DISCRETE DEFENSIVE STRATEGIES ON THE PENALTY KILL

Meghan Hall

Ottawa Hockey Analytics Conference

November 16, 2019

@MeghanMHall

YOU'VE PROBABLY HEARD

Goalies are your most important penalty killers

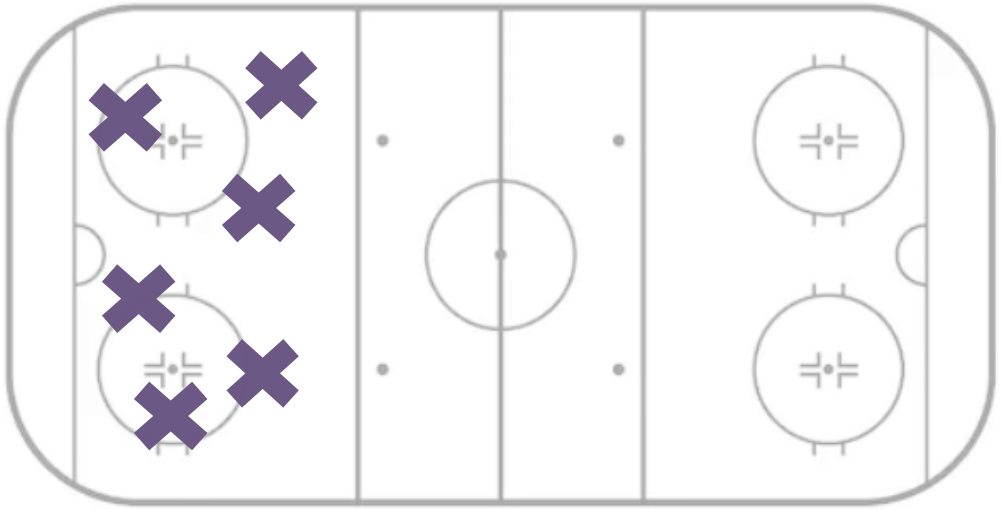
(but not today)

CAN WE AGREE ON A GOOD PK?

Limiting shots and
expected goals

BUT HOW?

1



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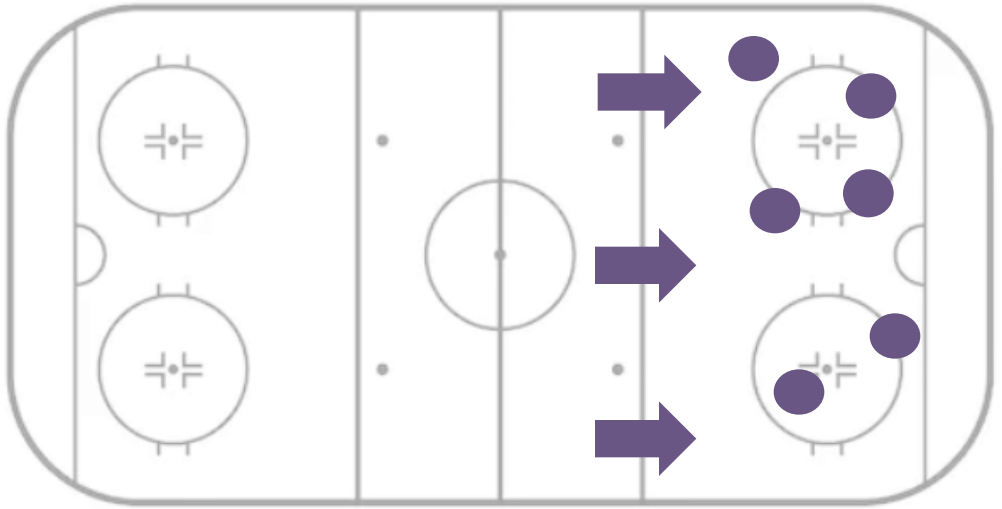

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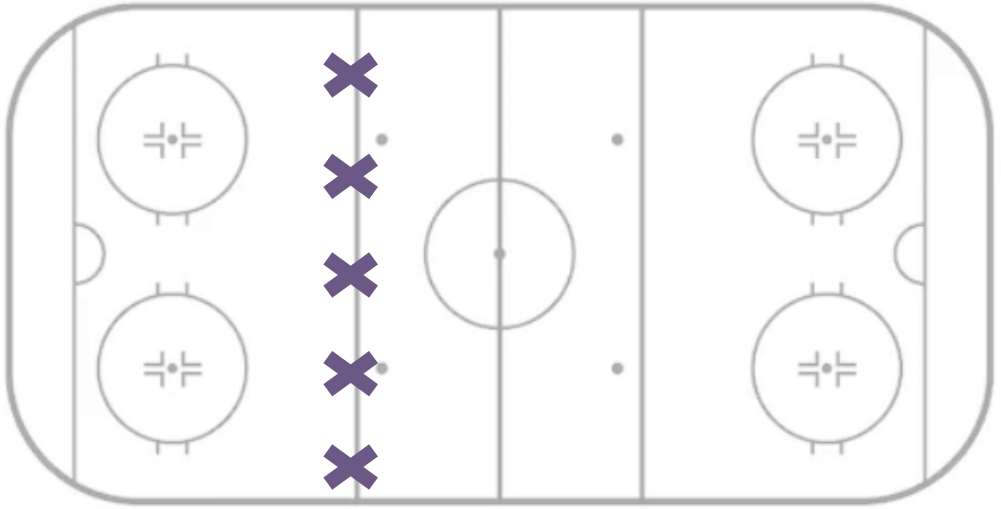

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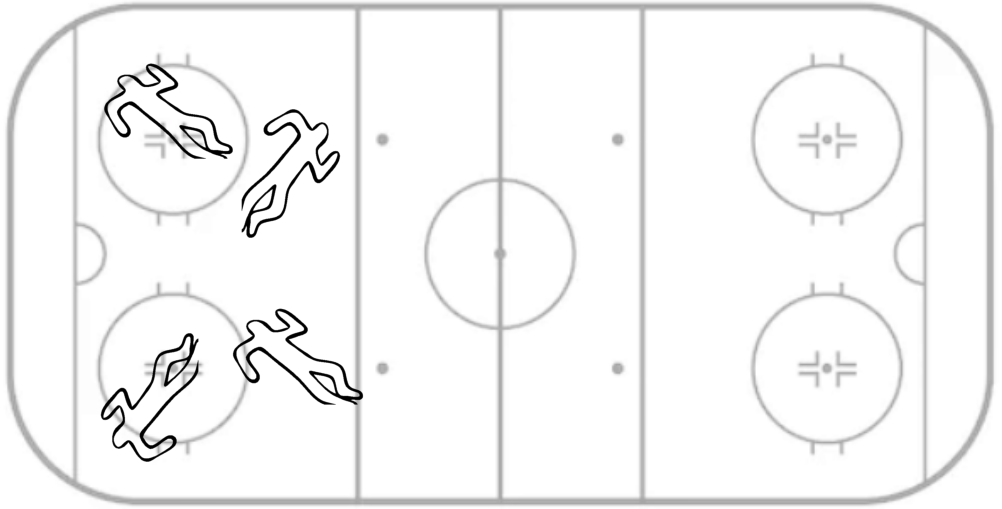
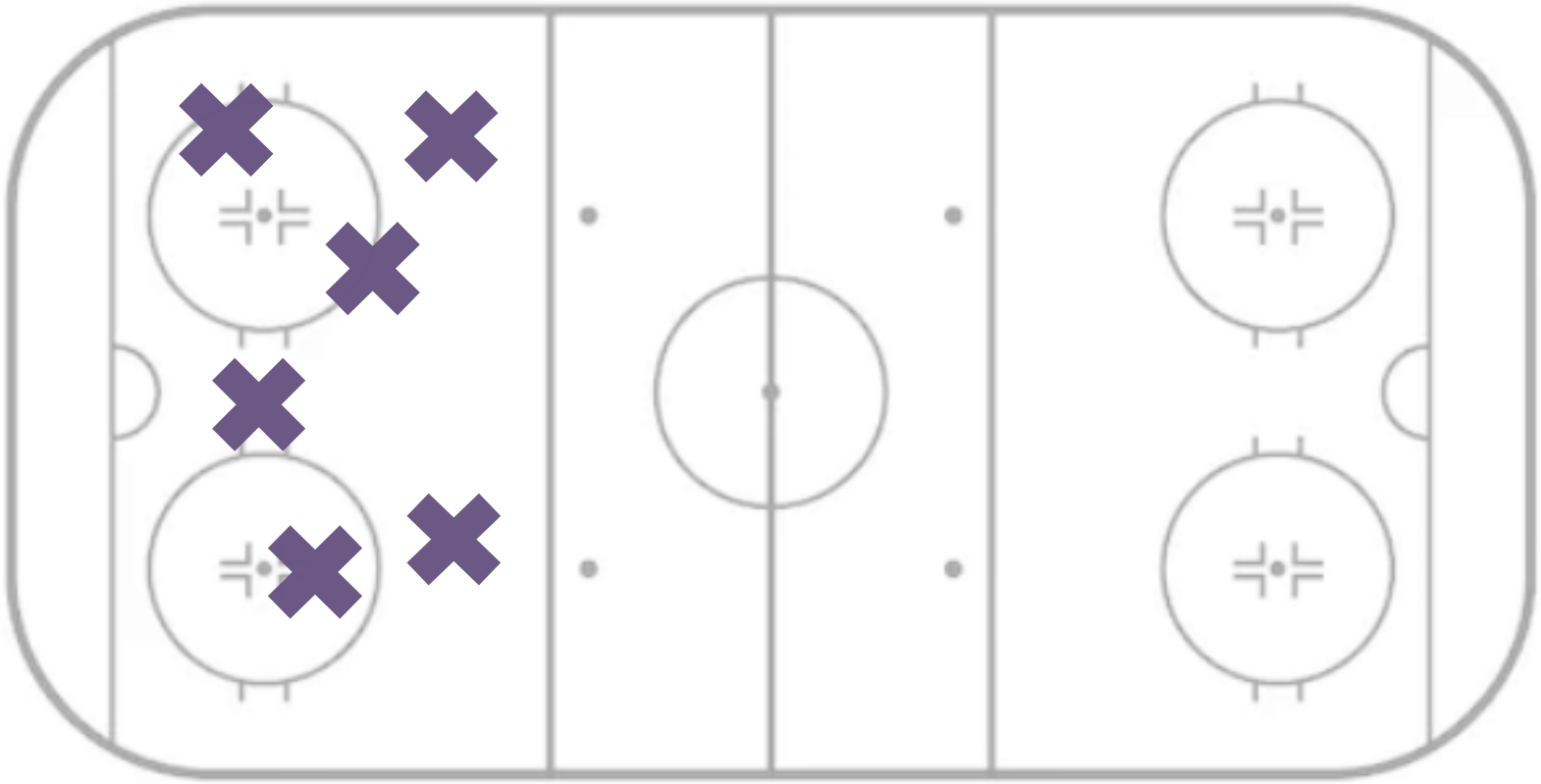


