# Rugby Sevens

## Study of the performance model

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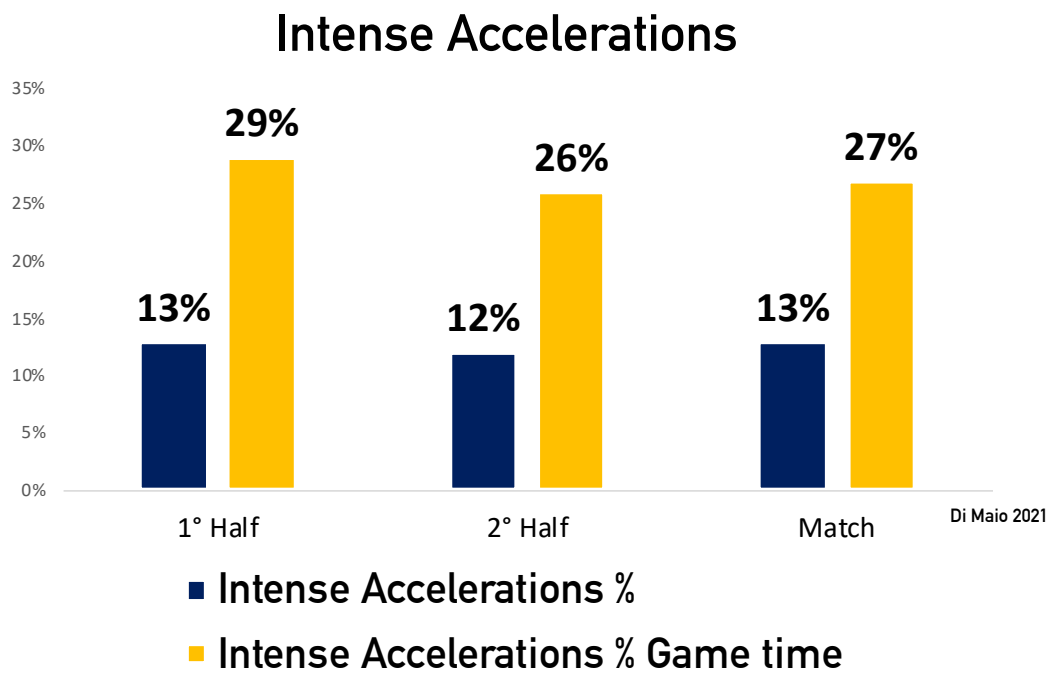
# INTENSE ACCELERATIONS AND DECELERATIONS

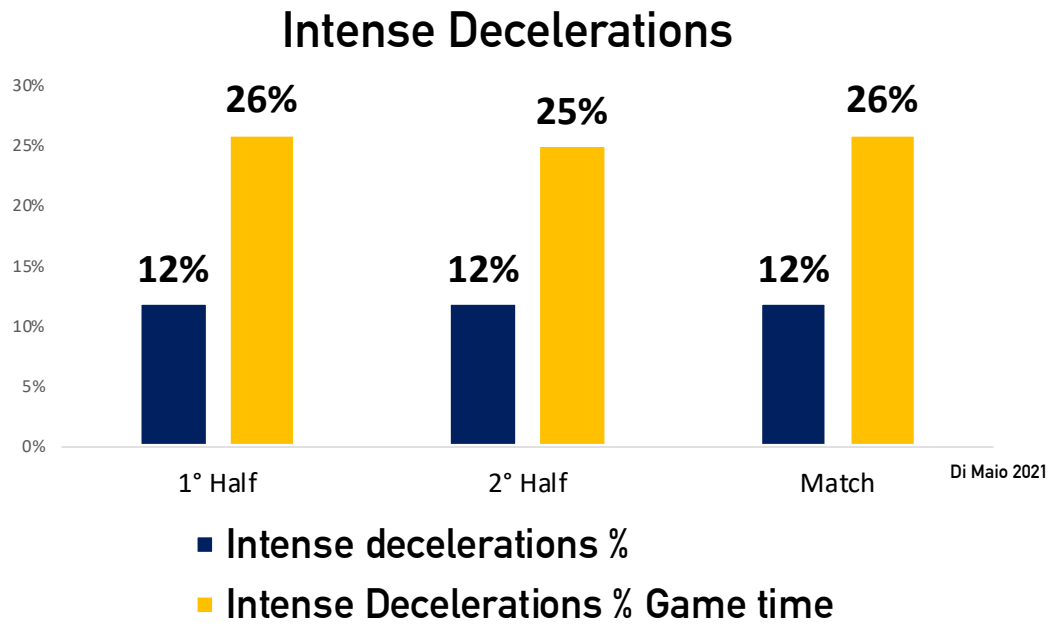
The maximum acceleration of a subject is closely related to the state of motion of the subject itself. In fact, at zero speed the subject is capable of expressing the maximum of his acceleration, varying his state of motion in a sudden manner.
To identify intense accelerations it is therefore necessary to know the instantaneous speed of the monitored subject.
Recording the absolute acceleration alone, setting an intensity threshold (for example 2.5m \ s2) has no value as a statistical data because there is a risk of running into two major errors. The first mistake is that some accelerations from a standstill exceed the threshold of 2.5 m \ s2 but in reality they are not intense, because at that moment the player can also reach 7 \ 8 m \ s2, so it is an acceleration of about 30% of its ceiling. The second mistake is that at high speeds the acceleration never exceeds these thresholds, because once we approach the maximum speed the acceleration tends to zero. But an acceleration below 2.5m \ s2 made at a speed above 16km \ h, for example, must be considered as an intense acceleration, because at that moment (at that speed) it is almost 100% of the possibility of the player under consideration.

