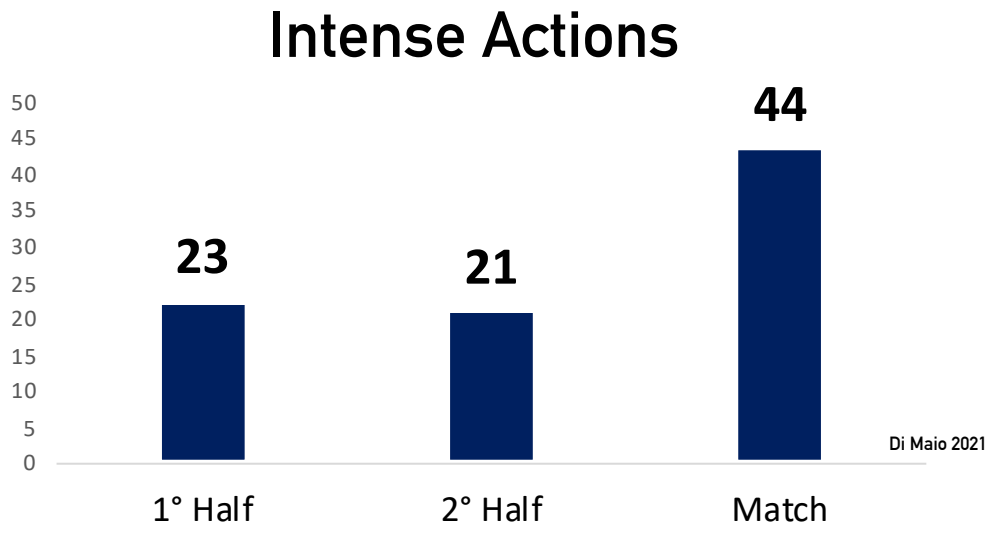
Rugby Sevens

Study of the performance model

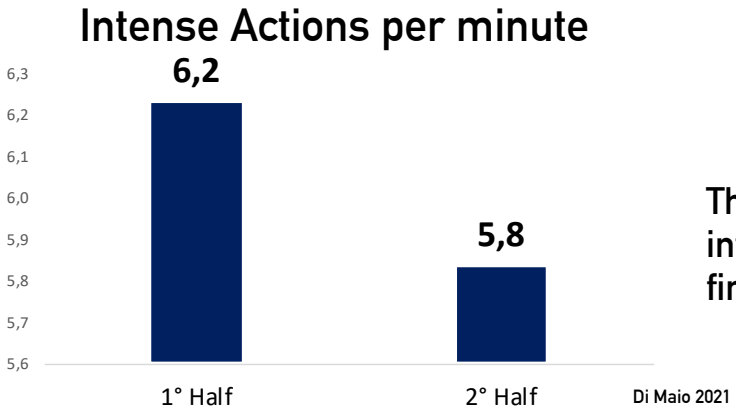
Index

INTENSE ACTIONS

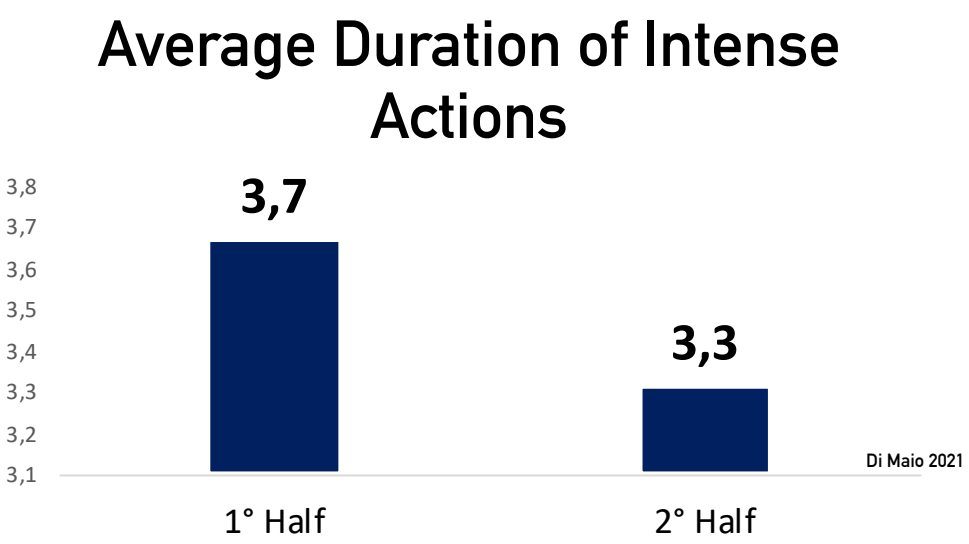
Intense are those actions that lead to exceeding the threshold of 20 Watts of Metabolic Power.
A further threshold of 35Watts has also been set to highlight the most intense actions.
Given that the metabolic power is influenced by both speed and acceleration, this parameter is particularly important by integrating the two values.



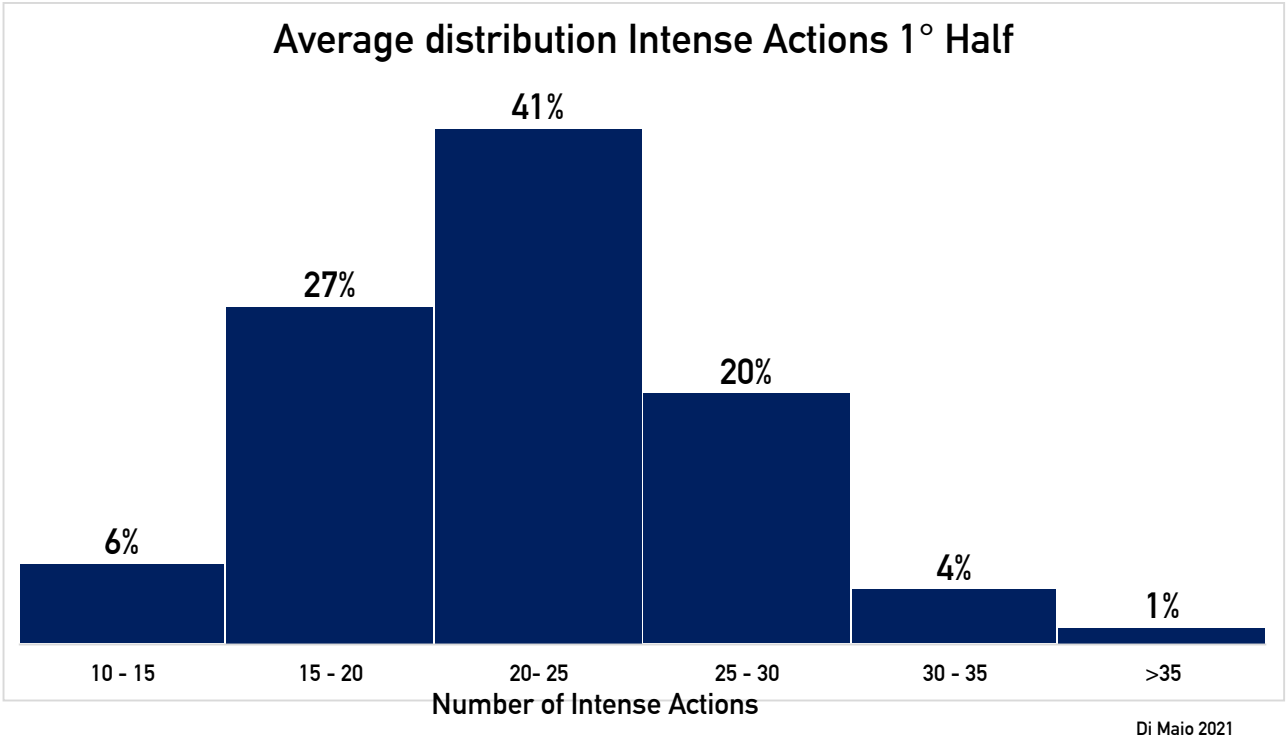
During a match a player on average performs 44 intense actions (if he is used for the whole game). Between the first and second half there is a 10% difference in favor of the first part of the match.

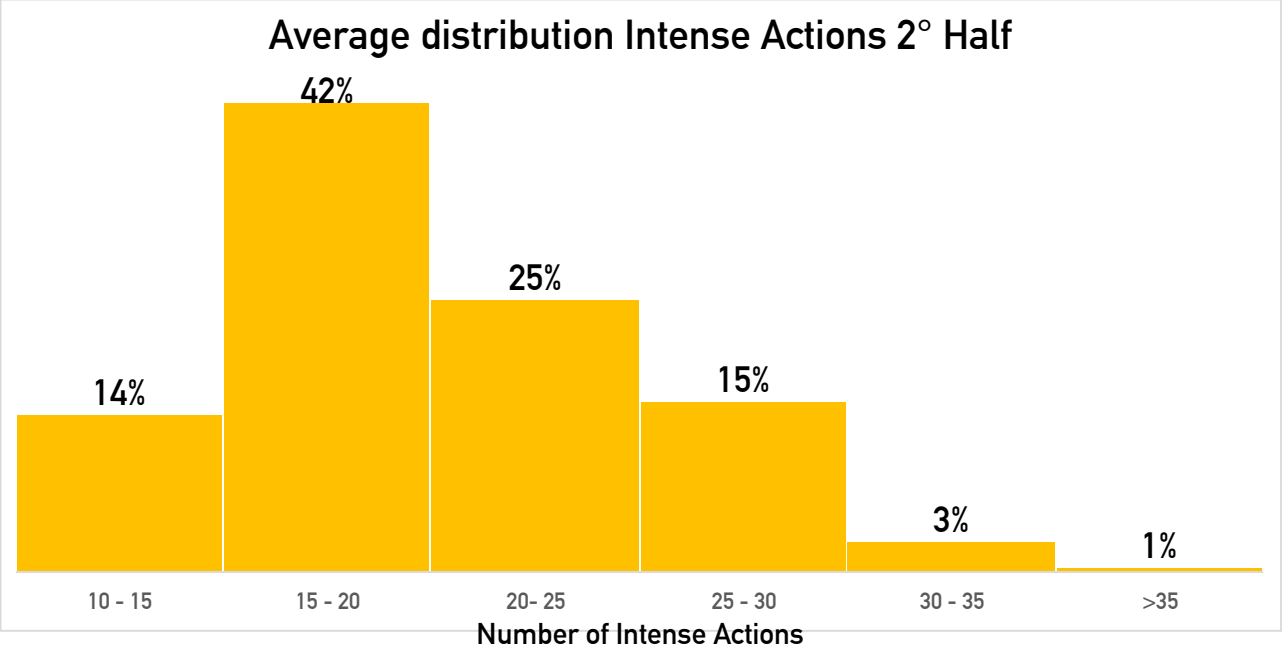


This translates into a density of about 6 intense actions per minute for both the first and second half.

