Again, we breakdown the data to understand it better. The graphs below show the % of races in which the 1st, 2nd, 3rd and 5th placed athletes have bike splits within 10, 20, …, 60 seconds of the fastest bike split of the day.


1st place athlete bike times compared to fastest bike time
All time
2009-London
London-Rio
Rio-COVID
COVID-present
100%
75%
50%
25%
0%
<=10s
<=20s
<=30s
<=40s
<=50s
<=60s


2nd place athlete bike times compared to fastest bike time
All time
2009-London
London-Rio
Rio-COVID
COVID-present
100%
75%
50%
25%
0%
<=10s
<=20s
<=30s
<=40s
<=50s
<=60s


3rd place athlete bike times compared to fastest bike time
All time
2009-London
London-Rio
Rio-COVID
COVID-present
100%
75%
50%
25%
0%
<=10s
<=20s
<=30s
<=40s
<=50s
<=60s


5th place athlete bike times compared to fastest bike time
All time
2009-London
London-Rio
Rio-COVID
COVID-present
100%
75%
50%
25%
0%
<=10s
<=20s
<=30s
<=40s
<=50s
<=60s

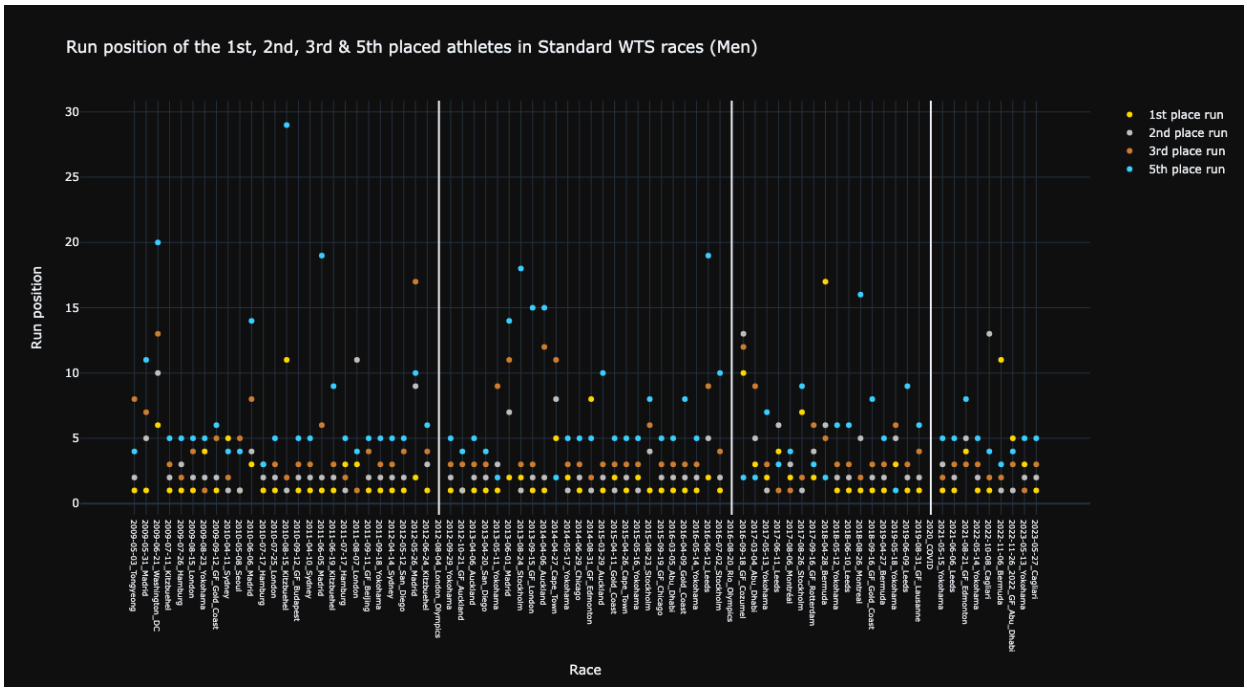
Some takeaways:

- In all the above graphs, there is a step change (increase) from the London-Rio cycle and the Rio-COVID cycle at almost every time interval behind the fastest bike. For example, race winners had a bike split within 10 seconds of the fastest split 25% of the time between London and Rio, but this rose sharply to 63% of races between Rio and COVID.
- Given that during this time we also saw a decrease in the % of race winners swimming in the top-10, we could conclude that this shows the front of the race (out of the swim) is being caught from behind. However, a more detailed analysis would be required to fully determine this.

Run

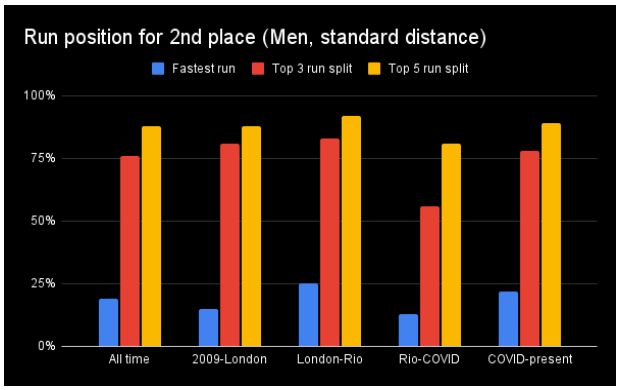
1️⃣ **Required run position**

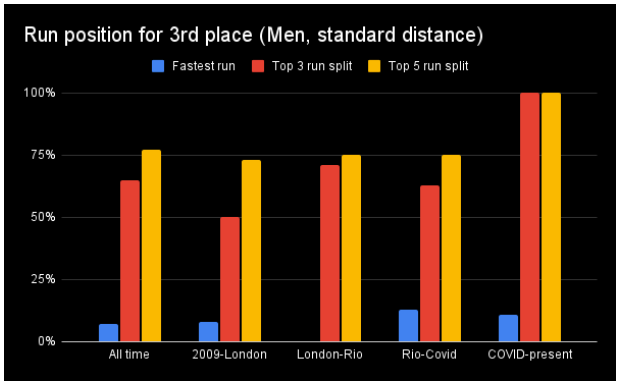
The graph below shows the required run position (for the podium & 5th place athletes) for Olympic distance since 2009. Recall the required run position for an athlete is the position their run split ranks compared to all other athletes in the race.

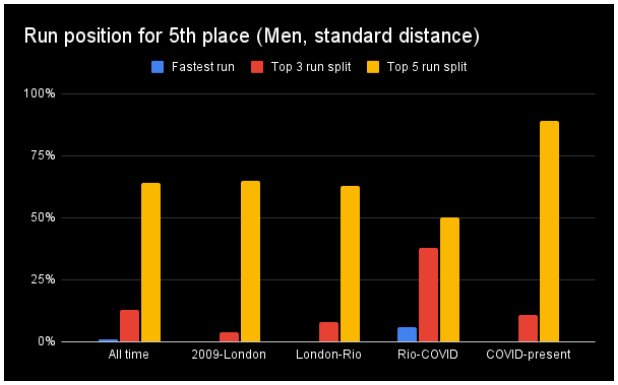


Compared to the equivalent swim graph, the run graph is much more uniform. In particular, the general trend is that the athletes on the podium hold the top run splits in the race. However, consider the data over time, again the different Olympic cycles look very uniform with no clear trends apparent from manual observation.

The graphs below visualise the data from above - showing the % of races where the podium and 5th placed athletes have the fastest, top-3 and top-5 runs.