Based on the acceleration trend as a function of speed, we identify as INTENSE ACCELERATIONS those accelerations that exceed 50% (accelerations above 75% will also be taken into account) of the real possibility of accelerating to a certain speed.
The same concept applies to INTENSE DECELERATIONS. Intense decelerations are defined as taking into account the input speed and the relationship that is established between it and the deceleration.

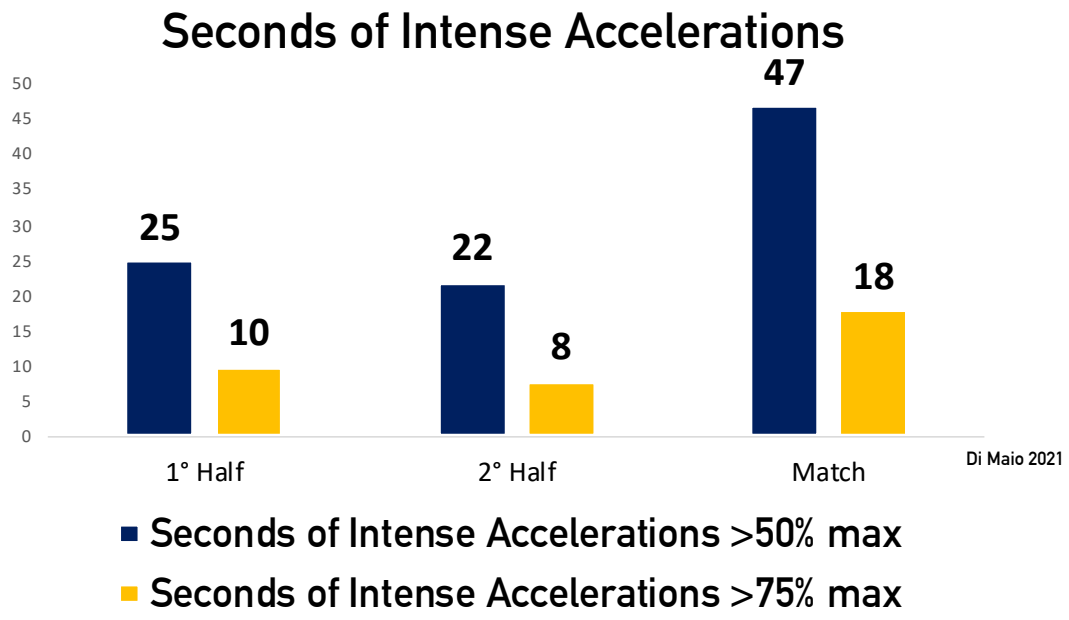
Percentage, i.e. considering all the changes in the states of motion, the intense accelerations represent 13% of the total if we consider the total time, and 27% if we take into account only the playing time.
The distribution between the first and second half is very similar as shown in the next graph.