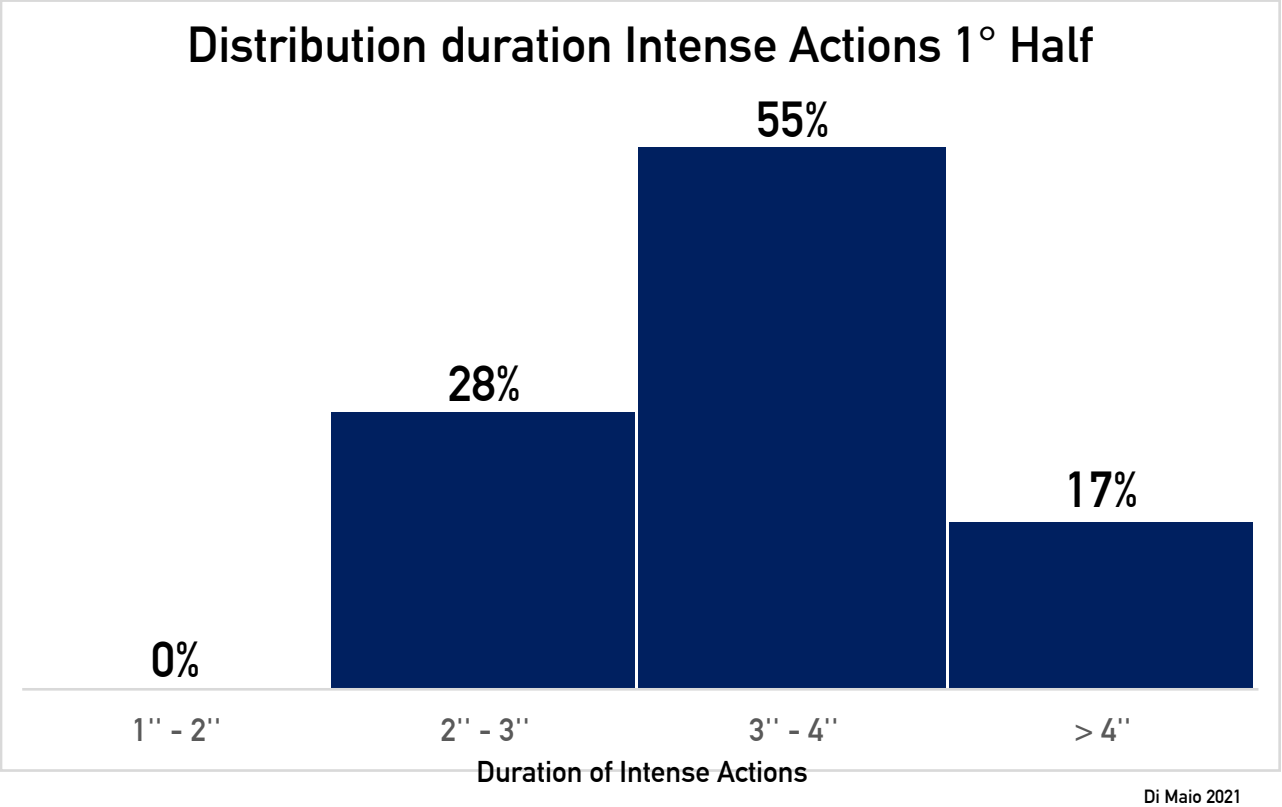


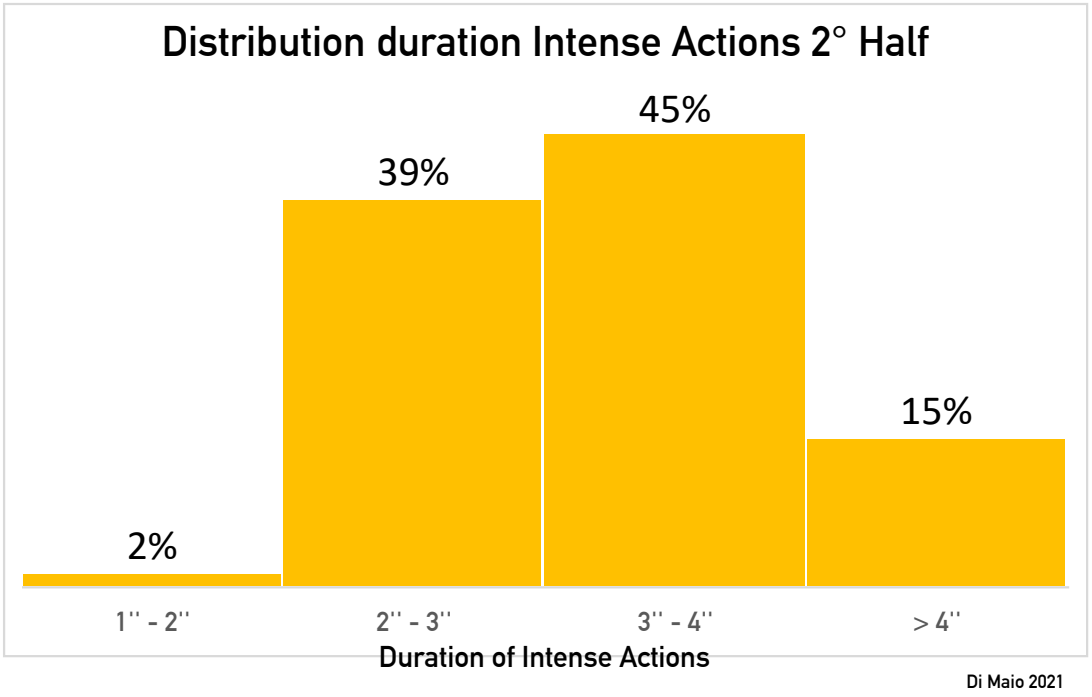
The average duration of these actions is respectively 3.7 and 3.3 seconds, whether they depend more on the acceleration aspect than on high speed.
As regards the distribution of the number of intense actions per competition time, we note that in the second half a smaller number of actions are more represented. In fact, the group that includes 10 to 20 intense actions alone represents 56% of all recordings performed while in the first half only 33%.



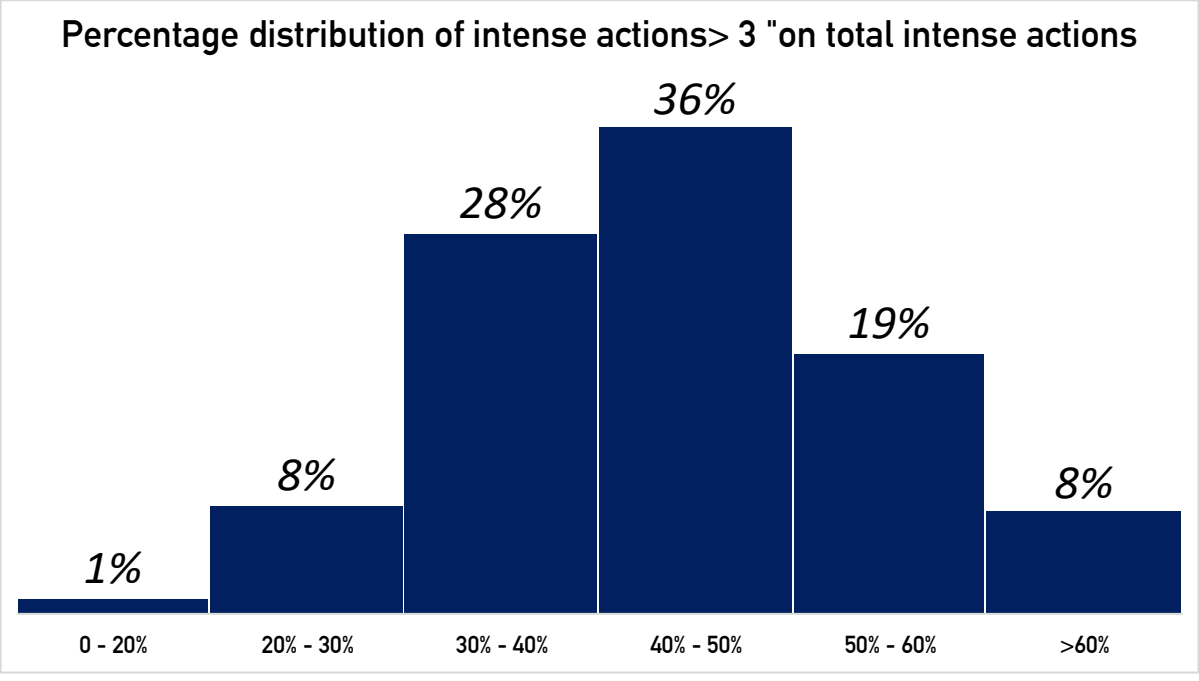


Also from the point of view of the average duration between the first and second time there is a difference that amplifies the volumetric data. In fact, the most popular actions (less than 3 ") represent 28% in the first part of the match while 41% in the second.