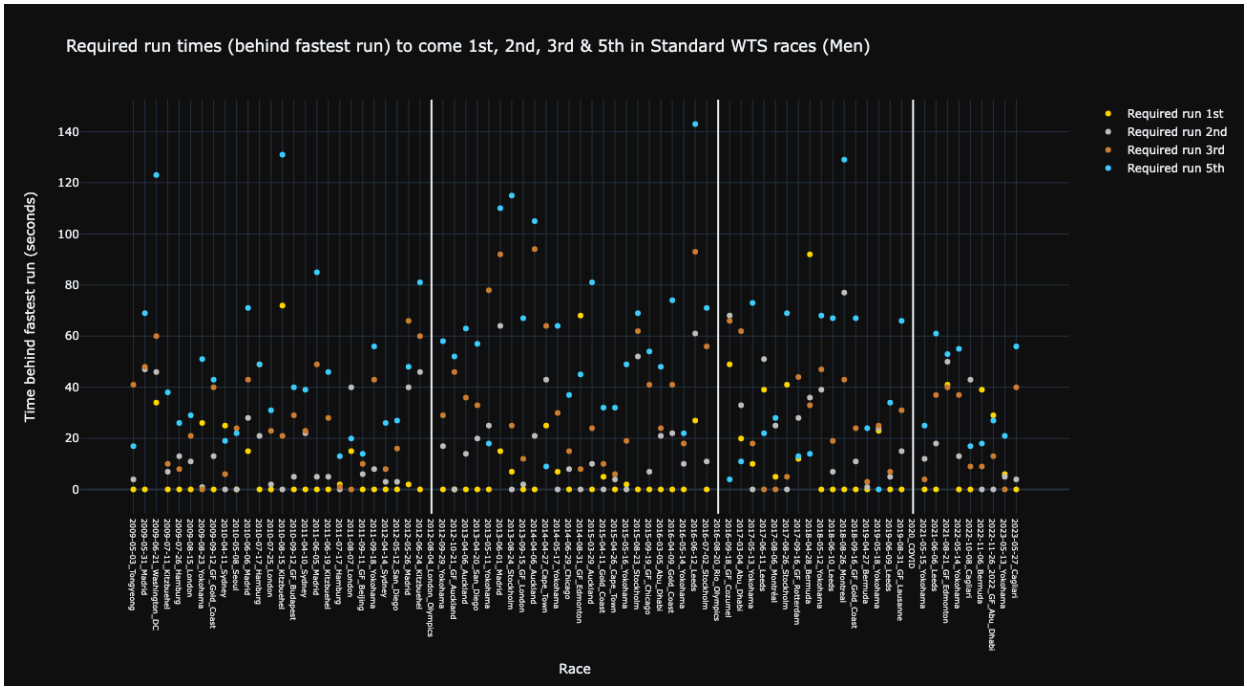


Some takeaways:

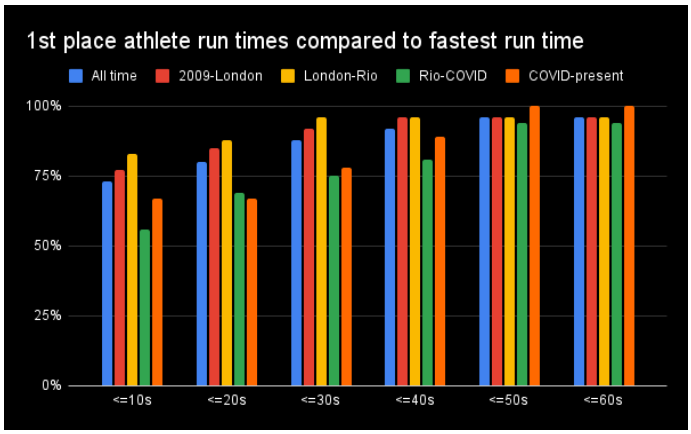
- Interestingly, this shows that we were right in that initial graph looks very uniform. Even with the data broken down in this way there are few trends of correlations - there is little variation across the different Olympic cycles.
- To win a race, an athlete needs to have (~75% of the time) a top-3 run split and more often than not (>50% of races) the winning athlete has had the fastest run split.
- The same can be said for podium athletes, in general (as somewhat expected) they need to consistently have top-3 and top-5 run splits on the day.