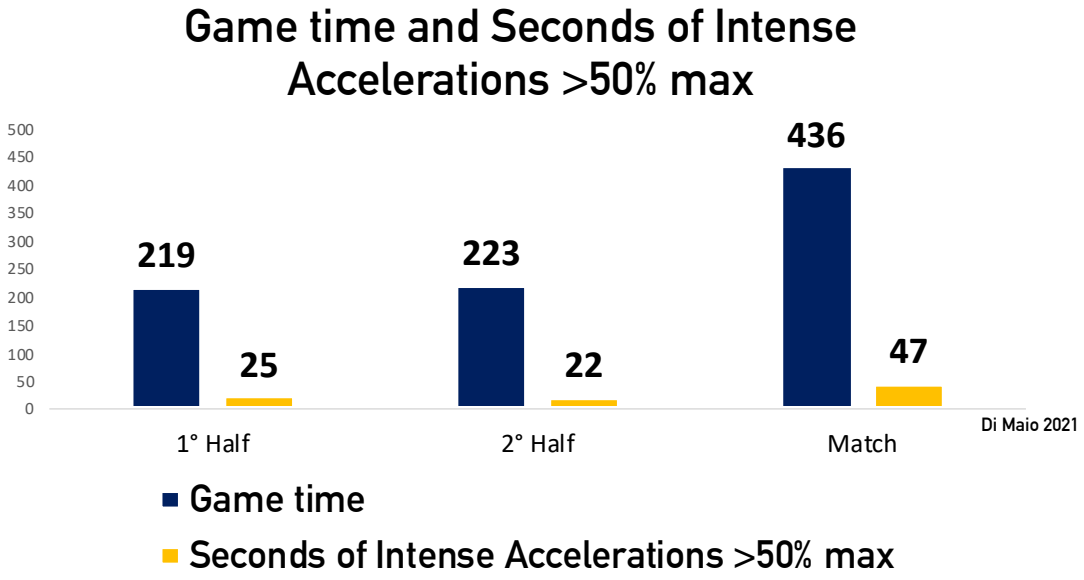

Even for intense decelerations, the ratio is practically the same both for the game and for the two halves.

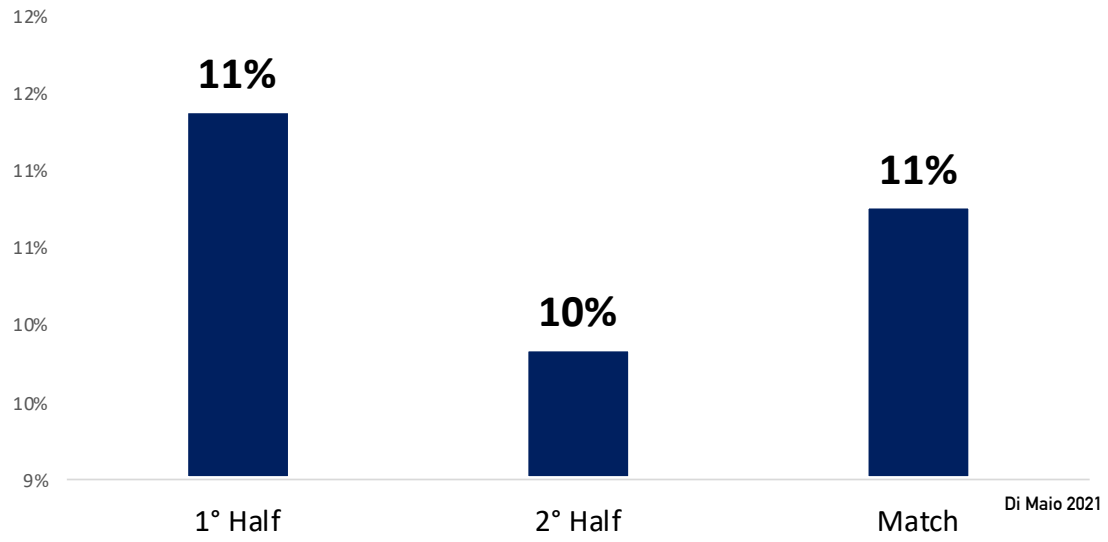


To find the real volume, we observe the time of exposure to this type of load during the game, using two different thresholds: 50% and 75% of the maximum acceleration allowed at a given speed.