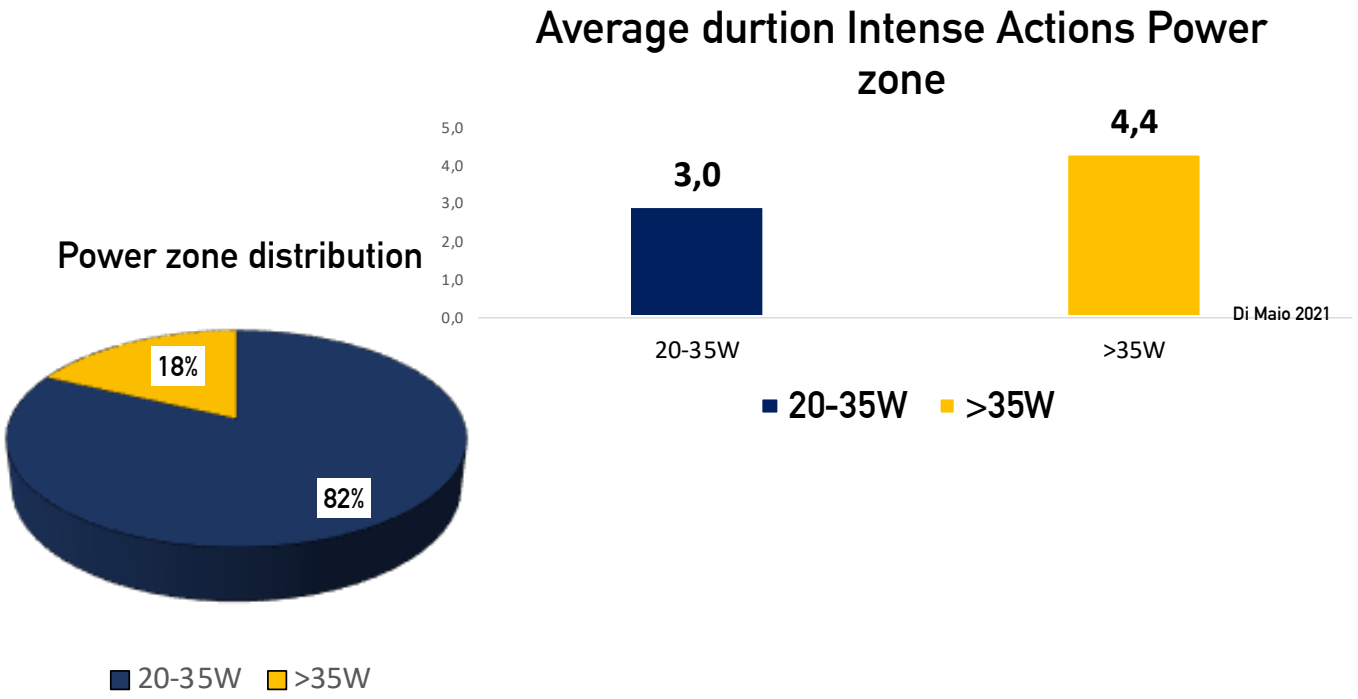




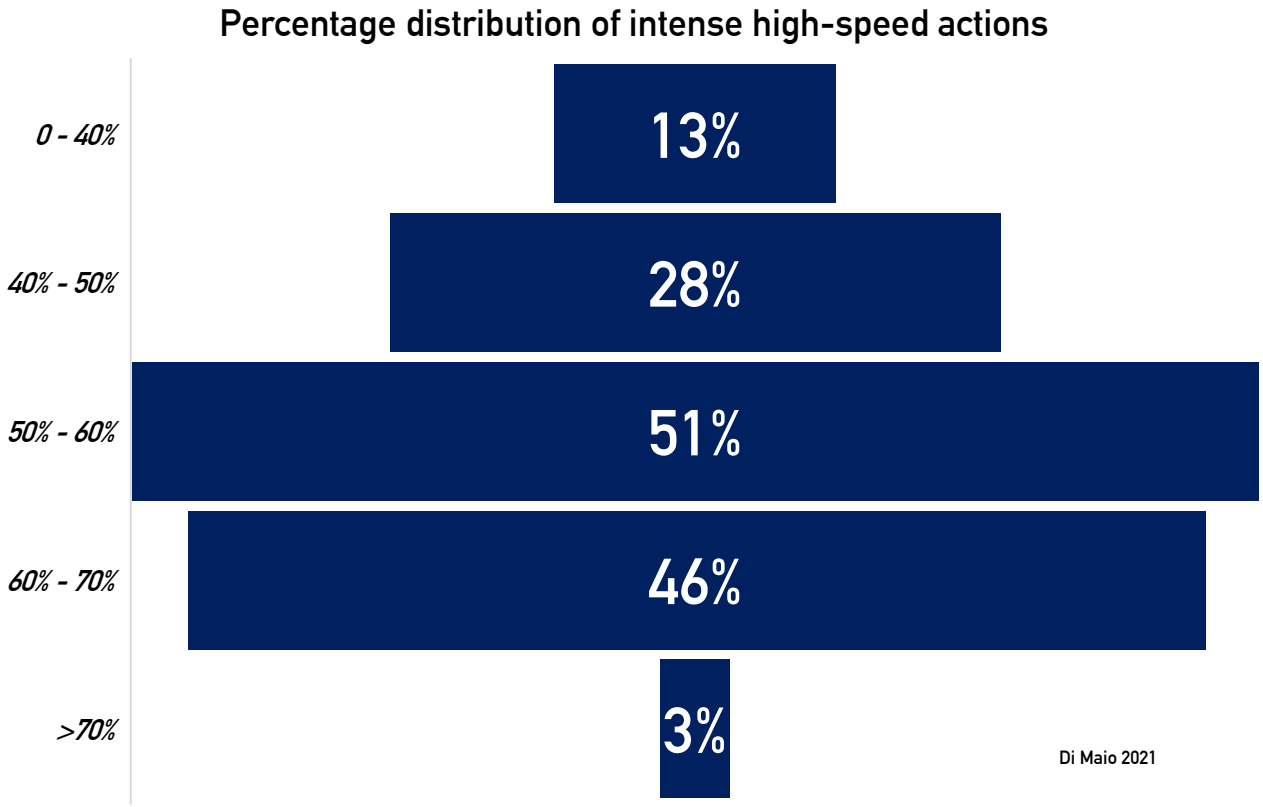
In general, the average duration (greater than 3 ") of the actions represents 69% of the total match. The percentage distribution, which takes into consideration not the average of the general duration of intense actions in the game but the individual percentage of each individual player, shows us a slightly different situation (over 3 '' is 63%). Once again it demonstrates that situation and individuality offer us different contexts within the performance model.



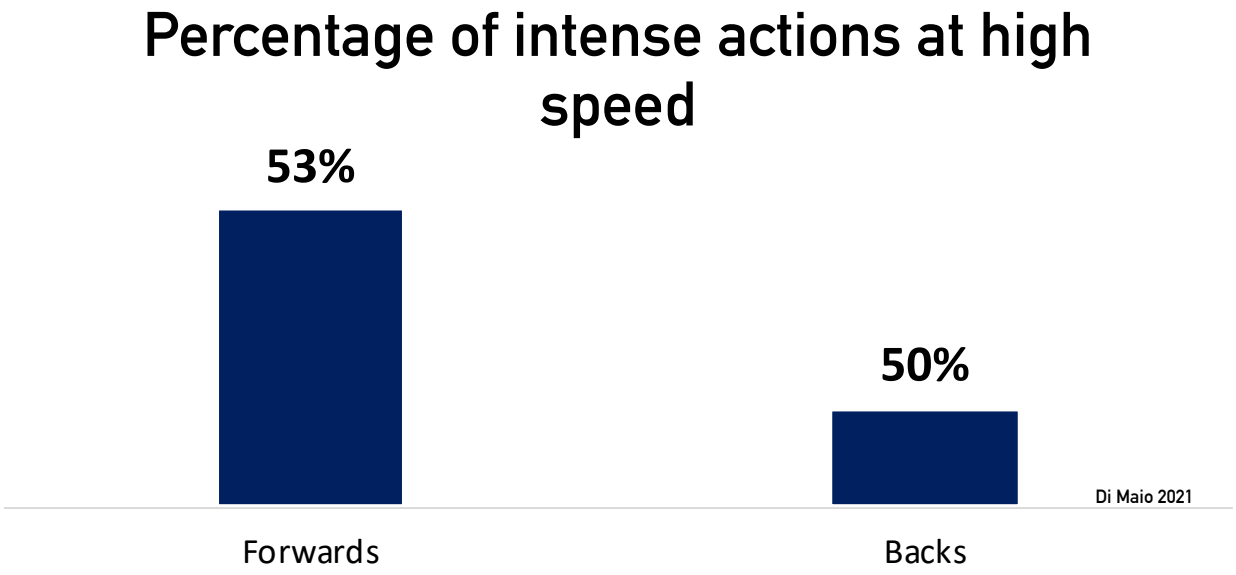
By inserting the second intensity band we can observe what is the division into power zones of intense actions and their relative average duration.