METHOD #1

PK defensive zone

PK offensive zone



METHOD #1

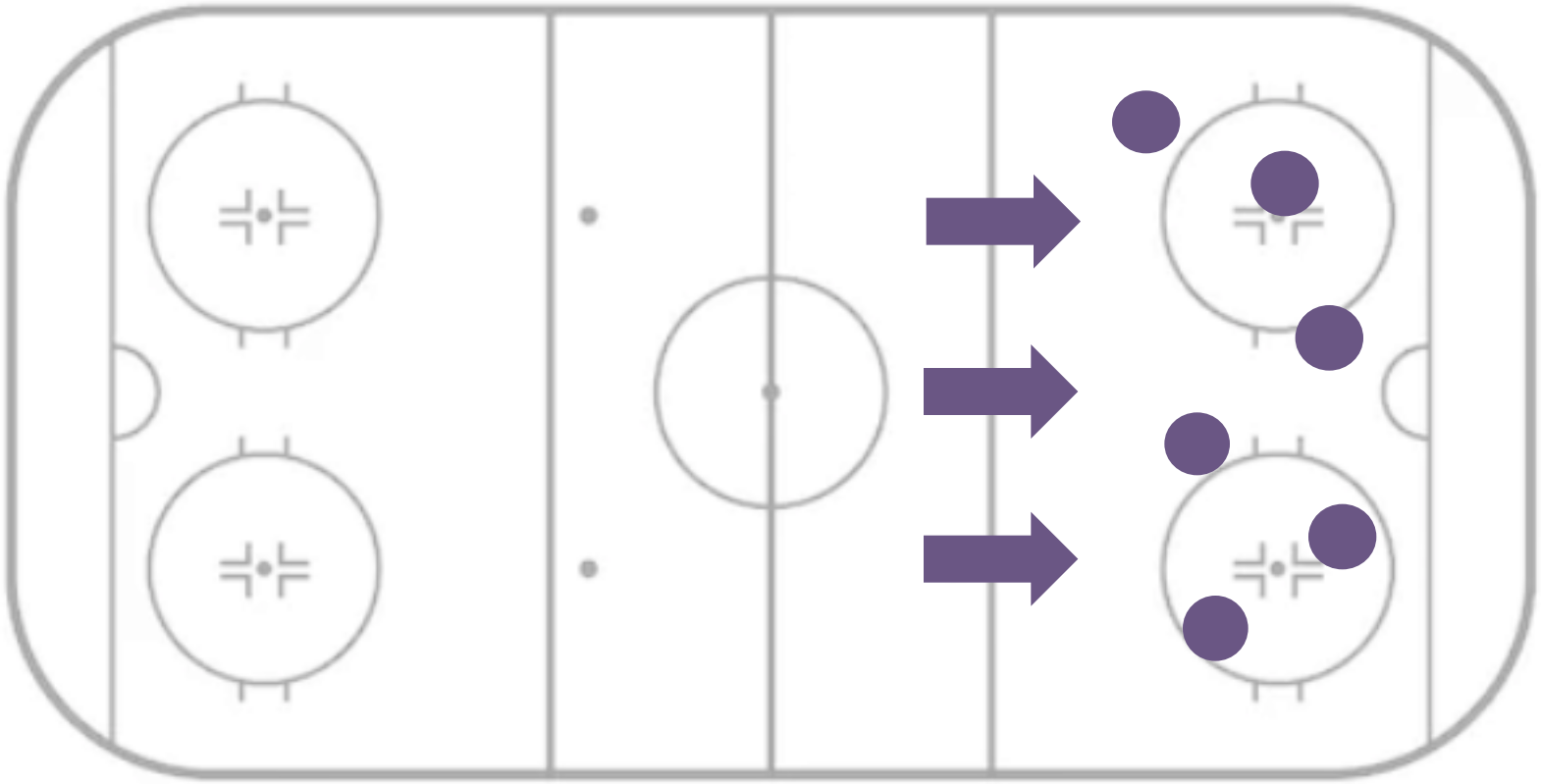
1. Play good defense

Rate of shots and
expected goals allowed
per time in the DZ

METHOD #2

PK defensive zone

PK offensive zone



METHOD #2

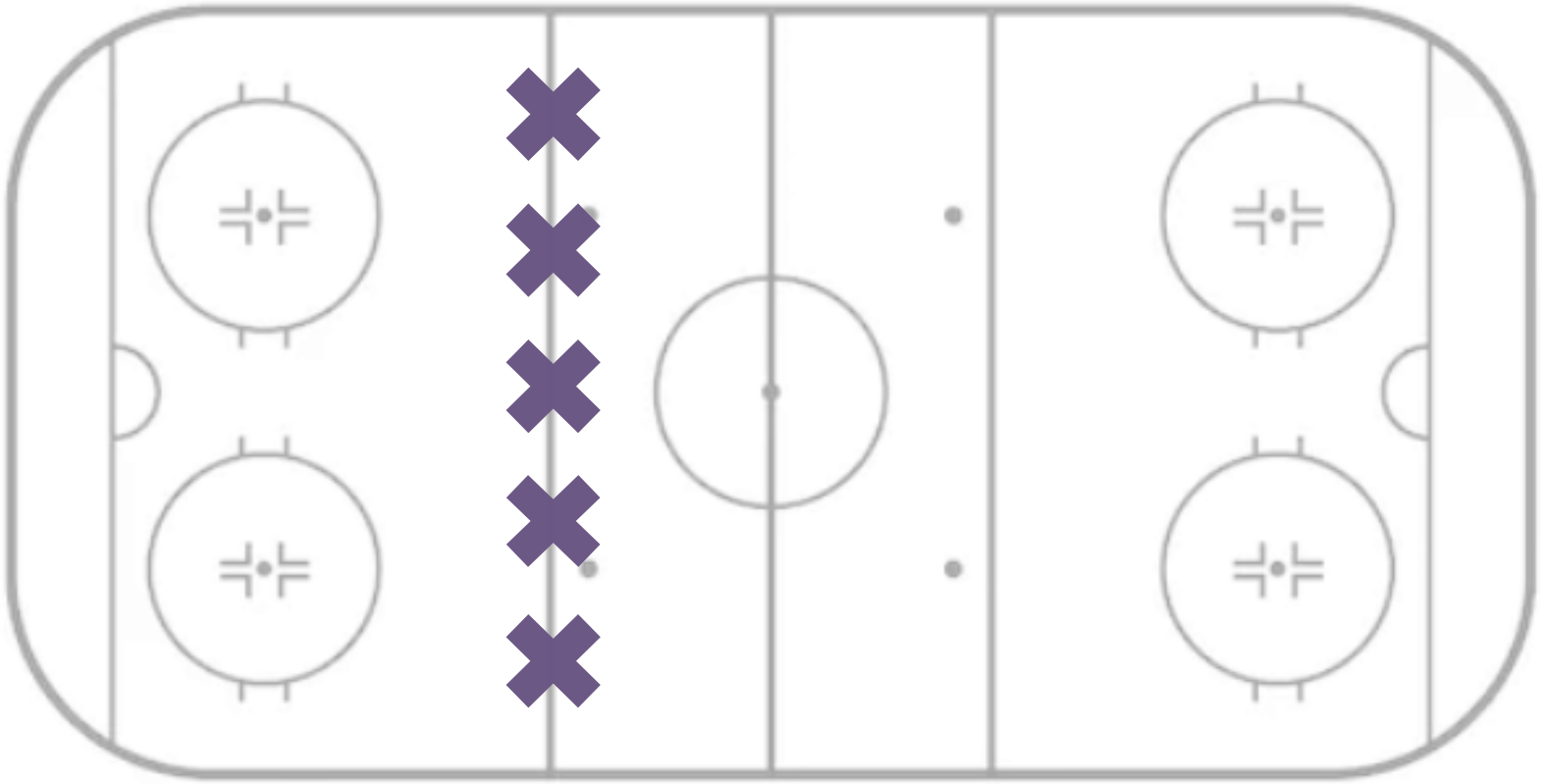
2. Play good offense

Rate of shots and expected goals **generated**

METHOD #3

PK defensive zone

PK offensive zone



METHOD #3

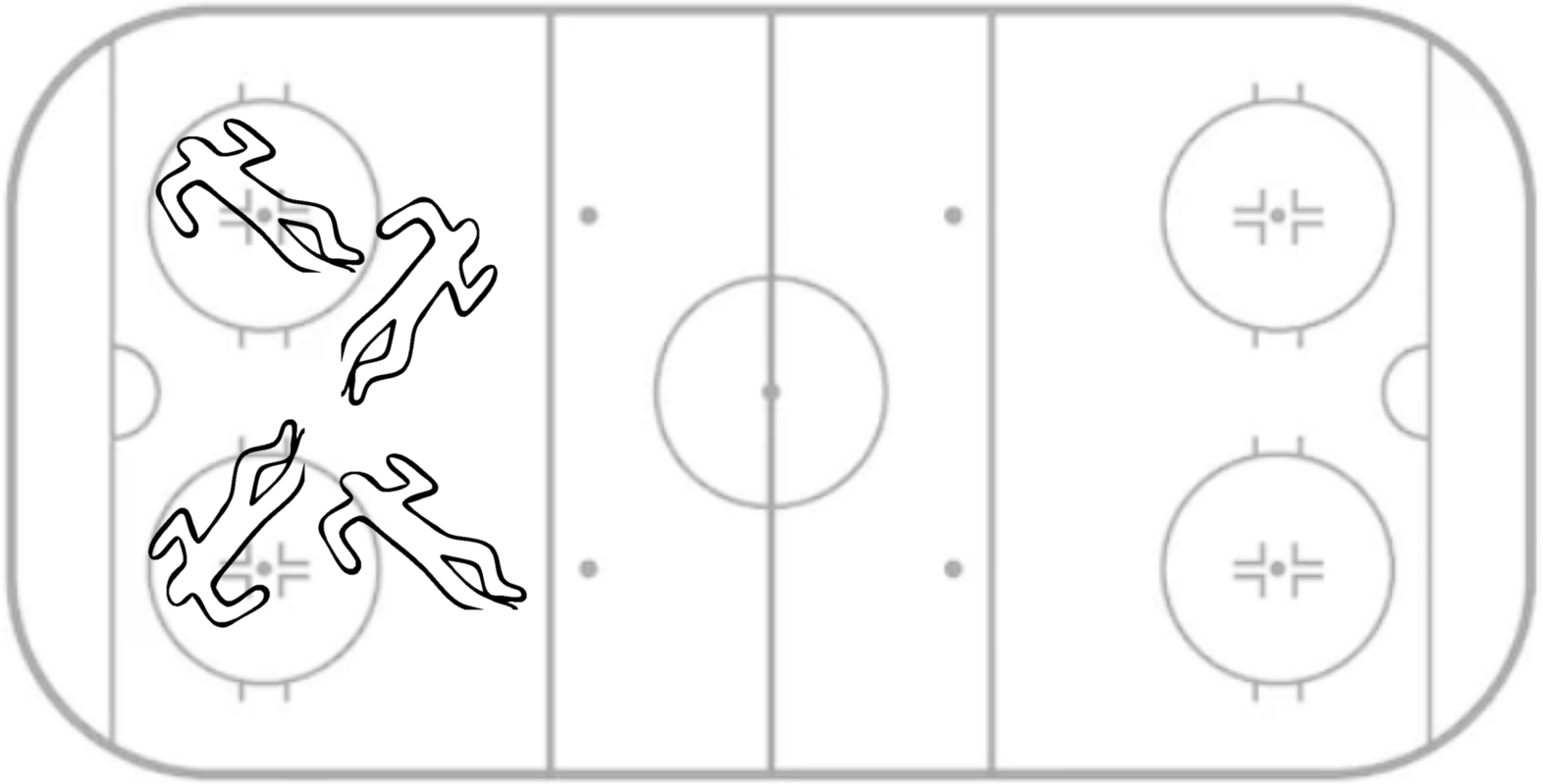
3. Keep the power play out of your zone

Percent of time the power play **doesn't have OZ possession**

METHOD #4