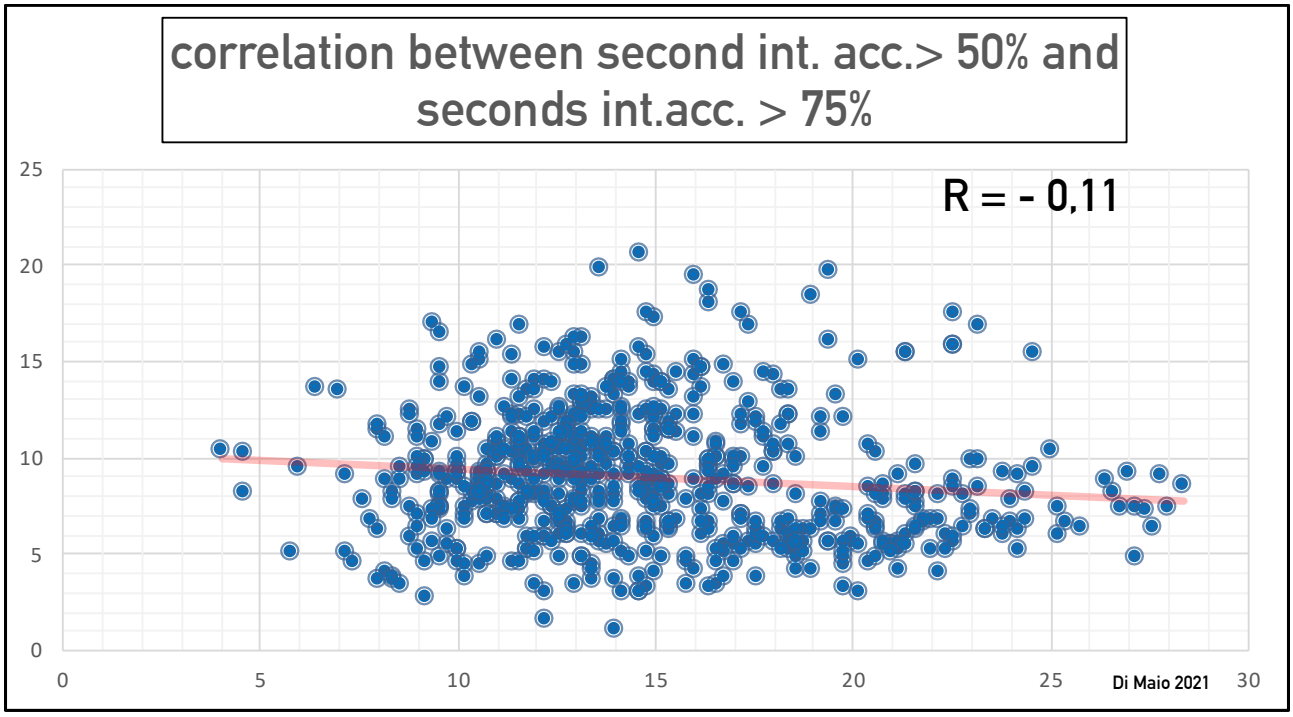



These accelerations are all done in game time.
The relationship that exists between these two values is represented in the next graph and the relationship that is created gives us a situation where these accelerations make up 10% -11% of the total playing time.