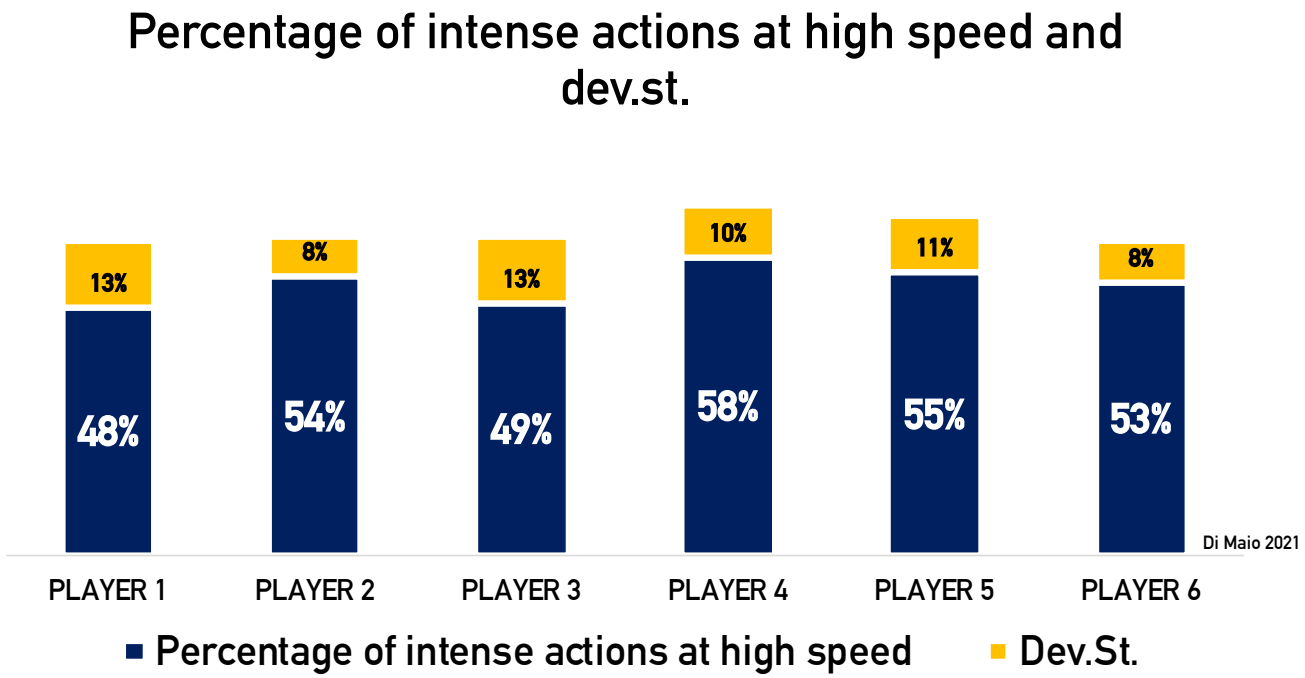
Only 18% of the total exceeds the 35Watt threshold but once the exposure time is exceeded it increases. This aspect is fundamental to insert another important element in the construction of the performance model.
In fact, high powers are much more often associated with very intense accelerations. This is because within the metabolic power formula, the accelerative component has a greater weight.
In Rugby Union we very often find very high intensity actions which, however, have a shorter duration, precisely due to an important presence of accelerations in confined spaces.
Furthermore, it must be considered that, in the management of the individual energy economy, players recognize the moments in which they are called to express their best and this happens in situations where there are often one-on-one challenges over very large spaces.
For this reason the weight of speed in Sevens is much higher than in Rugby Union so that intense actions dependent on high speeds are 51% of the total actions of a match.
The next graph shows what is the distribution of the percentage of high-speed intense actions compared to the total ones.
In this way we can appreciate how in many cases it even exceeds 60%.



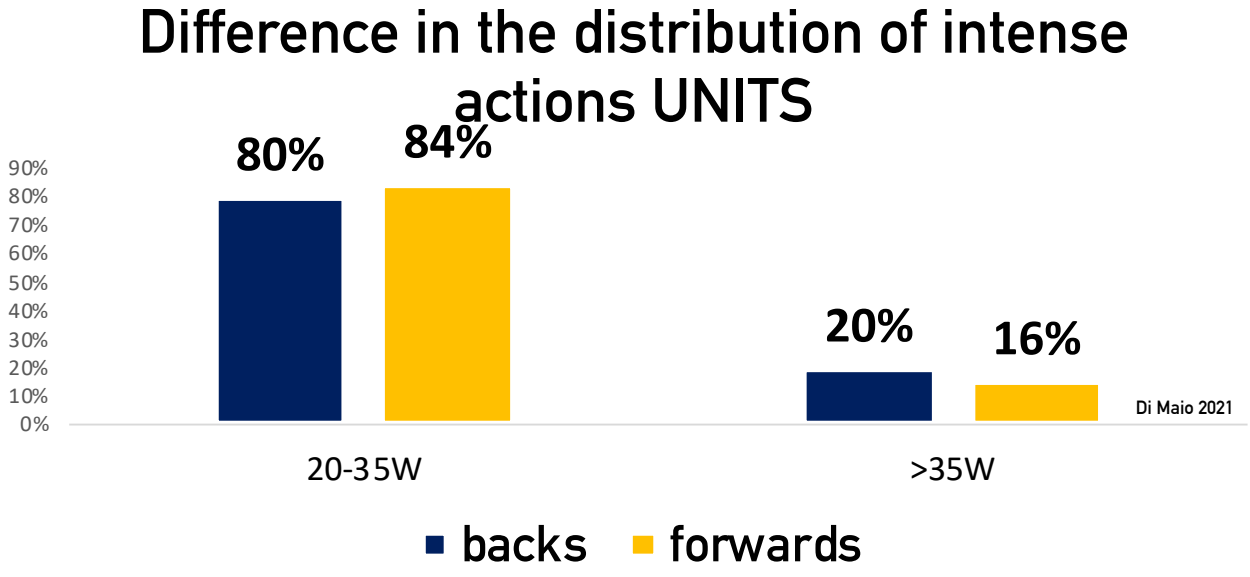
There are no substantial differences in this parameter between Forwards and Backs, but the forwards department is slightly more involved in this type of action. However, it must always be considered that individualities can cause the average recorded data to vary.



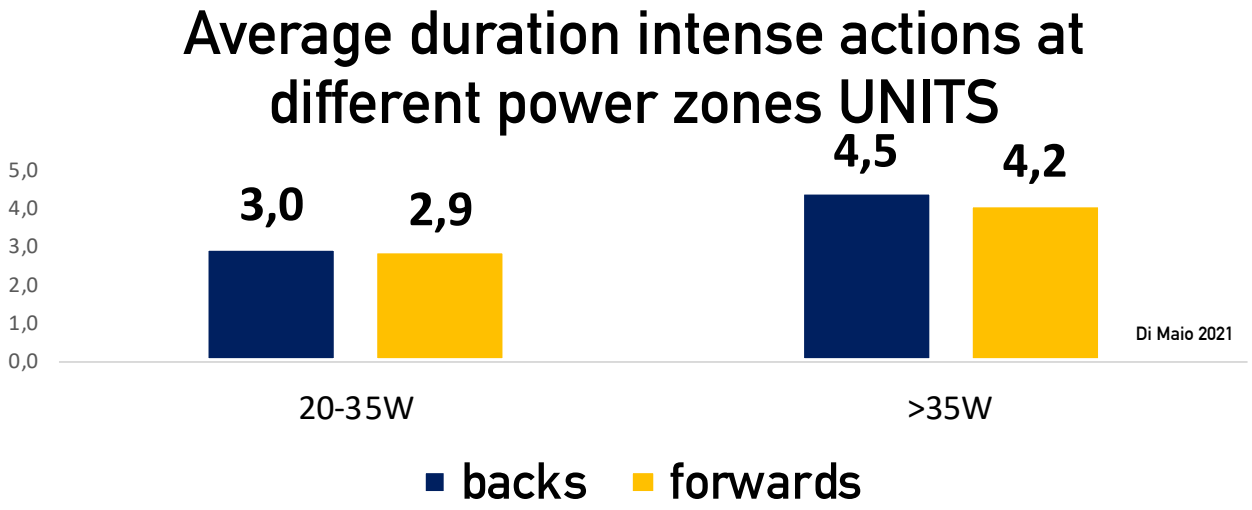
In fact, the greatest differences are recorded at the individual level. In the following example, 6 players are compared by adding the standard deviation data which gives us an idea of what the variability of the displayed value is.