PK defensive zone

PK offensive zone



METHOD #4

4. Kill some rats

METHOD #4

4. Kill some rats

Rate of blocked shots allowed
per time in the DZ

METHOD #5

5. Pray that your goalie saves the day

¯_(ツ)_/¯

DATA COLLECTION PROCESS

2018-19 season

12 teams

1,146 minutes of penalty kills (4v5 only)

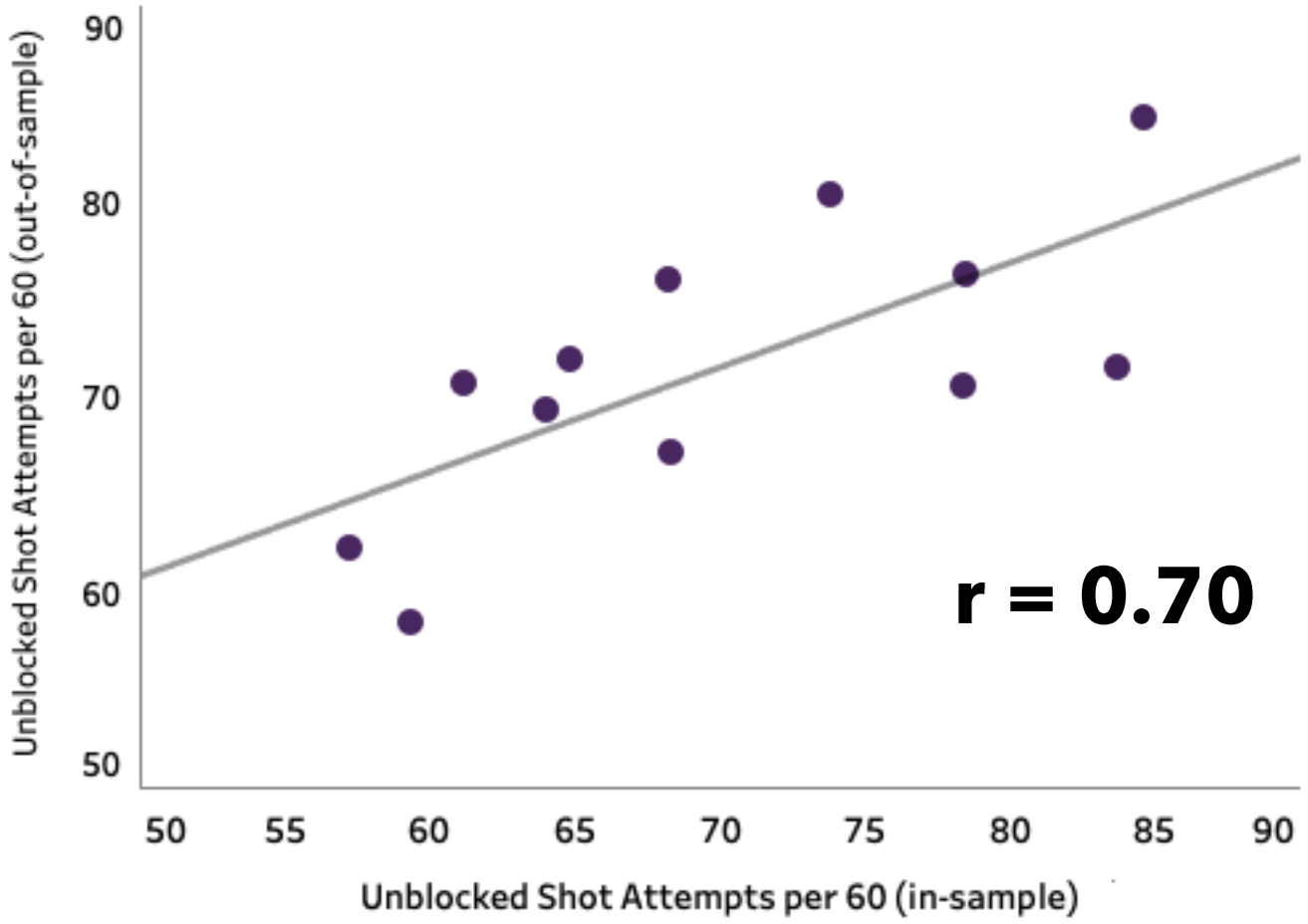
TIME FOR SUPER-FANCY MATH

1,146 minutes / 12 teams = **~95.5 min/team**

All teams averaged 385 4v5 minutes total

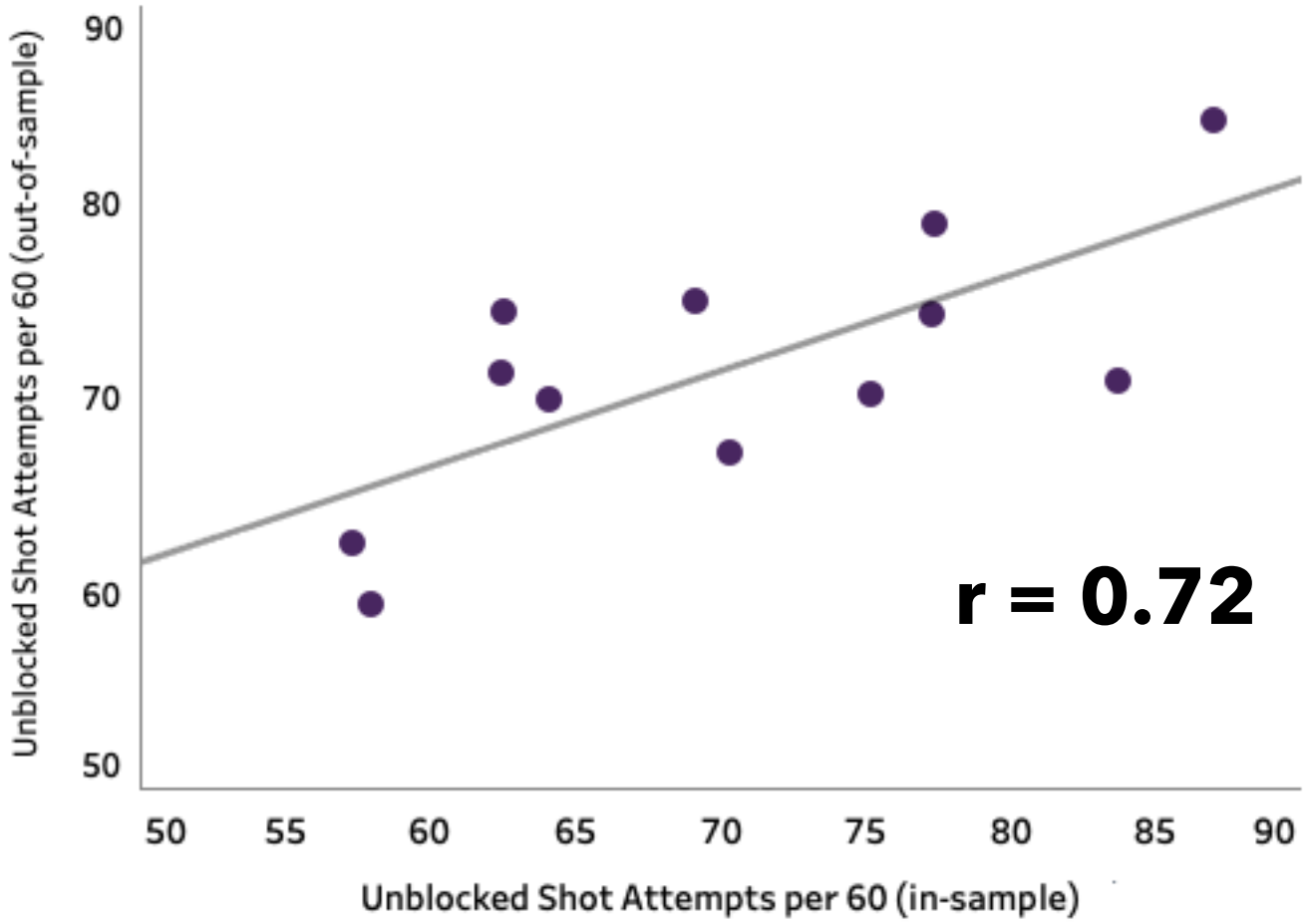
385 / 4 = 96.25 = CLOSE ENOUGH

IS A QUARTER OF A SEASON ENOUGH?