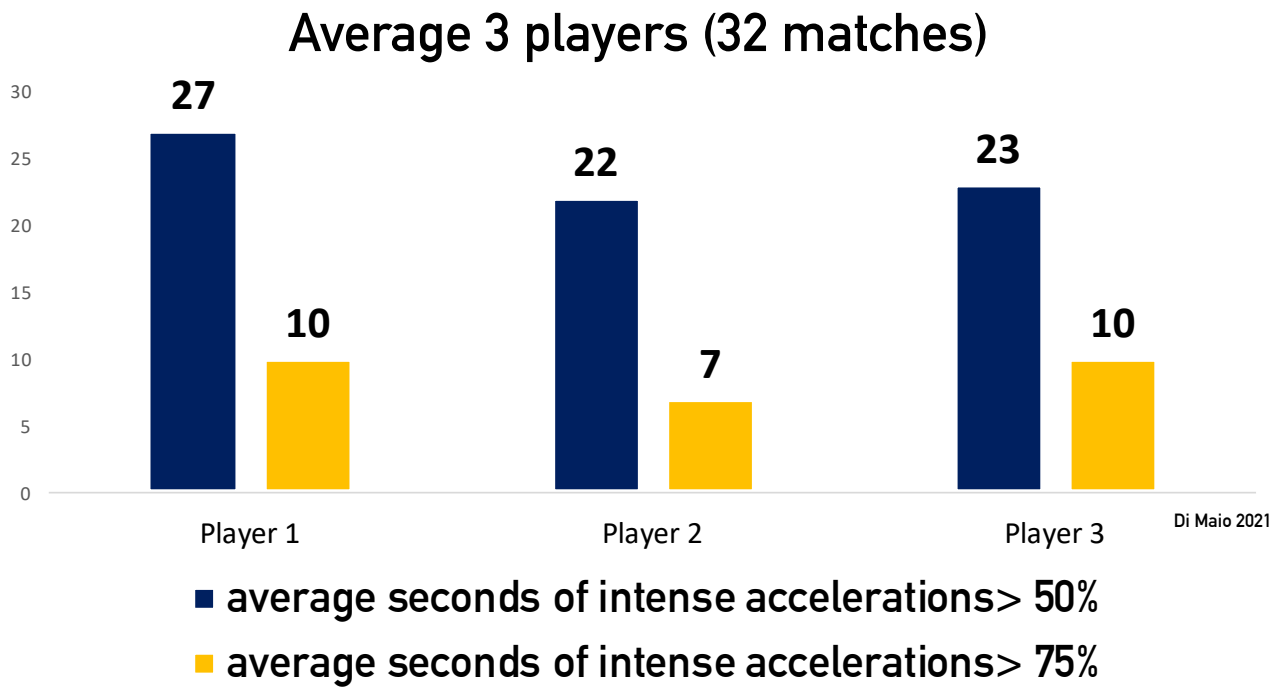




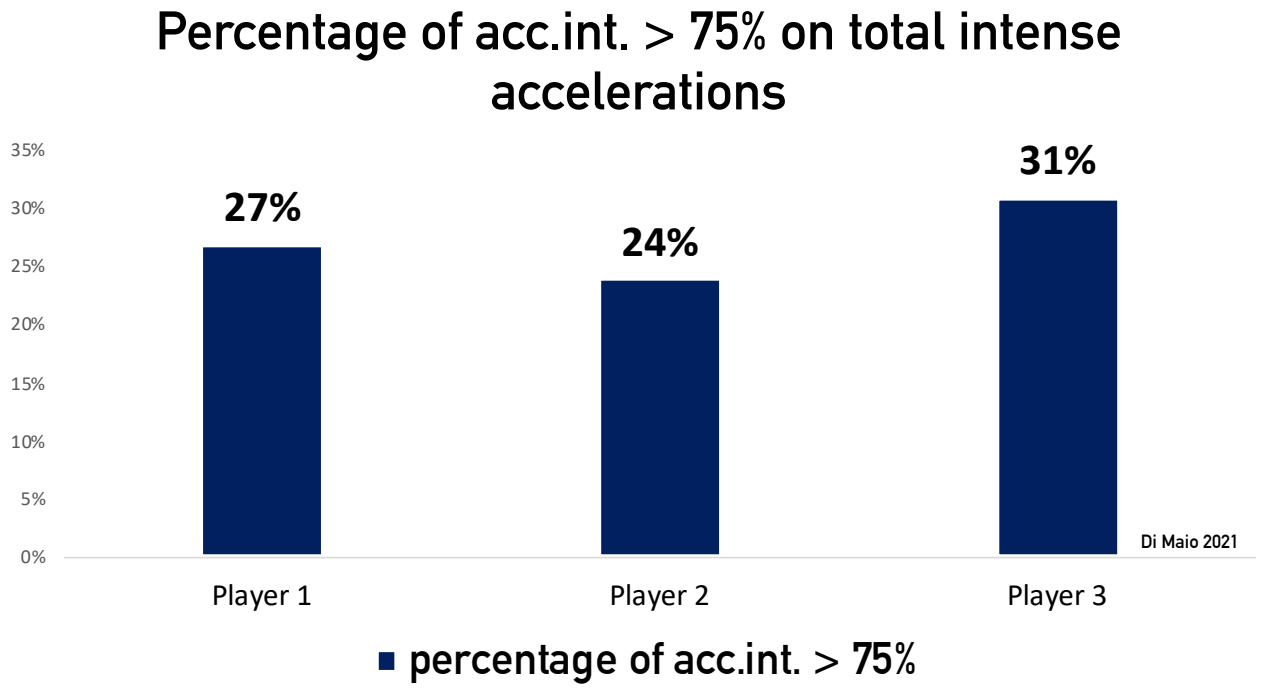

The relationship between the accelerations at the two set thresholds of 50% and 75% were related to understand if there was a dependence between the two elements.
The result, inserting the individual values of each individual player, is very evident and demonstrates how this