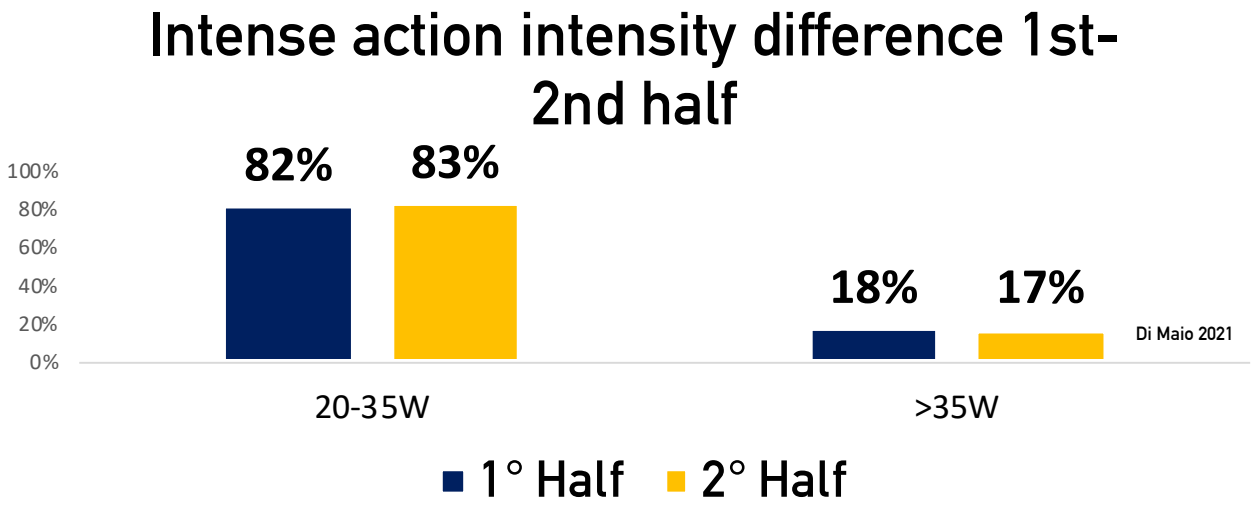
Returning to the general intensity of intense actions, we have seen that actions that exceed 35Watt are on average 18%.
In this sense Forwards and Backs have an almost overlapping distribution.



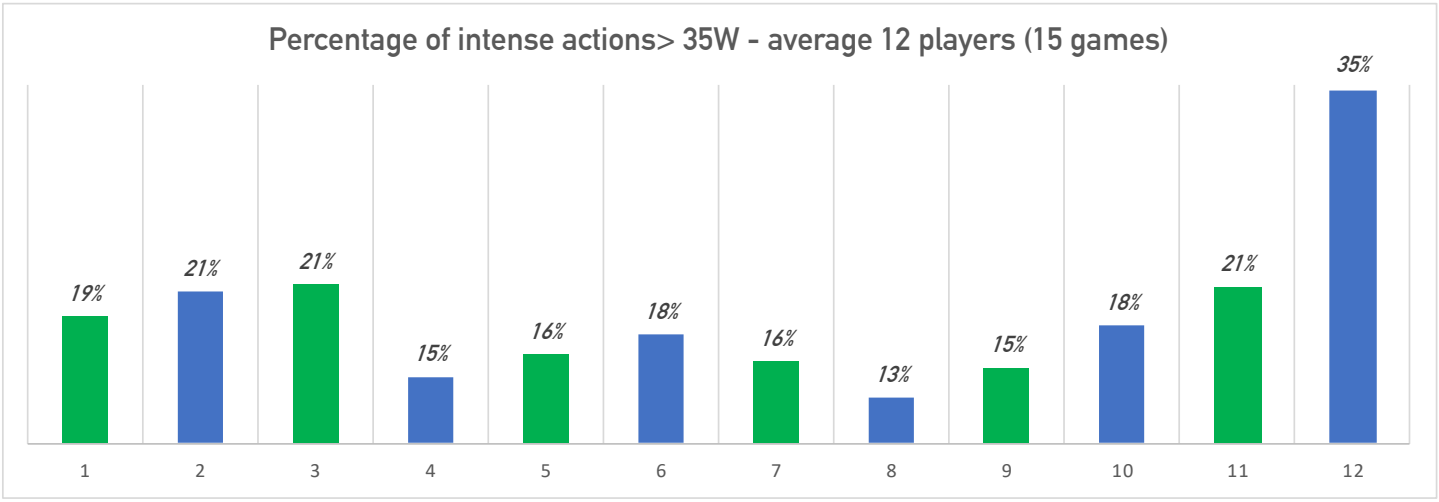
Even with respect to the duration in the two power bands, the two departments do not have substantial differences.

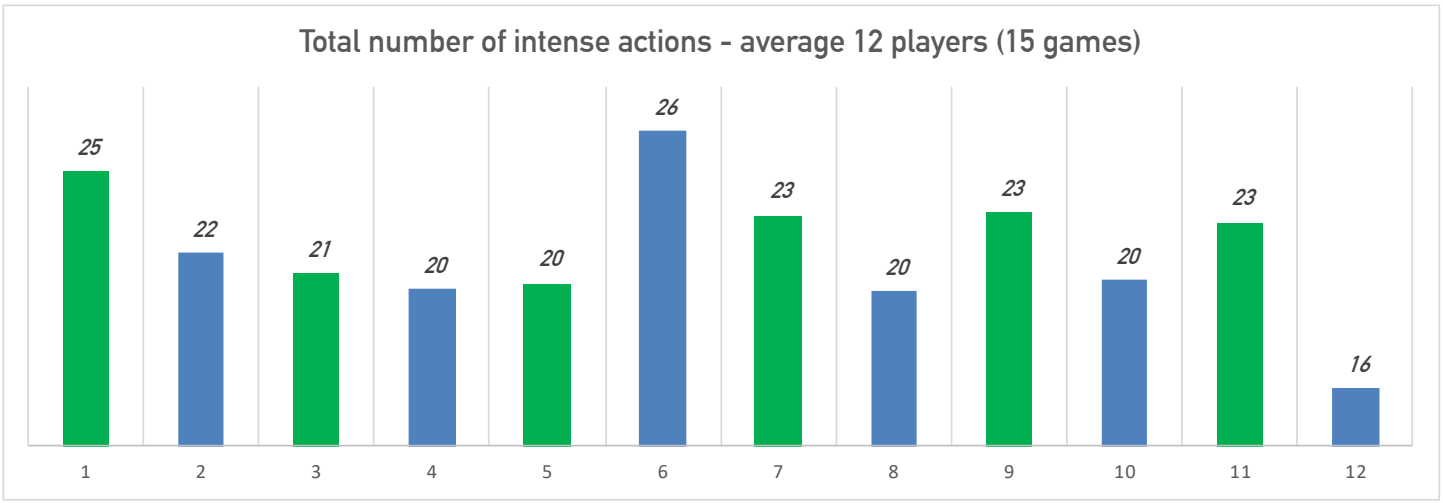


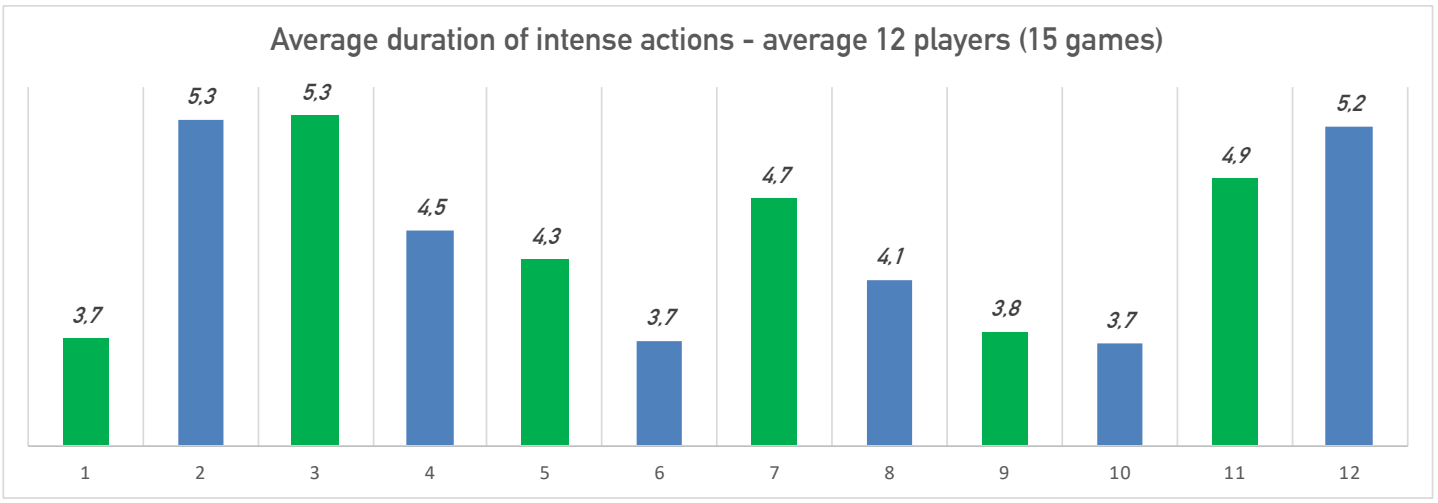
And finally, between the first and second half, on average, there were no differences in the distribution of shares in the various intensity bands.