Unblocked shot attempts against per 60, in-sample vs. out-of-sample

IS A QUARTER OF A SEASON ENOUGH?

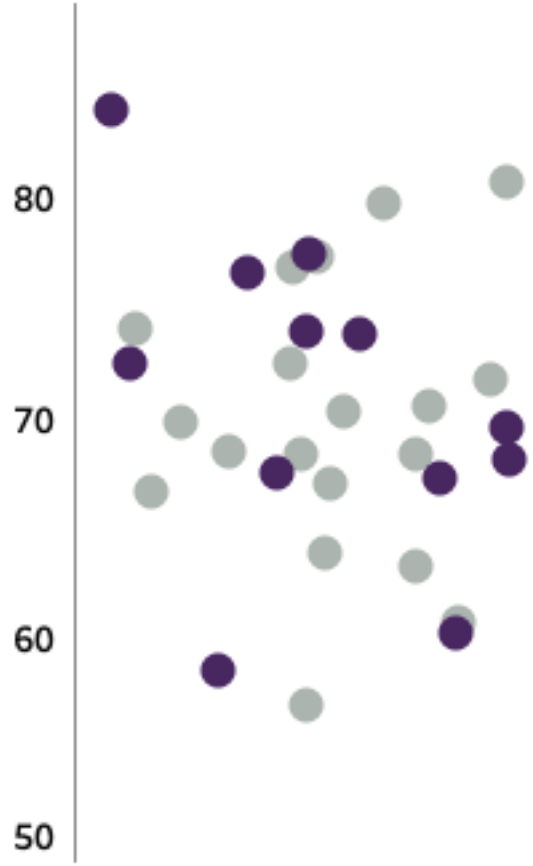


Adjusted unblocked shot attempts against per 60, in-sample vs. out-of-sample

…

Score adjustment
for special teams?

TEAM SELECTION



Unblocked shot attempts AGAINST per 60

Unblocked shot attempts FOR per 60

TEAM SELECTION

Chicago
Colorado
Dallas
Winnipeg
Vegas
Edmonton

New Jersey
NY Islanders
NY Rangers
Philadelphia
Vancouver
Florida

QUESTIONS TO ANSWER

Are these separate skills?

What correlates with shot quantity & quality?

Do teams find success in different ways?

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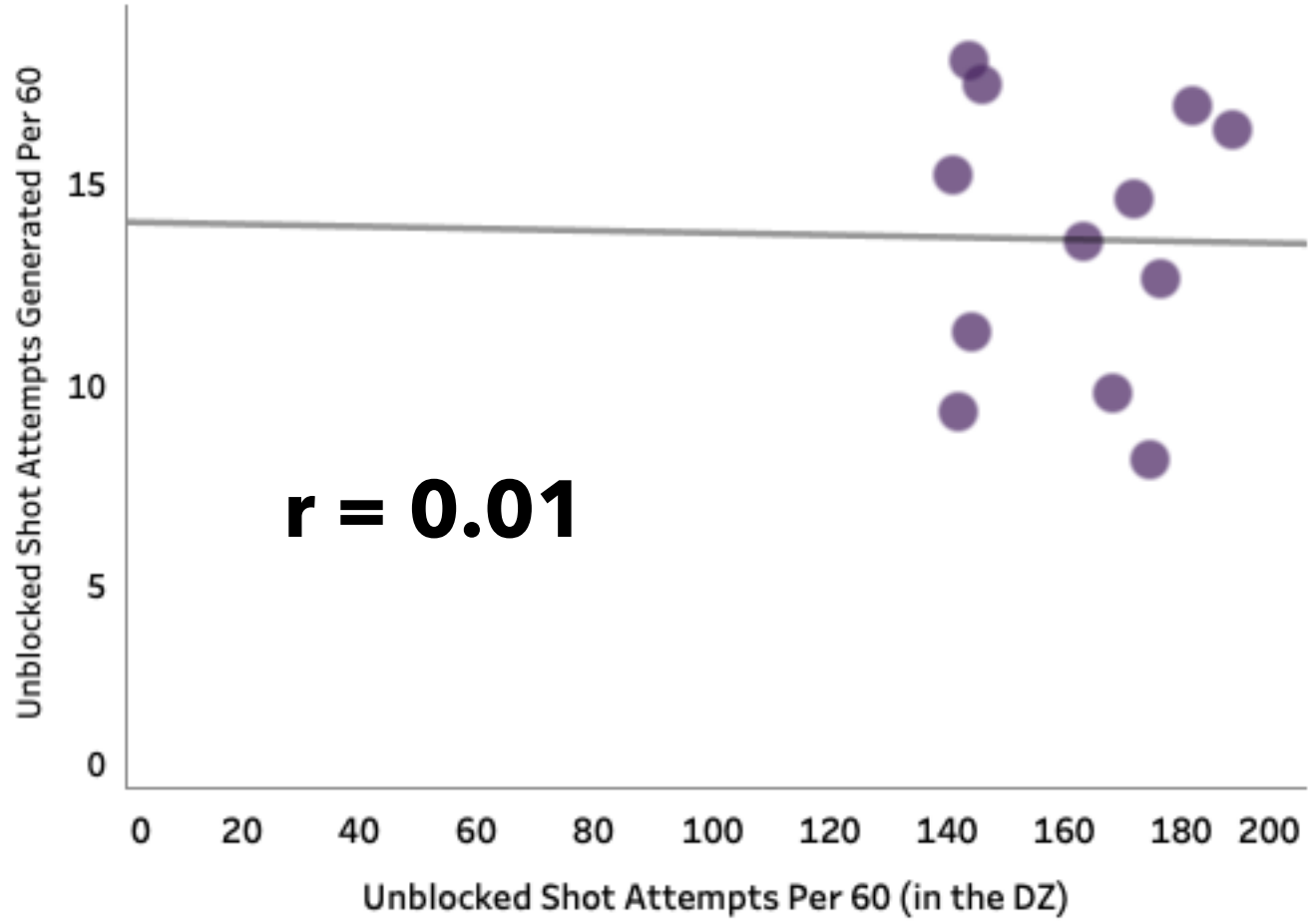
SEPARATE SKILLS