relationship does not exist, even if a different result could have been expected.

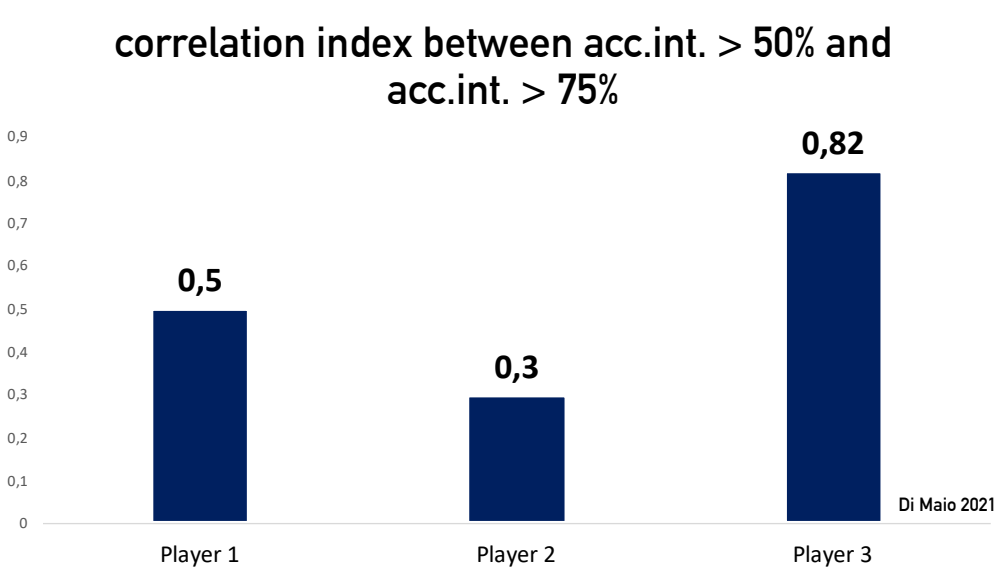


The problem with this type of analysis is that by putting all the data of the players together, their individual characteristics are lost.
What we will see now is the same type of correlation but using 3 players separately as an example.