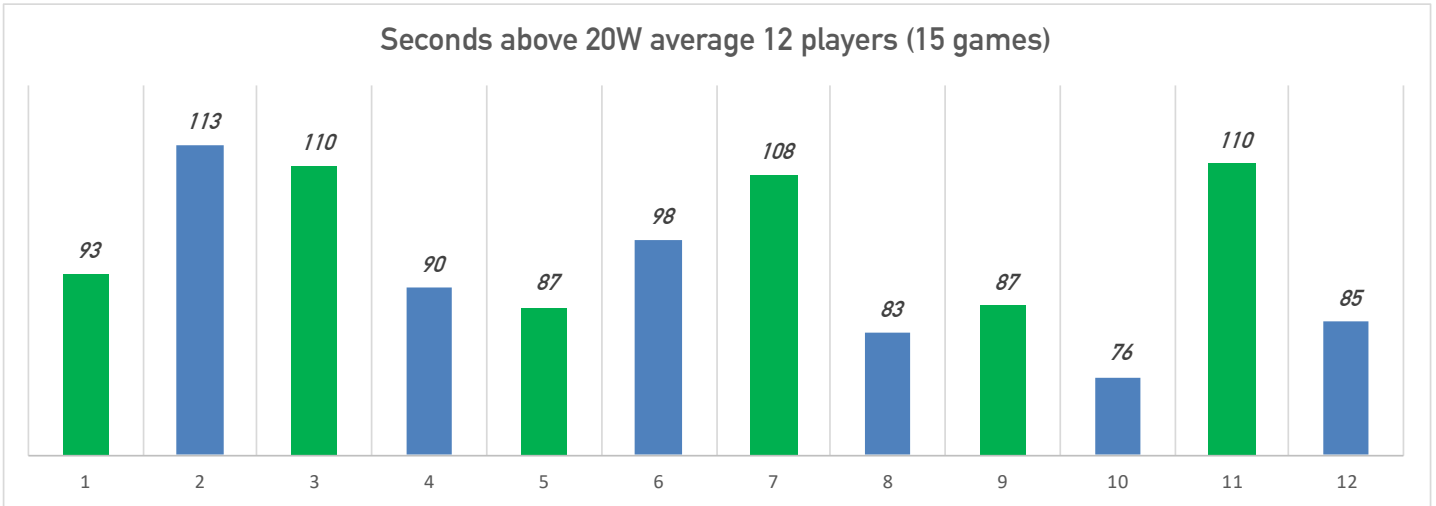


- Therefore, there is no difference as regards the departments and the two game fractions.
- On the next page, 12 players will be considered and four parameters will be examined simultaneously.
- This will make it easier to identify different types of players and understand within which ranges the average data shown is moving.
- The parameters used are:
- Percentage of shares over 35Watt on total intense actions
- Total number of intense actions
- Average duration of intense actions
- Total seconds over 20 Watts


Percentage of intense actions> 35W - average 12 players (15 games)
19%
21%
21%
15%
16%
18%
16%
13%
15%
18%
21%
35%
1
2
3
4
5
6
7
8
9
10
11
12


Total number of intense actions - average 12 players (15 games)
25
22
21
20
20
26
23
20
23
20
23
16
1
2
3
4
5
6
7
8
9
10
11
12


Average duration of intense actions - average 12 players (15 games)
3,7
5,3
5,3
4,5
4,3
3,7
4,7
4,1
3,8
3,7
4,9
5,2
1
2
3
4
5
6
7
8
9
10
11
12


Seconds above 20W average 12 players (15 games)
93
113
110
90
87
98
108
83
87
76
110
85
1
2
3
4
5
6
7
8
9
10
11
12

Some observations on the data set out above:
There are many variables and only with an overview can a deeper understanding be achieved
Going into detail, player number 6 performs the greatest number of intense actions but their duration is shorter. Consequently, the total time over 20W is on average with the others as the percentage of actions over 35Watts
Player number 12 has a very high percentage of actions over 35Watts and a higher average duration, but numerically performs less than all the other players.
Player 8 performs on average a few high-powered actions, a not too high number of total actions with an average duration with the other players. It follows that his total work turns out to be one of the lowest.

These are just some examples of how, by crossing the data of power and intense actions at an individual level, individual characteristics can be identified.
Furthermore, it is also possible to identify what can be associated with a "typical" performance model of the specific role.

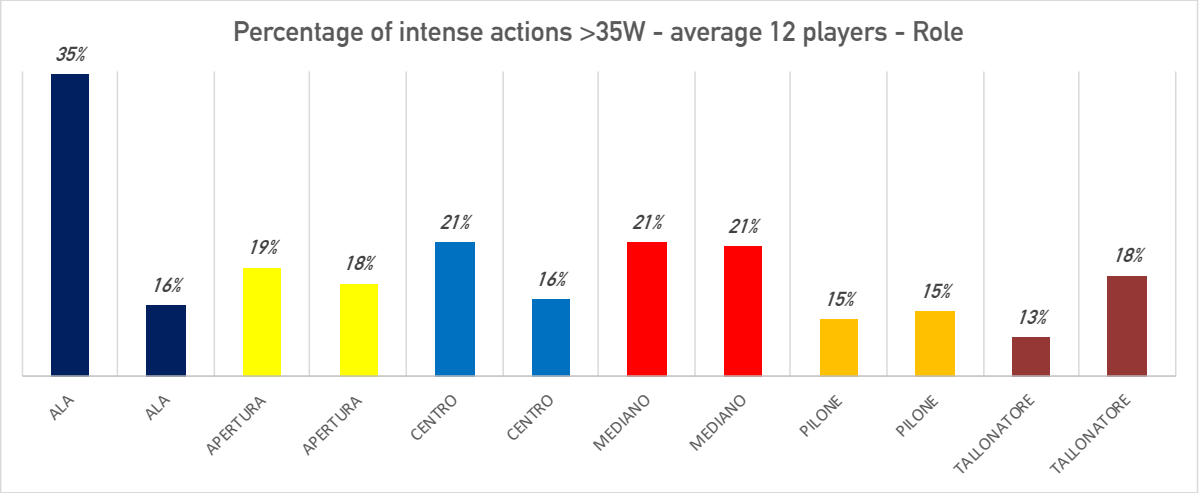
It is indeed important to understand that it would be more correct to compare players of the same role, because the different players on the pitch have skills and tasks that are not always the same and this can certainly affect the physical output of the performance.

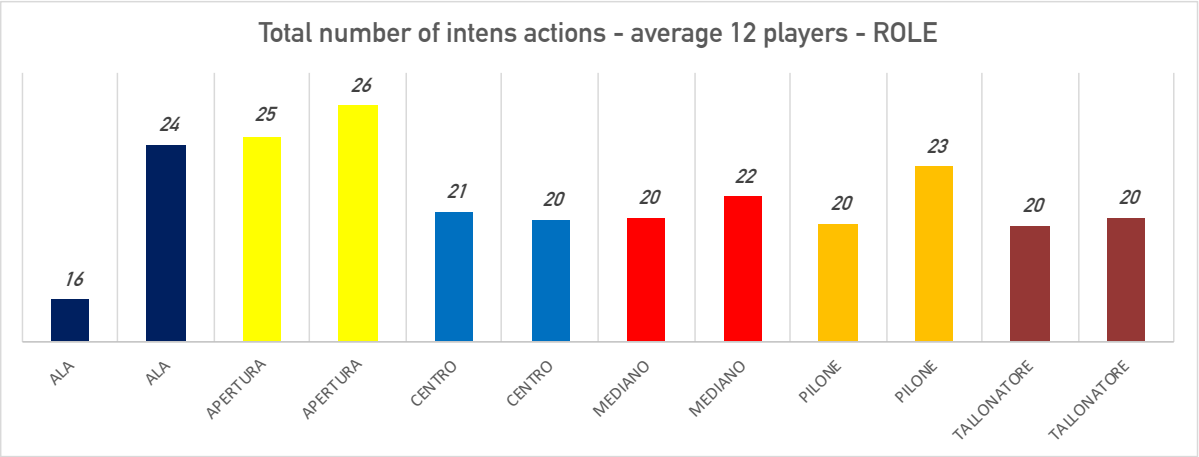
The next page shows the same graph but with a roles breakdown.

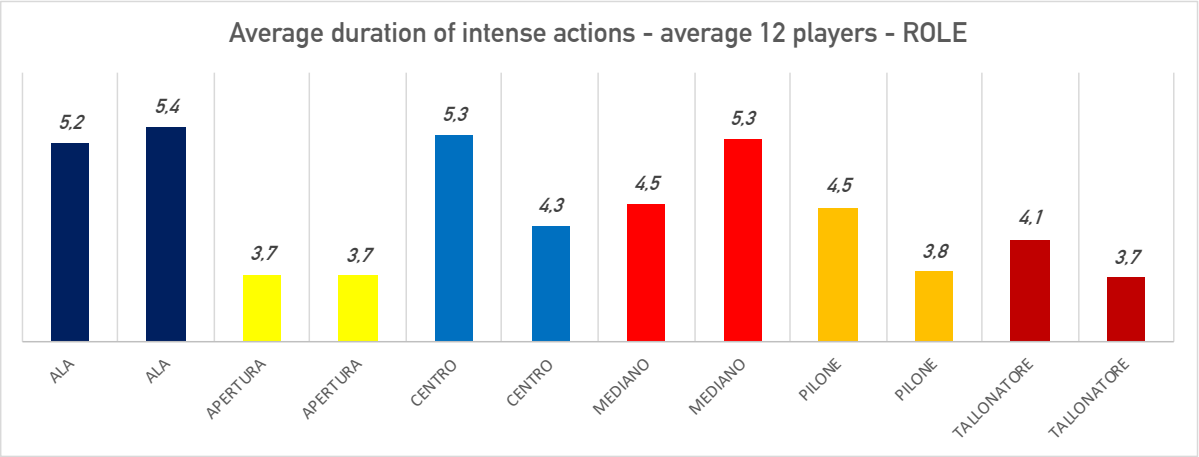
In particular, in the examples just made, player number 6 is an opening, player number 12 is a wing and player number 8 is a prop.
Clearly, having inserted the roles, the point of view changes because it connects what is physical work to what should be the specific technical work of the role.

