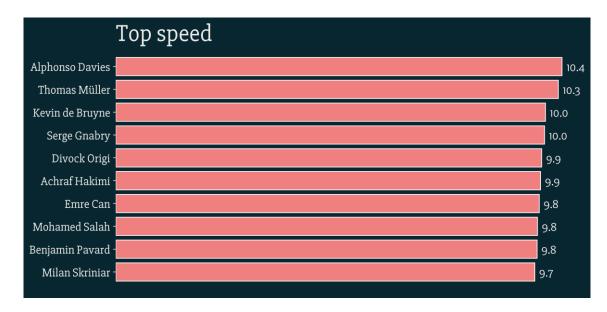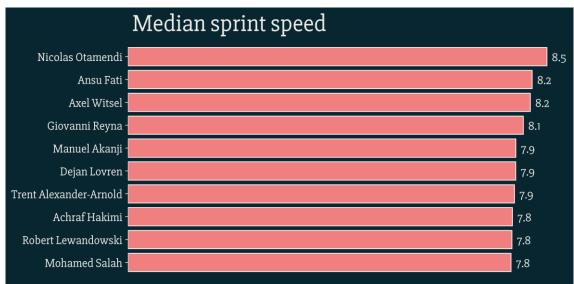# Measuring quickness of footballers

Quickness in football is quite tricky to define. Can mean a lot of things and most often is context-based. In this work, a few different directions have been worked on and a few more are suggested.
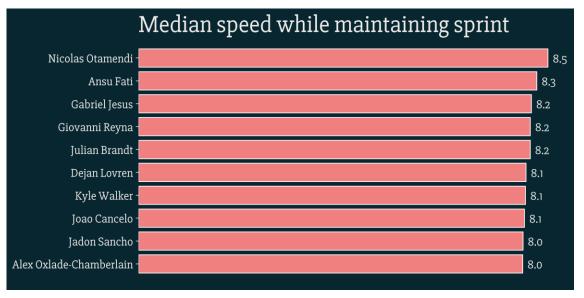
- Very coarse level and simplistic – top speed, top acceleration and median sprint speed (when running > 7 m/s)
- Grainier – look at sprint speeds in different contexts. Long distance running is not that frequent in football. Short distance/ short burst of sprints are more common.
    1. Median sprint speed when sustaining sprint for greater than 1 second
    2. Median sprint speed when sustaining sprint for 10 to 20 meters
    3. Median sprint speed when sustaining sprint for 20 to 30 meters
    4. Median sprint speed when sustaining sprint for 30 to 40 meters
    5. Median sprint speed when sustaining sprint for greater than 40 meters
- Context-based – different kinds of situations. On-ball running very different from off-ball running. Defensive phase running very different from offensive phase running.
    1. look at top speed, top acceleration and median sprint speed when running with the ball
    2. look at top speed, top acceleration and median sprint speed when defending
- Quickness can also refer to how quickly the ball gets released by players. But this requires lots of context. Here a simple proxy is used – median ball holding duration.
- External package used – "kloppy" for some pre-processing, Laurie Shaw's FoT code
- Dataset – Skill Corner open data – 9 games, 7 used (2 games threw errors with kloppy's preprocessing)
- Methodology – generate the above metrics for each game for all players. When combining, keep only the larger value for players who have played in 2 games. All metrics presented in SI units.

Course view of "quickness"

Top speed

Player	Value
Alphonso Davies	10.4
Thomas Müller	10.3
Kevin de Bruyne	10.0
Serge Gnabry	10.0
Divock Origi	9.9
Achraf Hakimi	9.9
Emre Can	9.8
Mohamed Salah	9.8
Benjamin Pavard	9.8
Milan Skriniar	9.7

Top accl

Player	Value
Kevin de Bruyne	7.6
Georginio Wijnaldum	7.5
Marcelo Brozovic	7.5
Raheem Sterling	7.2
Andrew Robertson	7.1
Julian Brandt	7.1
Gabriel Jesus	6.9
Benjamin Pavard	6.9
Joshua Kimmich	6.9
Ferland Mendy	6.7

Median sprint speed

Player	Value
Nicolas Otamendi	8.5
Ansu Fati	8.2
Axel Witsel	8.2
Giovanni Reyna	8.1
Manuel Akanji	7.9
Dejan Lovren	7.9
Trent Alexander-Arnold	7.9
Achraf Hakimi	7.8
Robert Lewandowski	7.8
Mohamed Salah	7.8

Median speed while maintaining sprint

Player	Value
Nicolas Otamendi	8.5
Ansu Fati	8.3
Gabriel Jesus	8.2
Giovanni Reyna	8.2
Julian Brandt	8.2
Dejan Lovren	8.1
Kyle Walker	8.1
Joao Cancelo	8.1
Jadon Sancho	8.0
Alex Oxlade-Chamberlain	8.0

Breaking down sprints into distance bins

Median speed during 10 to 20m sprints

Player	Speed
Giovanni Reyna	8.4
Divock Origi	8.4
David Alaba	8.4
Julian Brandt	8.2
Serge Gnabry	8.1
Federico Bernardeschi	8.1
Virgil van Dijk	8.1
Dejan Lovren	8.1
Joao Cancelo	8.1
Achraf Hakimi	8.1