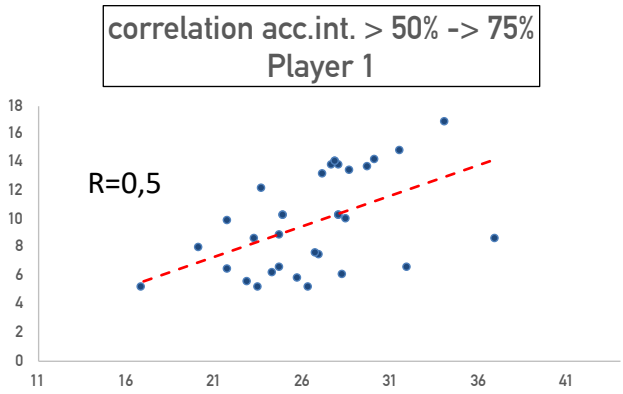


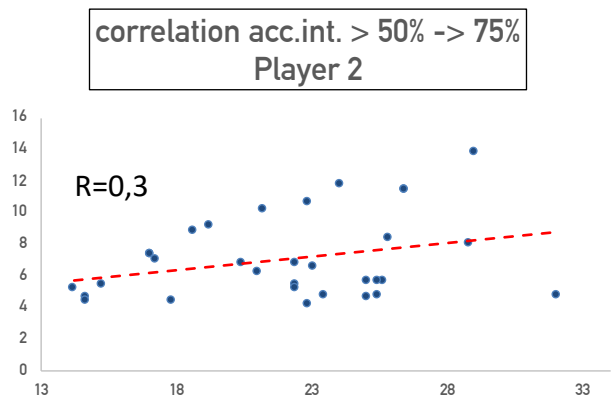

As a first examination, the intense acceleration values of 3 players were compared, creating for each one a relationship between the two values which is represented in the next graph.

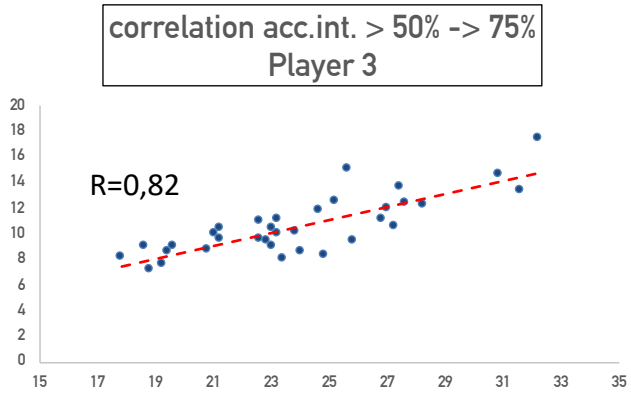




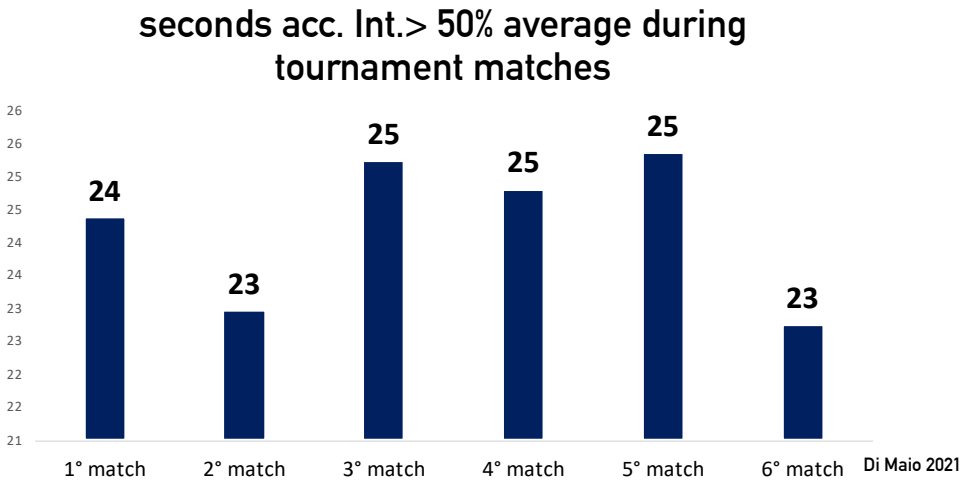

Each player has a different relationship between the two values and the correlation index, which is created between all the data of the 32 monitored games of these 3 players, is very different: Player number 3 has a high correlation between these two data (so the more he accelerates above 50% of chance the more he will find himself accelerating even above 75%).
For the other two players the ratio is extremely different, indicating that much less often they are able to reach the highest threshold of intense acceleration when they exceed the first threshold of 50%.
Below the values of each individual player taken into account.



Even with this parameter, the average trend was observed during the 6 matches of the tournament.
These are the average results




- The values are very similar in all games and on average it is noted that the maximum difference found is only 2 seconds.
- Even observing the progress of 12 different tournaments, the just made observations do not change, rather they are strengthened by finding all the values contained in a very narrow range. This takes on two meanings:
- The averages are very strong and fully represent the performance model of a match
- There is no decrease in value during the tournament.