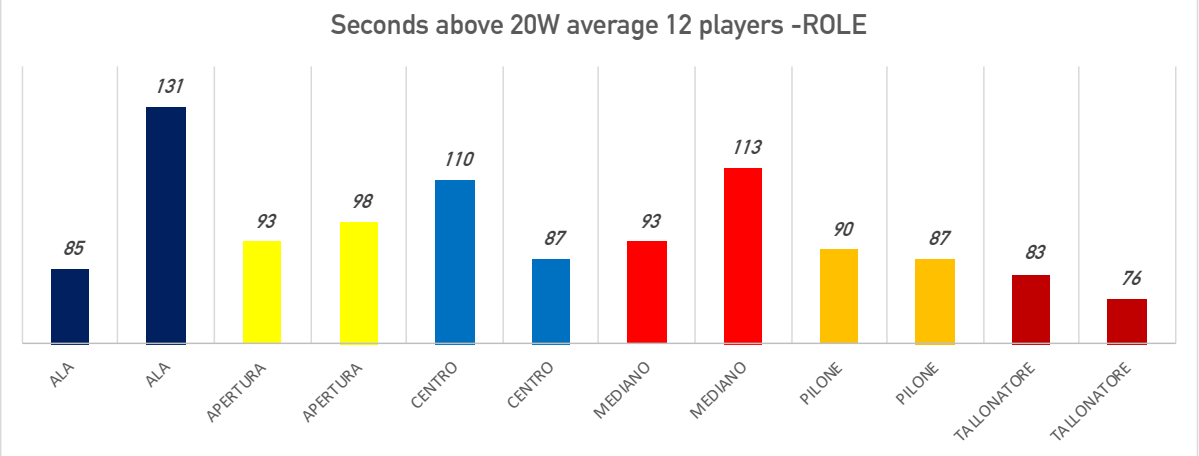
In my opinion, this aspect is very important when comparing players and situations. It is necessary to minimize errors and comparisons that do not also take into account technical-tactical-strategic aspects that the numbers alone cannot fully show us.

So let's review the same data but broken down by roles. In this way, the comparison error is reduced by entering the technical-tactical specifications and it is possible to compare the performance of the same role.


Percentage of intense actions >35W - average 12 players - Role
35%
16%
19%
18%
21%
16%
21%
21%
15%
15%
13%
18%
ALA
ALA
APERTURA
APERTURA
CENTRO
CENTRO
MEDIANO
MEDIANO
PILONE
PILONE
TALLONATORE
TALLONATORE

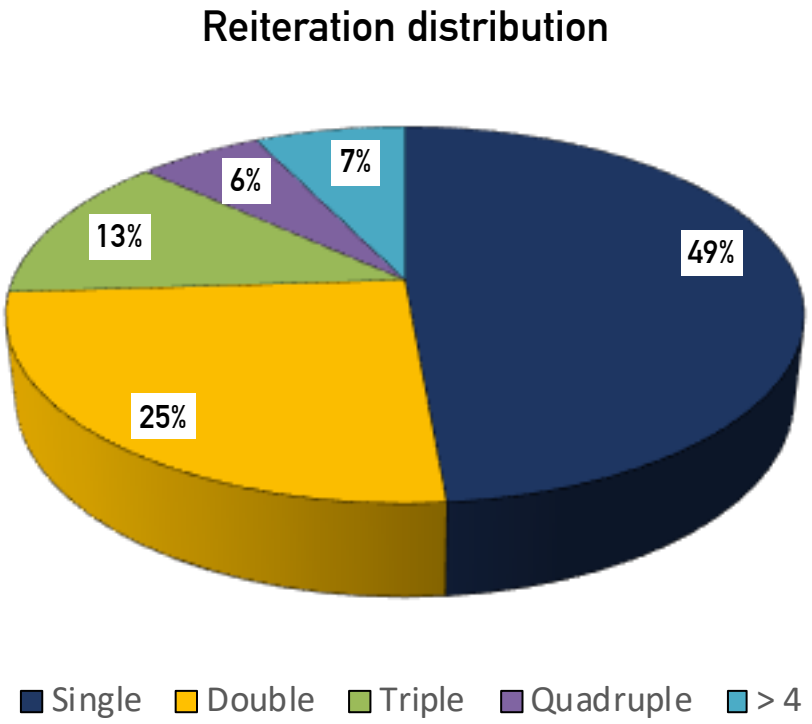

Total number of intens actions - average 12 players - ROLE
16
24
25
26
21
20
20
22
20
23
20
20
ALA
ALA
APERTURA
APERTURA
CENTRO
CENTRO
MEDIANO
MEDIANO
PILONE
PILONE
TALLONATORE
TALLONATORE


Average duration of intense actions - average 12 players - ROLE
5,2
5,4
3,7
3,7
5,3
4,3
4,5
5,3
4,5
3,8
4,1
3,7
ALA
ALA
APERTURA
APERTURA
CENTRO
CENTRO
MEDIANO
MEDIANO
PILONE
PILONE
TALLONATORE
TALLONATORE


Seconds above 20W average 12 players -ROLE
85
131
93
98
110
87
93
113
90
87
83
76
ALA
ALA
APERTURA
APERTURA
CENTRO
CENTRO
MEDIANO
MEDIANO
PILONE
PILONE
TALLONATORE
TALLONATORE

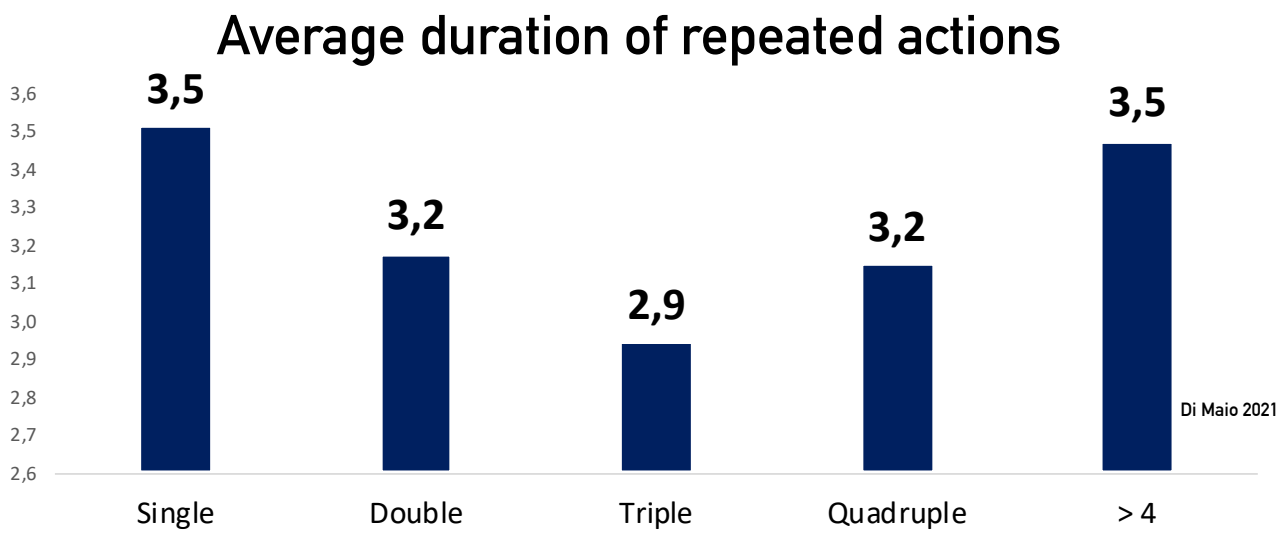
Intense actions can be performed individually ie followed by adequate recovery.
But it happens very often that these actions follow one another with recoveries of less than 5 ".
In this case, at the metabolic level, we can add these actions together in a single great moment of intensity as there is no material time for even a partial recovery.

By dividing the actions greater than 20W into groups of reiterations based on the number of repetitions of intense actions with recovery less than 5 ", we have the following average distribution:

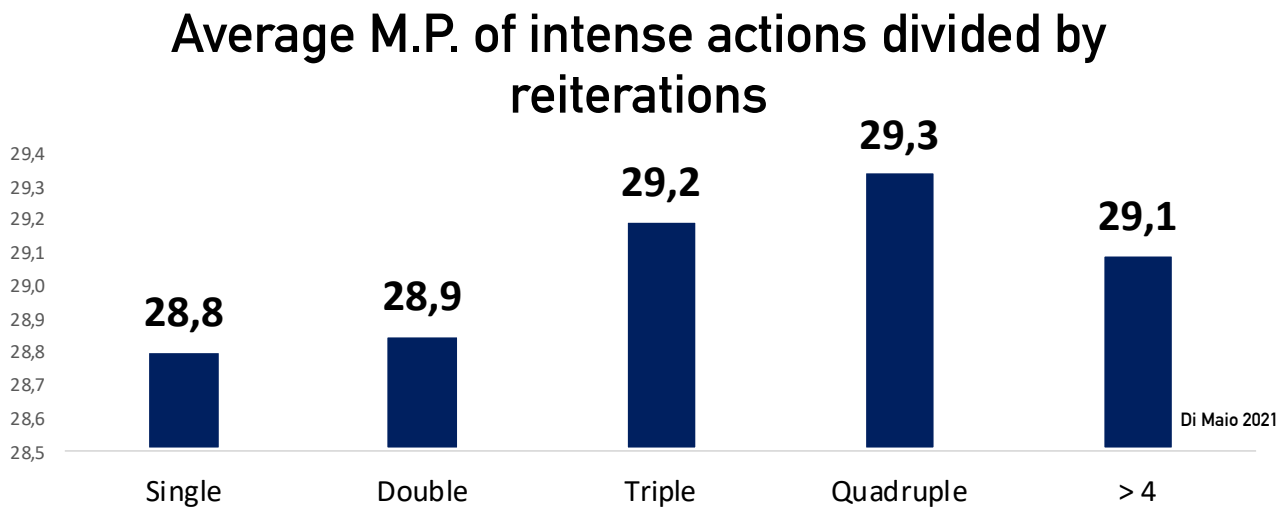


50% of total shares are followed by a recovery of more than 5 '. All the other actions fall into the reiteration groups shown.

The average of the duration of these actions shows that, even if they are part of a group of reiterations, the intense actions do not suffer a decrease in the single duration.
On the contrary, the reiterations greater than 4 are those that on average last longer.