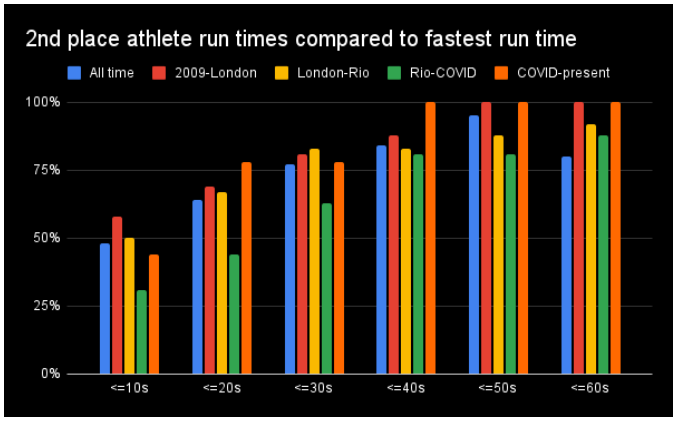
2️⃣ **Required run time**

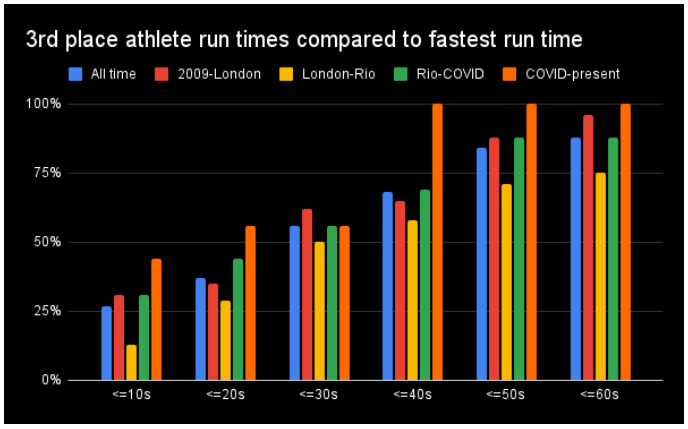
Below is the men's required run time graph. It shows the time differences between the podium & 5th placed athletes compared to the fastest run of the day.

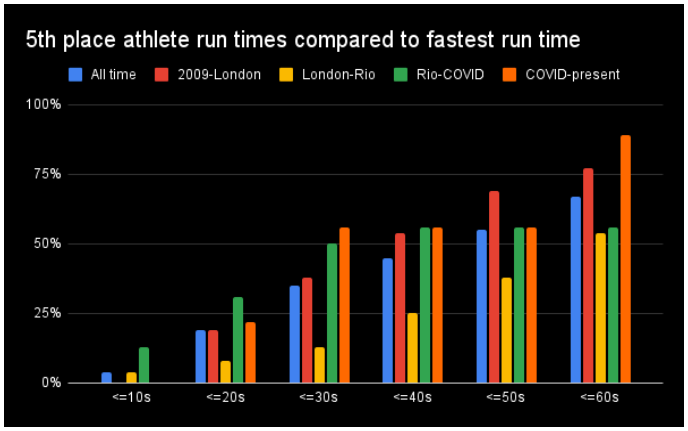


As above (required position), the data is quite uniform with no obvious visible trends. Below we break the data down further and plot the % of races in different cycles where the podium and 5th placed athletes are within 10, 20, …, 60 seconds of the fastest run of the day.