DZ defense

and

shots generated

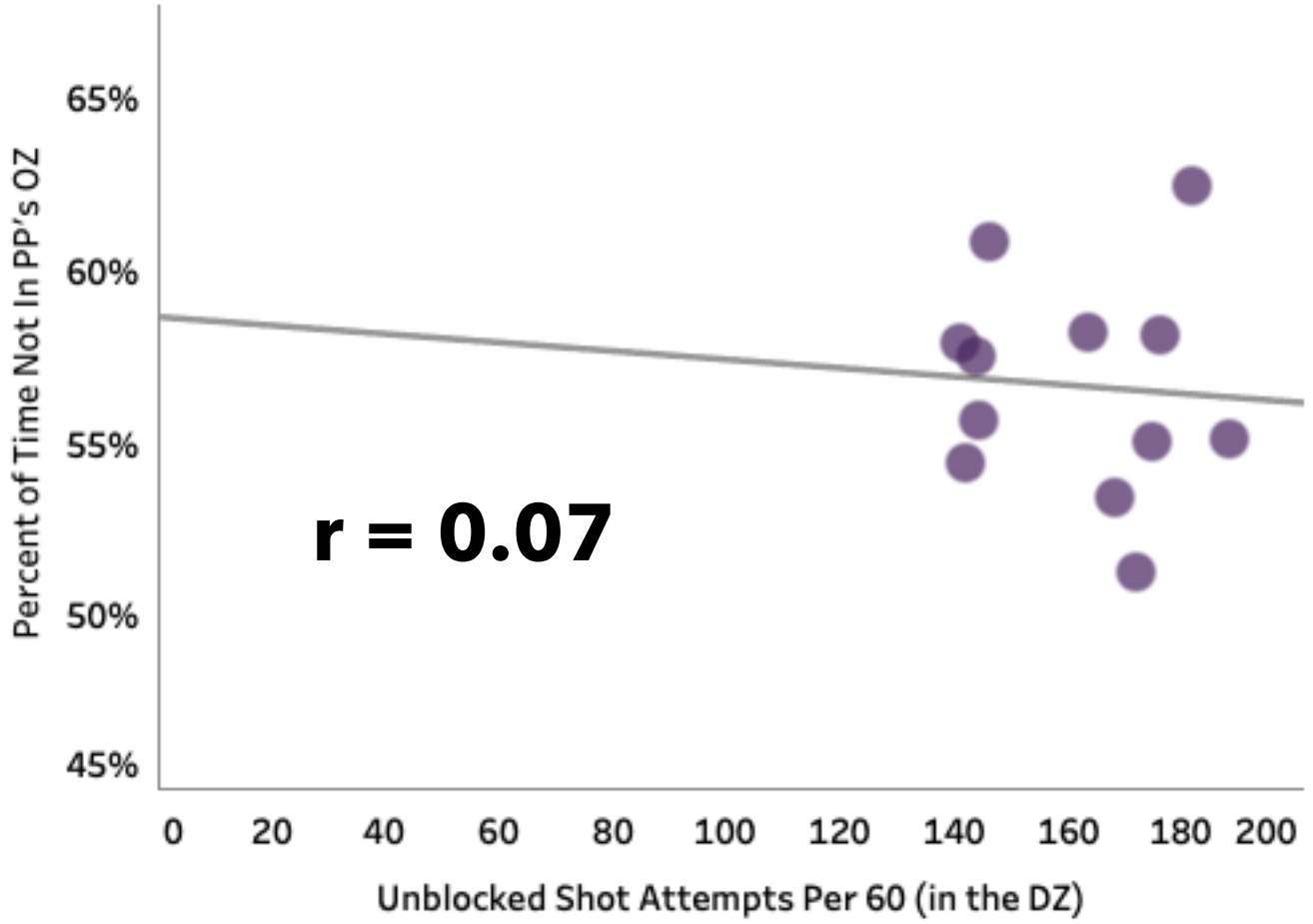


SEPARATE SKILLS

DZ defense

and

time out of the PP OZ



SEPARATE SKILLS

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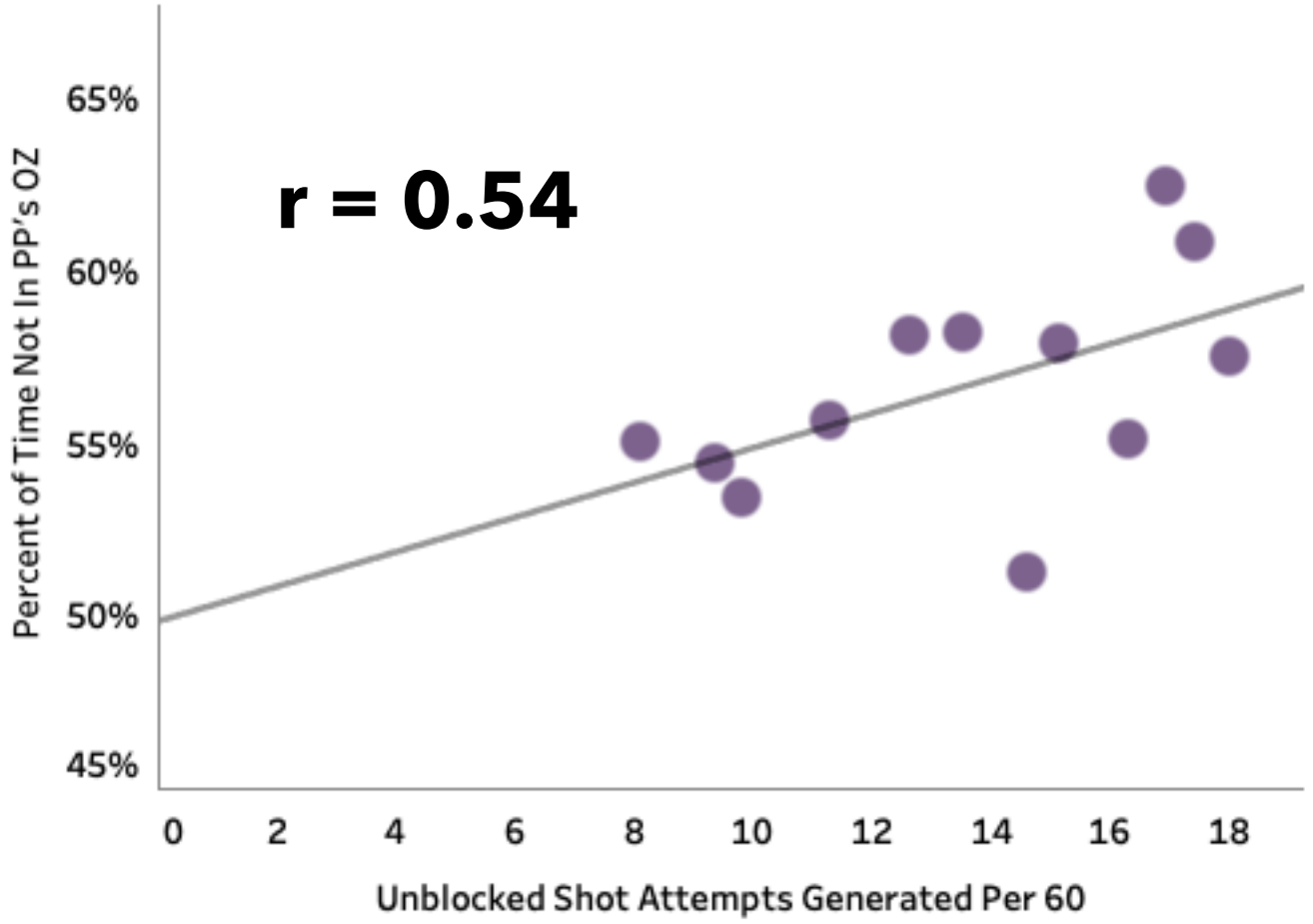
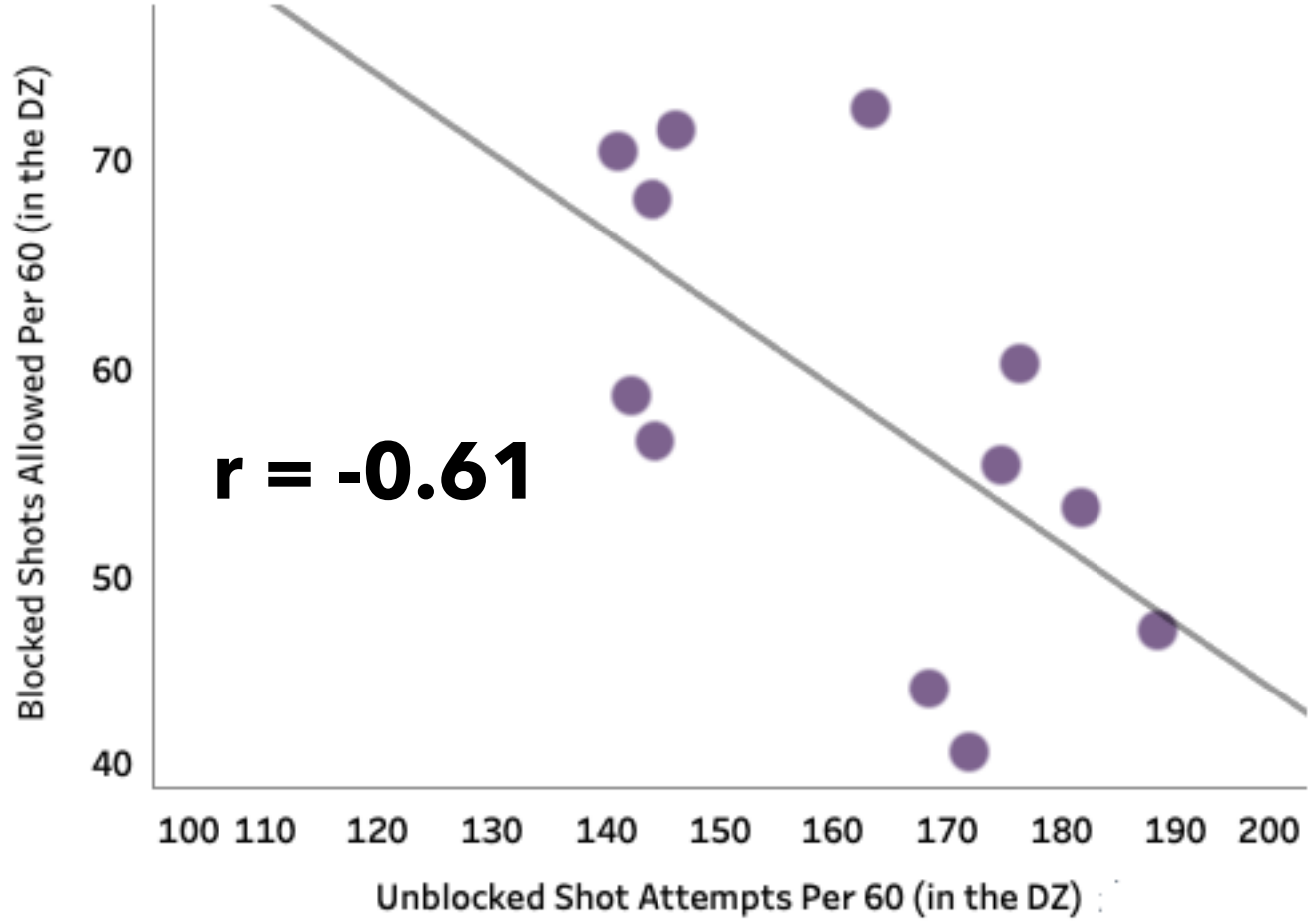