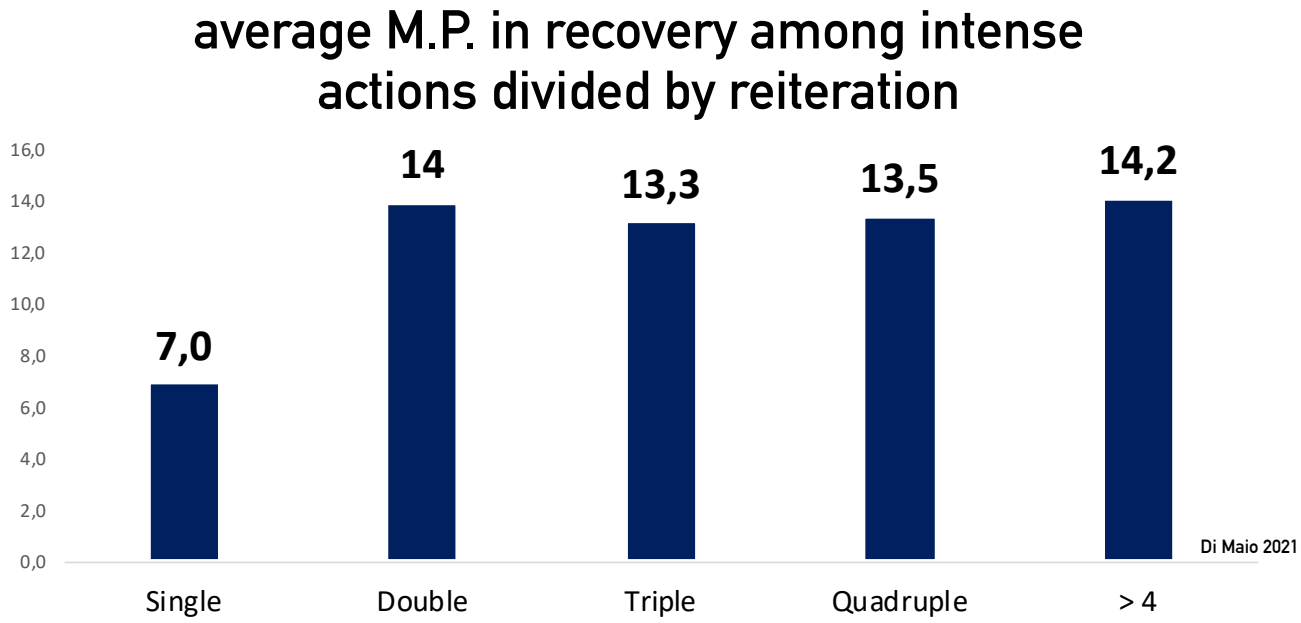


The same situation is found if the average metabolic power expressed in the individual actions within the recurrence groups is highlighted:

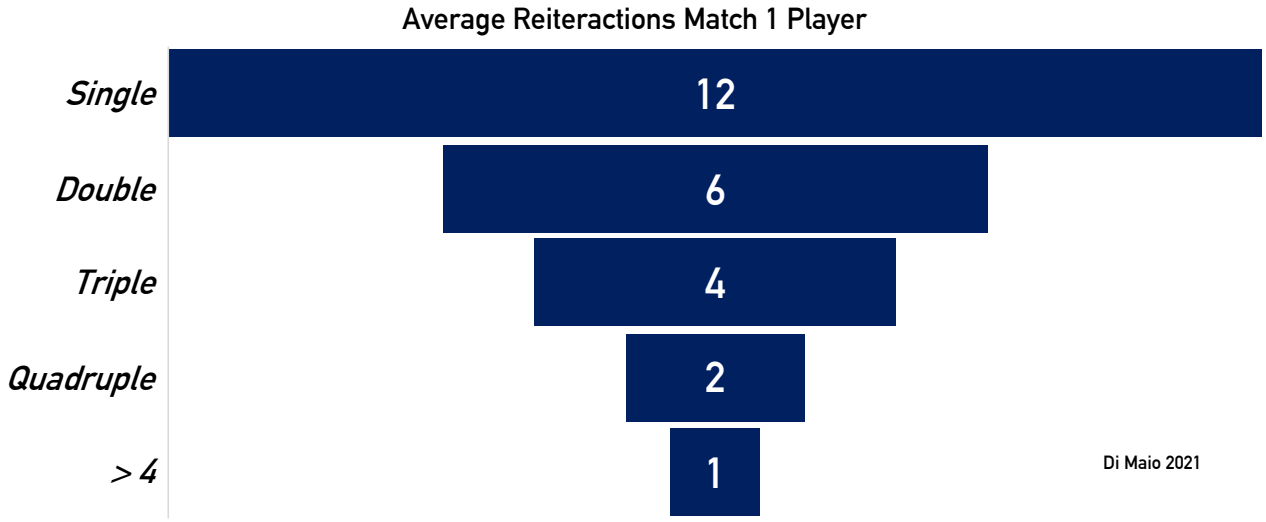


There was no substantial difference between the recurrence groups.

But what happens in the few seconds that divide two or more repeated actions?
We can answer this question by looking at the average metabolic power expressed in the moments that divide an intense action from another when they are defined as repeated (recovery <5 ").



As clearly shown by the graph, when an action is followed by a recovery longer than 5 ", the latter has on average a very low Metallic power which allows a good recovery of the energy systems.
A completely different matter for the reiterations.
A completely different matter for the reiterations.
Power levels remain high and very close to the 20W threshold.
This determines a "grouping" of these intense actions from the metabolic point of view.
Take for example the average of the distribution of intense actions based on the repetitions of the same of a single player:



In the example, the player performs an average of 49 intense actions in a match (The general average is 44) divided into 12 Singles - 6 Doubles - 4 Triples - 2 Quadruples and only 1 higher than 4.
If these data are combined with those of average duration and average metabolic power (both during work and in the short recovery of less than 5 "), it is possible to have a clearer picture of this part of the performance model:

Average work above 20W during repeated intense actions					
	Average events 1 Player	N. Intense Actions	Average Metabolic Power (Watt)	Average Duration (Seconds)	Total duration above 20W (Seconds) for each reiteration
Single	12	12	28,8	3,5	3,5
Double	6	12	28,9	3,2	6,4
Triple	4	12	29,2	2,9	8,7
Quadruple	2	8	29,3	3,2	12,8
> 4	1	5	29,1	3,5	17,5

Average work below 20W during repeated intense actions					
	Average events 1 Player	Number of Rests below 20W	Average Metabolic Power Rests among the reiterations (Watt)	Average Duration (Seconds)	Total duration Rests for each reiteration (Seconds)
Single	12	0	7	\	\
Double	6	1	14	3	3
Triple	4	2	13,3	3,5	7
Quadruple	2	3	13,5	2,9	8,7
> 4	1	4	14,2	3,7	14,8

The next step will be to add the work beyond the 20Watt threshold with the relative recoveries for each group of reiterations to understand both the total duration of the metabolic effort and its relative average metabolic power.

Total work repeated intense actions						Total Duration and Metabolic Power for each reiterations	
	Average events 1 Player	Duation Work above 20W for each reiteration	Duration Rest below 20W for each reiteration	Total Joule from work above 20W for each reiteration	Total Joule from rest below20W for each reiteration	DURATION (Seconds) for each reiteration	Average METABOLIC POWER (Watt)
Single	12	3,5	0	101	0	3,5	28,8
Double	6	6,4	3	185	42	9	25
Triple	4	8,7	7	254	93	16	22
Quadruple	2	12,8	8,7	375	117	22	22
> 4	1	17,5	14,8	509	210	32	22

The table shows a much clearer and more precise situation than the study of the Metabolic Power alone and of the intense actions alone.
In fact, it is possible to identify very different types of actions at the metabolic level.
12 times the player performs a single action which on average lasts 3.5 seconds.
For 6 times during the race it exceeds 20W on average for 9 seconds by performing 2 consecutive intense actions. On 4 occasions there are 3 consecutive actions above 20W which involve a commitment of about 16 seconds with an average metabolic power of 22 Watts. Quadruple reiterations are on average 2 per game with an average power of 22Watt and a duration of 22 seconds.
Actions repeated more than 4 times are not always present in the match model. There are matches where, however, 2 \ 3 are also found. On average, however, once per game the player is exposed to an intensity load equal to 22Watt for 32 seconds.
25 total events that give us a very specific situation of Rugby Sevens.
28% of these metabolically demanding situations last on average more than 15 seconds and have very high power moments and moments just below the 20W threshold that do not allow true recovery.
This means that there are situations (7 out of 15 minutes of the game) in which the alactic acid anaerobic system is absolutely not sufficient to guarantee all the substrate necessary for the execution of the task. The anaerobic glycolysis pathway remains the only way to continue working at high powers. The recoveries between the game sequences still guarantee a recovery from these situations as the players are specifically trained to use the aerobic system to refuel the high-power systems.

It is probably the occasions where these longer actions are repeated in close times during the match, which cause the feeling of greater fatigue to the players.

During these longer sequences, the players who can better "bear" the accumulated acute load, are able to have better peak performance and make a difference. When we talk about peak performance we are referring not to the individual maximum peak but to a percentage of it that must be related to the real possibilities of the moment of the other players on the field.
However, it should not be forgotten that 72% of the time the actions last less than 9 seconds and in particular 48% of the intense actions have an average duration of 3.5 seconds, before even a partial recovery.

Below is a summary graphic representation of the total work as a function of the groups of reiterations, both from the point of view of the average work per game (Joule), and of seconds of activity for each type of reiteration of the player considered in this part of the chapter.