1st place athlete run times compared to fastest run time
All time
2009-London
London-Rio
Rio-COVID
COVID-present
100%
75%
50%
25%
0%
<=10s
<=20s
<=30s
<=40s
<=50s
<=60s


2nd place athlete run times compared to fastest run time
All time
2009-London
London-Rio
Rio-COVID
COVID-present
100%
75%
50%
25%
0%
<=10s
<=20s
<=30s
<=40s
<=50s
<=60s



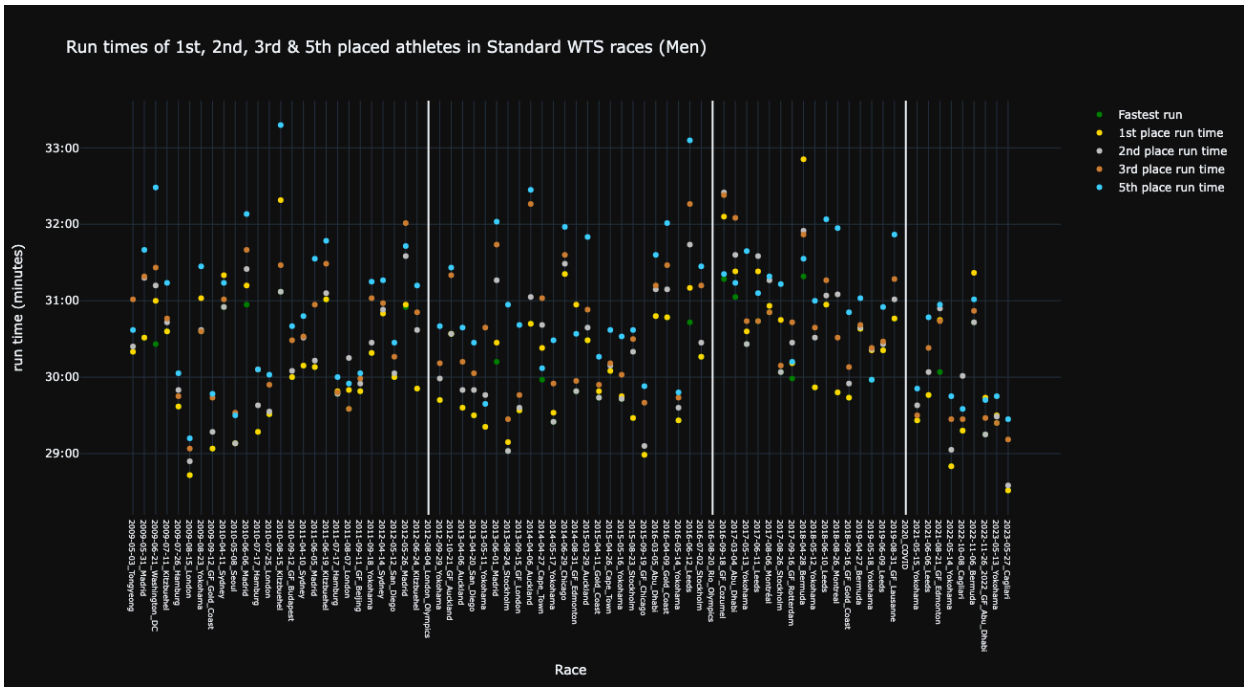


Some takeaways:

- Again there is few trends of correlations of note.
- Race winners are more often than not running within 10 seconds of the fastest run time (of course in some cases they are running the fastest run time).
- And to come 2nd, athletes are ~50% of the time having to run within 10 seconds of the fastest run.

3️⃣ **Raw run time**

The graph below shows the raw run times of all podium and 5th place runs. As before we do not place much emphasis on this data due to varying conditions, terrains and lengths of courses.



The data follows a similar trend to the women's data however, with the Rio-COVID cycle seeing a drop off in run times (i.e. slower times) and then a resurgence in speedy running since. Likely this is due to the athletes, however it is interesting the pattern is similar to the women's data, meaning potentially the courses in the Rio-COVID era were just slightly longer/slower.

Well done on reading to the end, drop me a line if you want to discuss anything. Hope this was somewhat interesting. davetbutler1@gmail.com