SEPARATE SKILLS

DZ defense

and

blocked shots



QUESTIONS TO ANSWER

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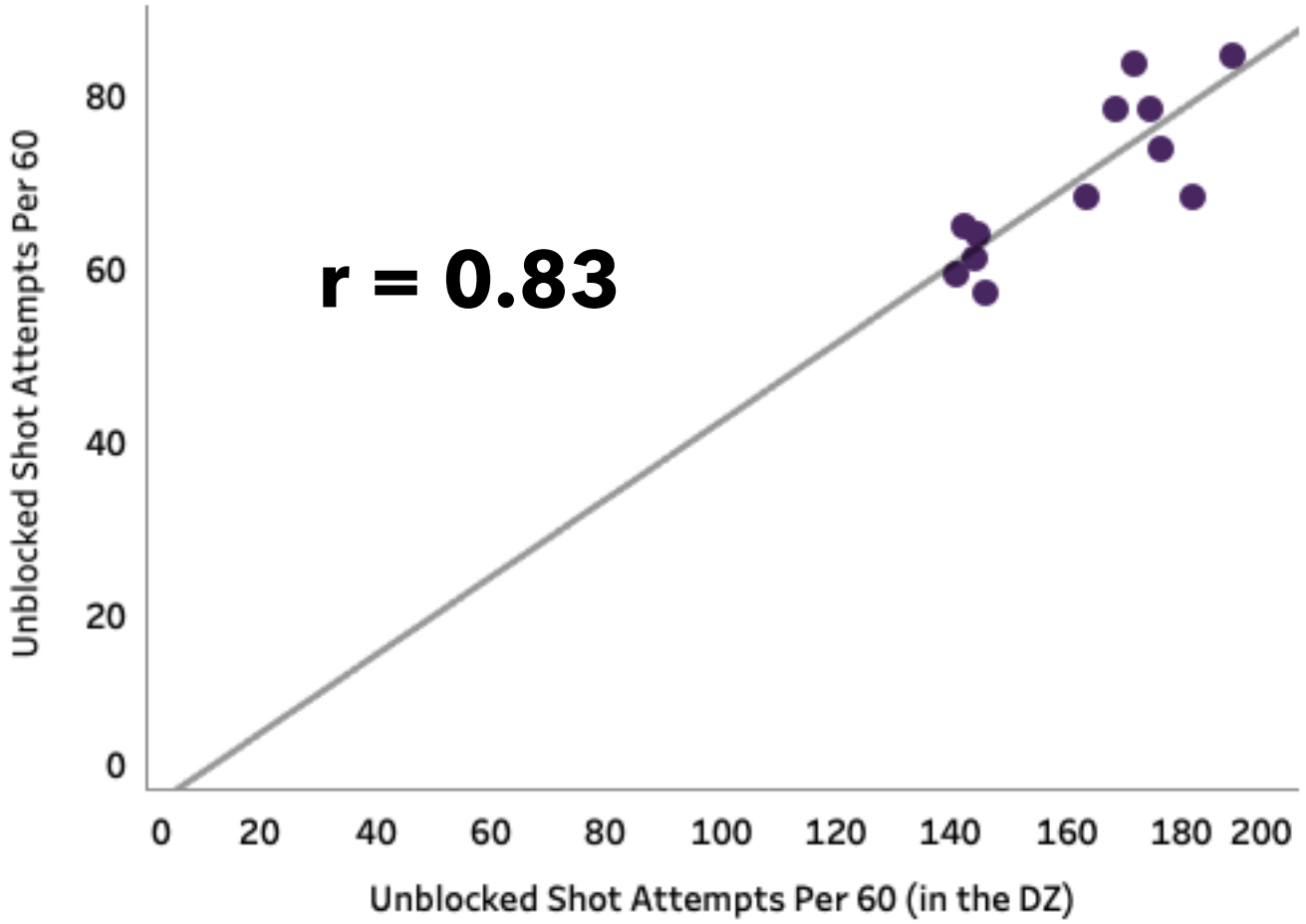
CORRELATIONS