Median speed during 20 to 30m sprints

Player	Speed
Alphonso Davies	9.1
Nicolas Otamendi	8.5
Nico Schulz	8.5
Thorgan Hazard	8.4
Trent Alexander-Arnold	8.4
Gabriel Jesus	8.4
Alex Sandro	8.3
Achraf Hakimi	8.3
Kyle Walker	8.3
Robert Lewandowski	8.3

Median speed during 30 to 40m sprints

Player	Speed
Robert Lewandowski	9.0
Alphonso Davies	8.8
Federico Valverde	8.6
Nico Schulz	8.4
Luiz Fernandinho	8.4
Achraf Hakimi	8.3
Manuel Akanji	8.3
Lukasz Piszczek	8.3
Kingsley Coman	8.3
Ansu Fati	8.3

Median speed during 40m or more sprints

Player	Speed
Rodrigo Bentancur	8.6
Kevin de Bruyne	8.4
Kyle Walker	8.4
John Stones	8.4
Kingsley Coman	8.3
Mats Hummels	8.3
Raheem Sterling	8.3
Georginio Wijnaldum	8.3
Phil Foden	8.2
Emre Can	8.2

Running with the ball

Top speed with ball

Player	Value
Kingsley Coman	9.5
Thorgan Hazard	9.4
Federico Valverde	9.4
Achraf Hakimi	9.2
Neco Williams	9.1
Julian Brandt	9.0
Robert Lewandowski	8.9
Kyle Walker	8.9
Rodrigo Hernandez	8.9
Juan Cuadrado	8.8

Top accl with ball

Player	Value
Manuel Akanji	6.3
Dejan Lovren	6.2
Nico Schulz	6.1
Thomas Müller	6.1
Thorgan Hazard	6.1
Alex Sandro	6.1
Raphael Varane	6.0
Alex Oxlade-Chamberlain	6.0
Sadio Mane	6.0
Virgil van Dijk	5.9

Median sprint speed with ball

Player	Value
Federico Valverde	9.1
Kingsley Coman	9.0
Neco Williams	8.9
Virgil van Dijk	8.3
Thorgan Hazard	8.3
Achraf Hakimi	8.2
Aymeric Laporte	8.2
Robert Lewandowski	8.1
Lautaro Martinez	8.0
Benjamin Pavard	8.0

Median ball hold duration

Player	Value
Stefan de Vrij	1.4
Mattia De Sciglio	1.4
Alessandro Bastoni	1.4
Virgil van Dijk	1.5
Jérôme Boateng	1.5
Luiz Fernandinho	1.6
Aymeric Laporte	1.7
Raphael Varane	1.7
John Stones	1.8
Gerard Pique	1.8

Defensive phase running

Top speed in defensive phase

Player	Value
Alphonso Davies	10.4
Thomas Müller	10.3
Mohamed Salah	9.8
Benjamin Pavard	9.8
Milan Skriniar	9.7
Robert Lewandowski	9.7
Achraf Hakimi	9.7
Leon Goretzka	9.6
Kyle Walker	9.6
Nico Schulz	9.6

Top accl in defensive phase

Player	Value
Kevin de Bruyne	7.6
Marcelo Brozovic	7.5
Raheem Sterling	7.2
Andrew Robertson	7.1
Blaise Matuidi	6.7
Dejan Lovren	6.7
Serge Gnabry	6.7
Raphael Guerreiro	6.6
Federico Valverde	6.5
Leon Goretzka	6.5

Median sprint speed in defensive phase

Player	Value
Gabriel Jesus	8.2
Axel Witsel	8.2
Robert Lewandowski	8.2
Giovanni Reyna	8.2
Dejan Lovren	8.0
Alex Oxlade-Chamberlain	8.0
Manuel Akanji	7.9
John Stones	7.9
Aymeric Laporte	7.9
Alphonso Davies	7.9

1. What are the pros and cons of this definition?

I didn't use a single definition; instead tried to calculate quickness in a bunch of different ways and in different contexts. However, some of the contexts need much more detailed investigation. Also, one particular aspect of quickness – reflex and response speed – seems hard to measure from this data.

2. Describe your general approach and any difficulties you encountered

Methodology – generate the metrics for each game for all players. When combining, keep only the larger value for players who have played in 2 games. All metrics presented in SI units.
Difficulties – absence of event data makes context hard to understand. Pre-processing using kloppy failed for 2 of the games.

3. What would you do differently if you had more time? More data?

More time would have allowed me to write my own completely independent pre-processor. I did do some pre-processing of the json files separately, but not at the level of kloppy. More time would have allowed to me explore the data in a more detailed fashion and understand certain contexts like defensive tracking back better. More data would have allowed me to create a range of data instead of a single point (max of two games) and show distribution plots. More data also removes outliers and fills up (probably) missing values.

4. How would your approach differ if you had access to a controlled environment and could test players?

Certain metrics required proxies. For e.g. quickness of release. Also, reaction speed/reflex could not be evaluated at all. These can be done better in a controlled environment. Exact sprint distances can be set up (10m,20m etc), zigzag pathways sprinting, turning with and without ball, reacting to turnovers in practice games with GPS tracking data etc.