DZ defense

and

unblocked shot rate

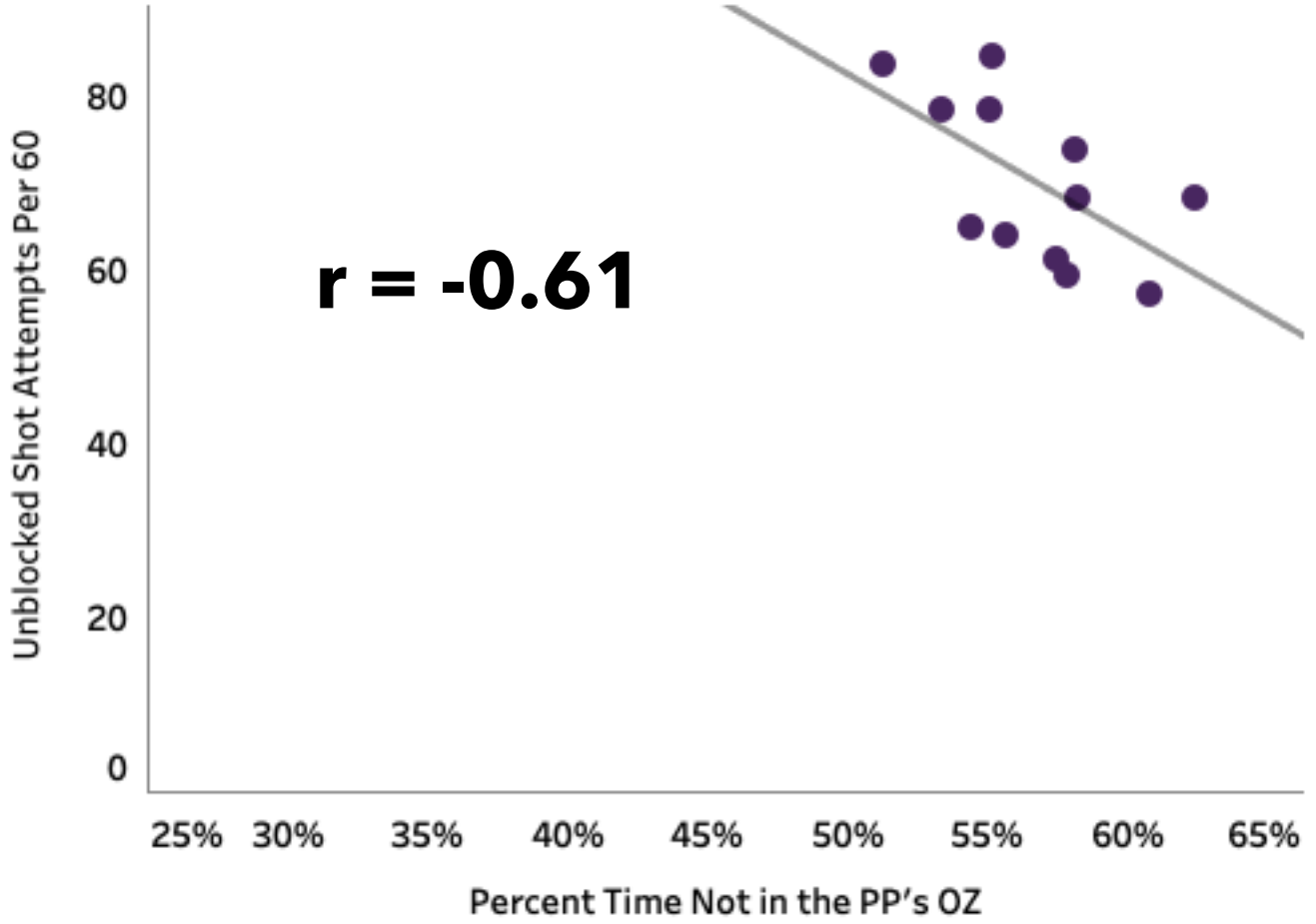


CORRELATIONS

time out of the PP OZ

and

unblocked shot rate

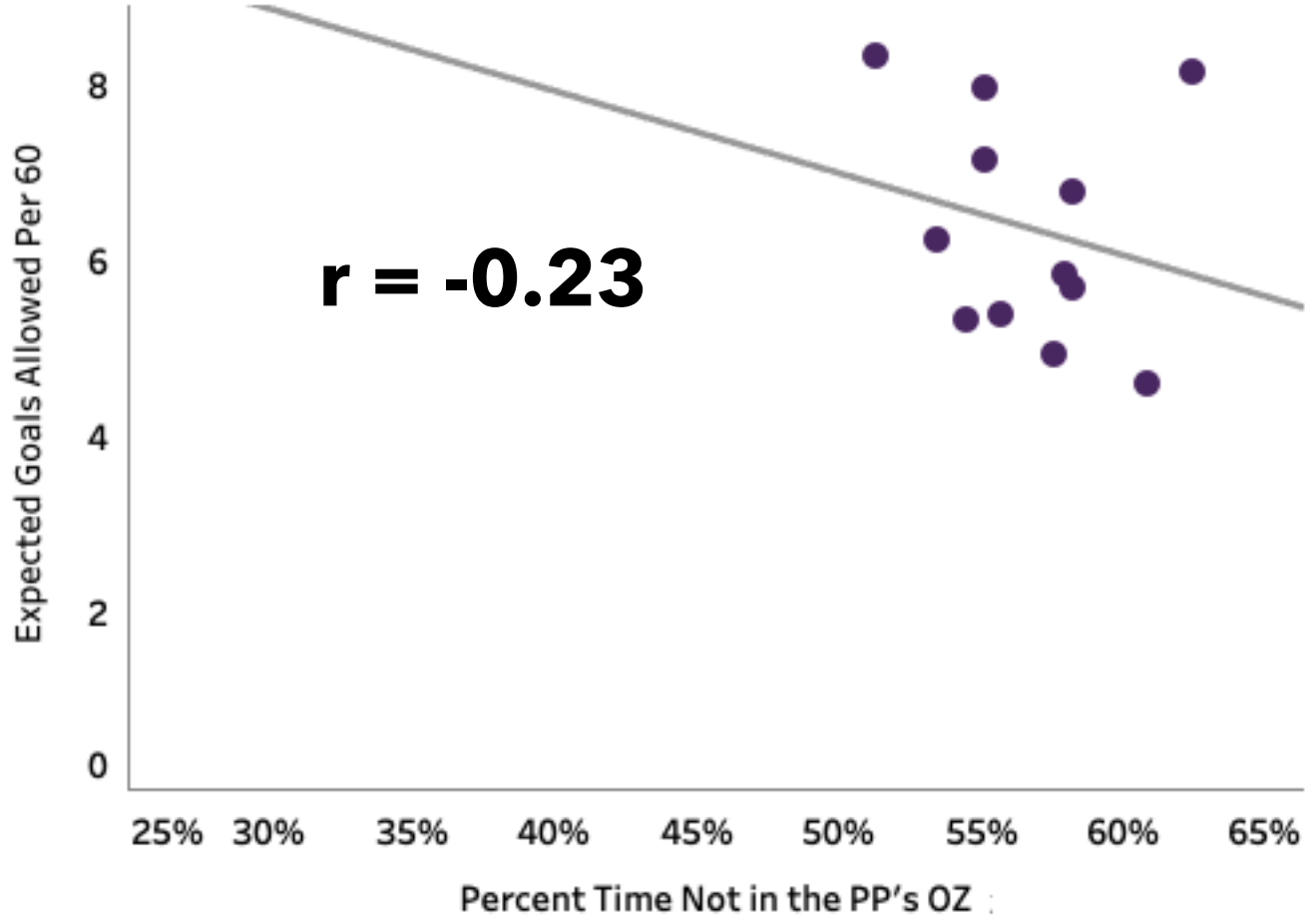


CORRELATIONS

time out of the PP OZ

and

expected goal rate

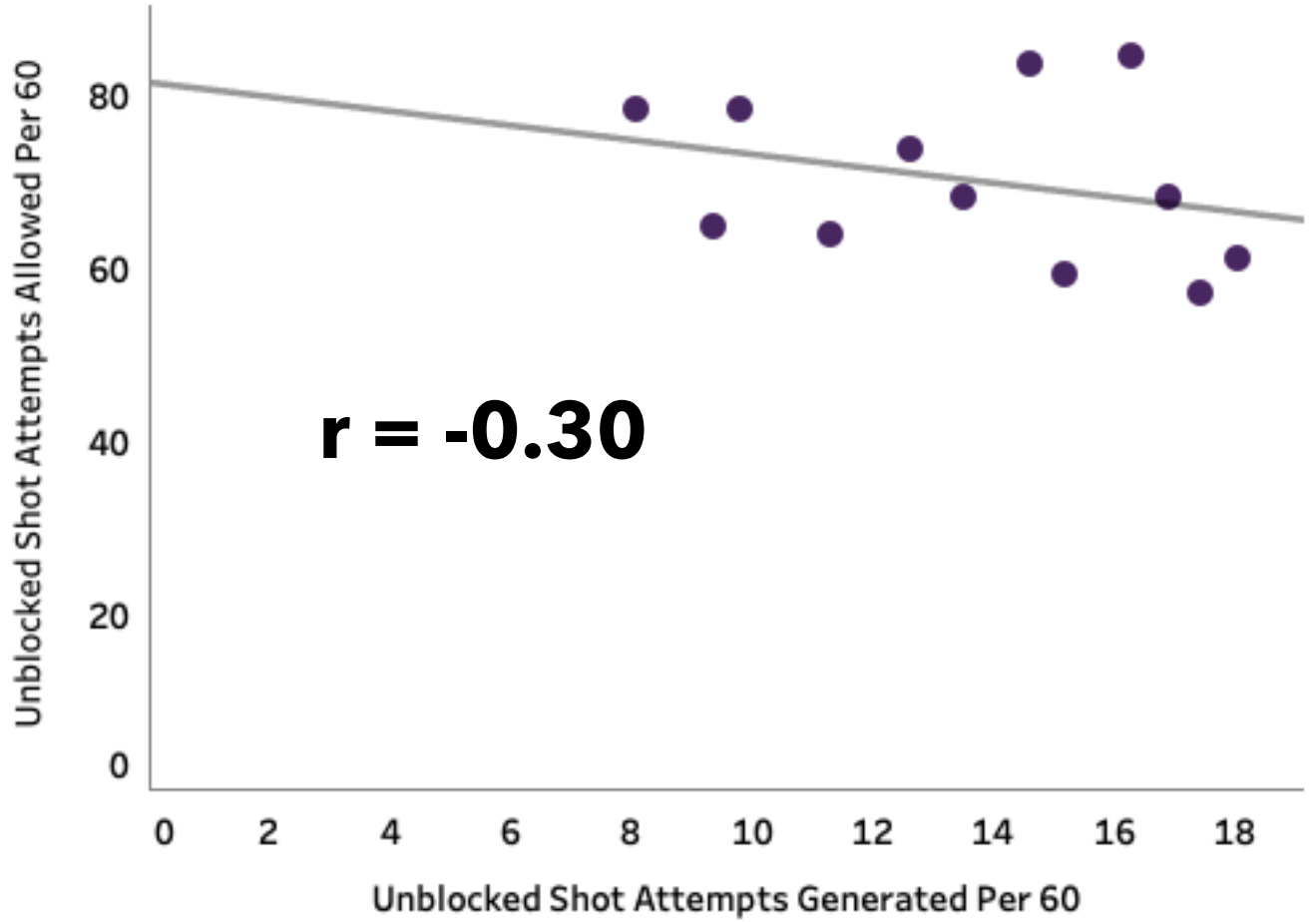


CORRELATIONS

generated shot rate

and

unblocked shot rate

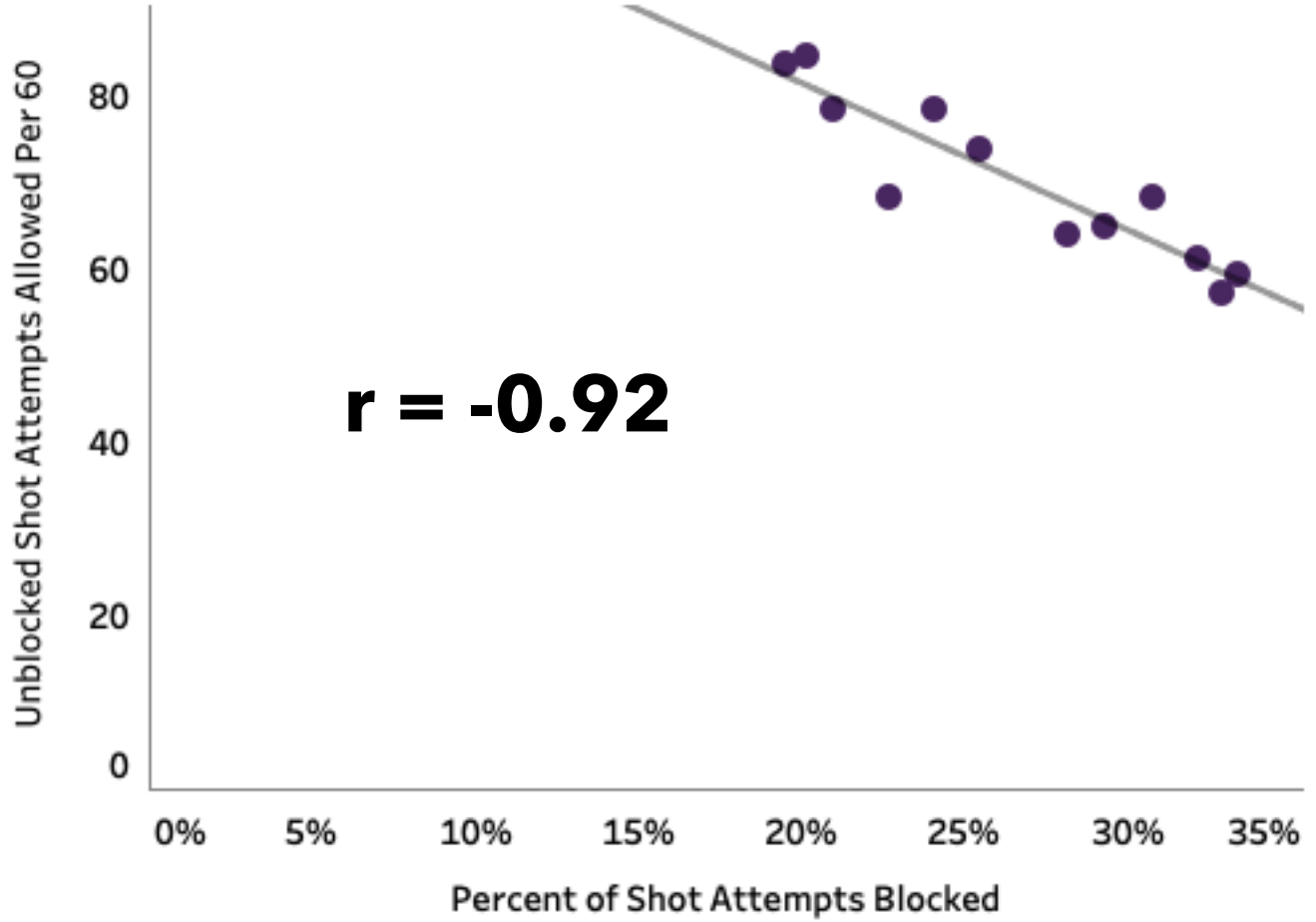


CORRELATIONS

blocked shot %

and

unblocked shot rate



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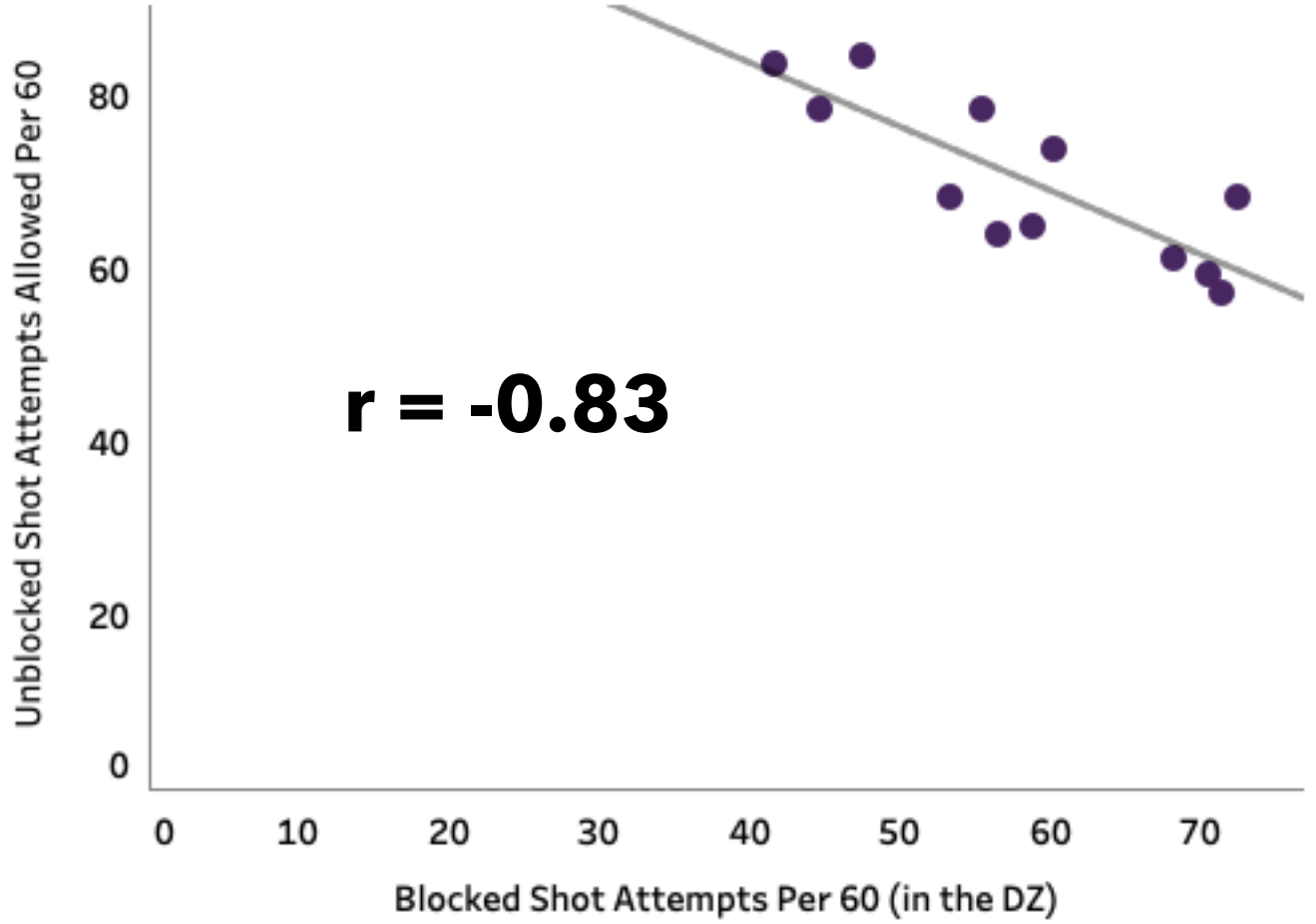

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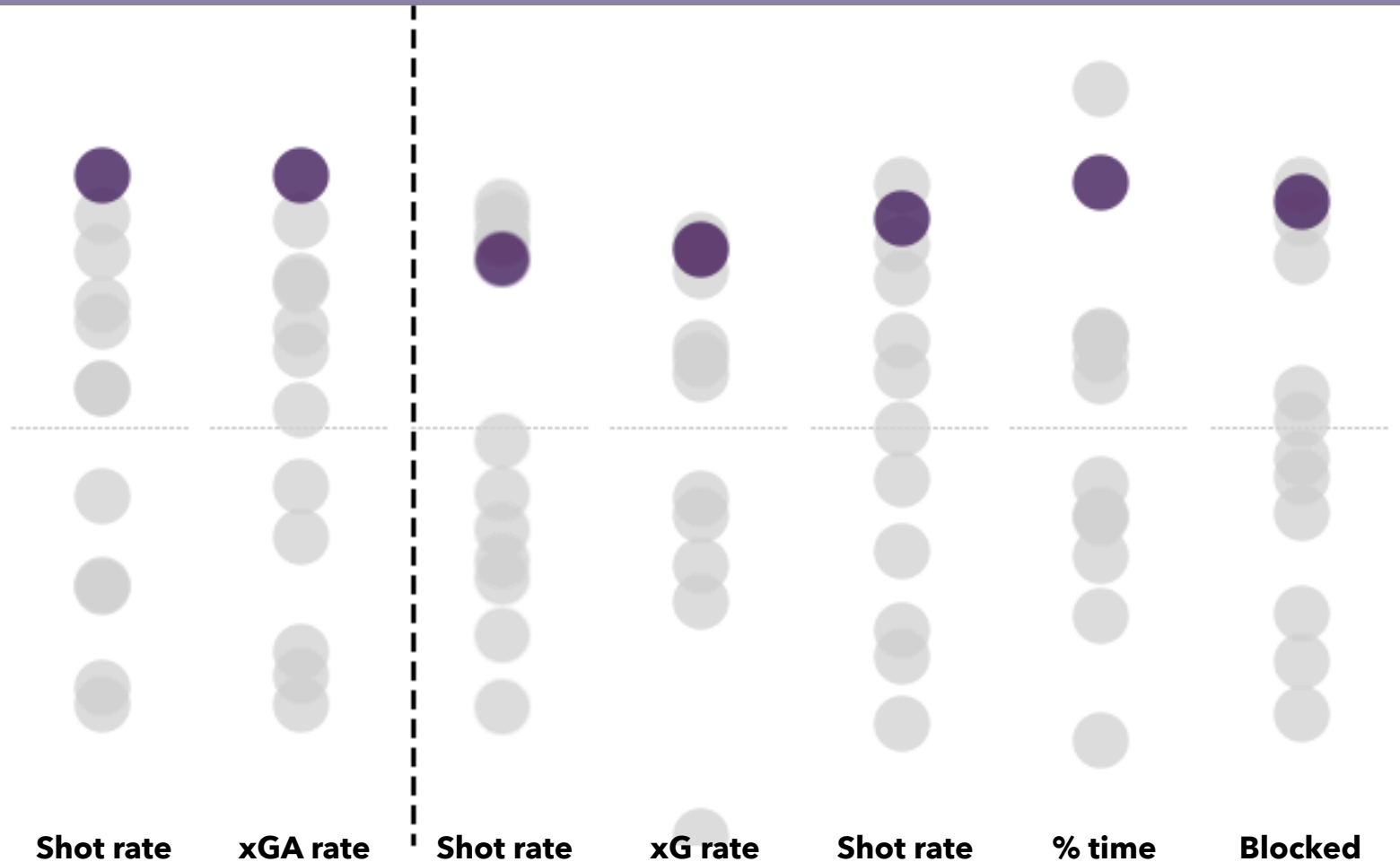
Shot rate against (all)
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Shot rate against (DZ)
xG rate against (DZ)
Shot rate for
% time not in PP OZ
Blocked shot rate (DZ)

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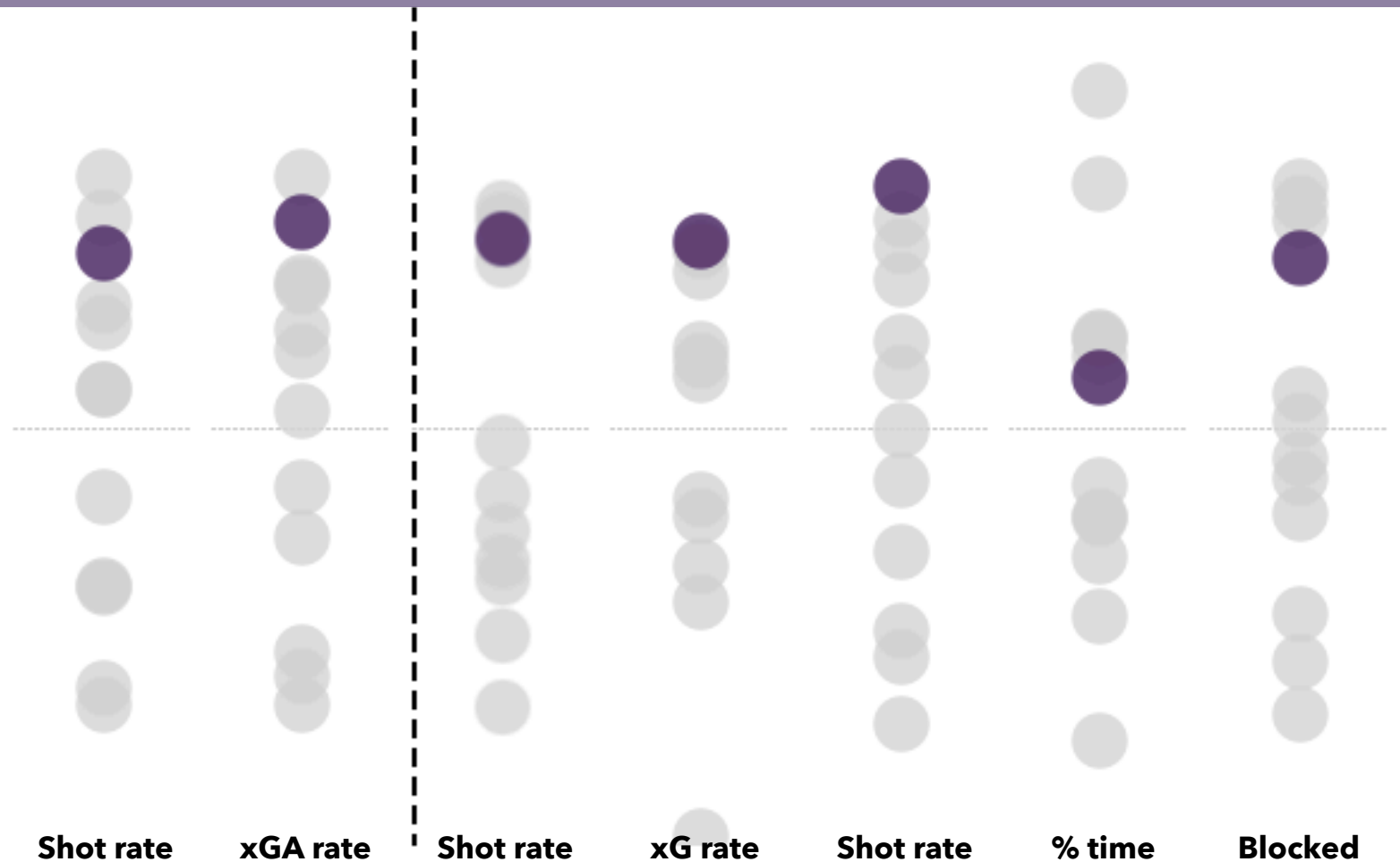
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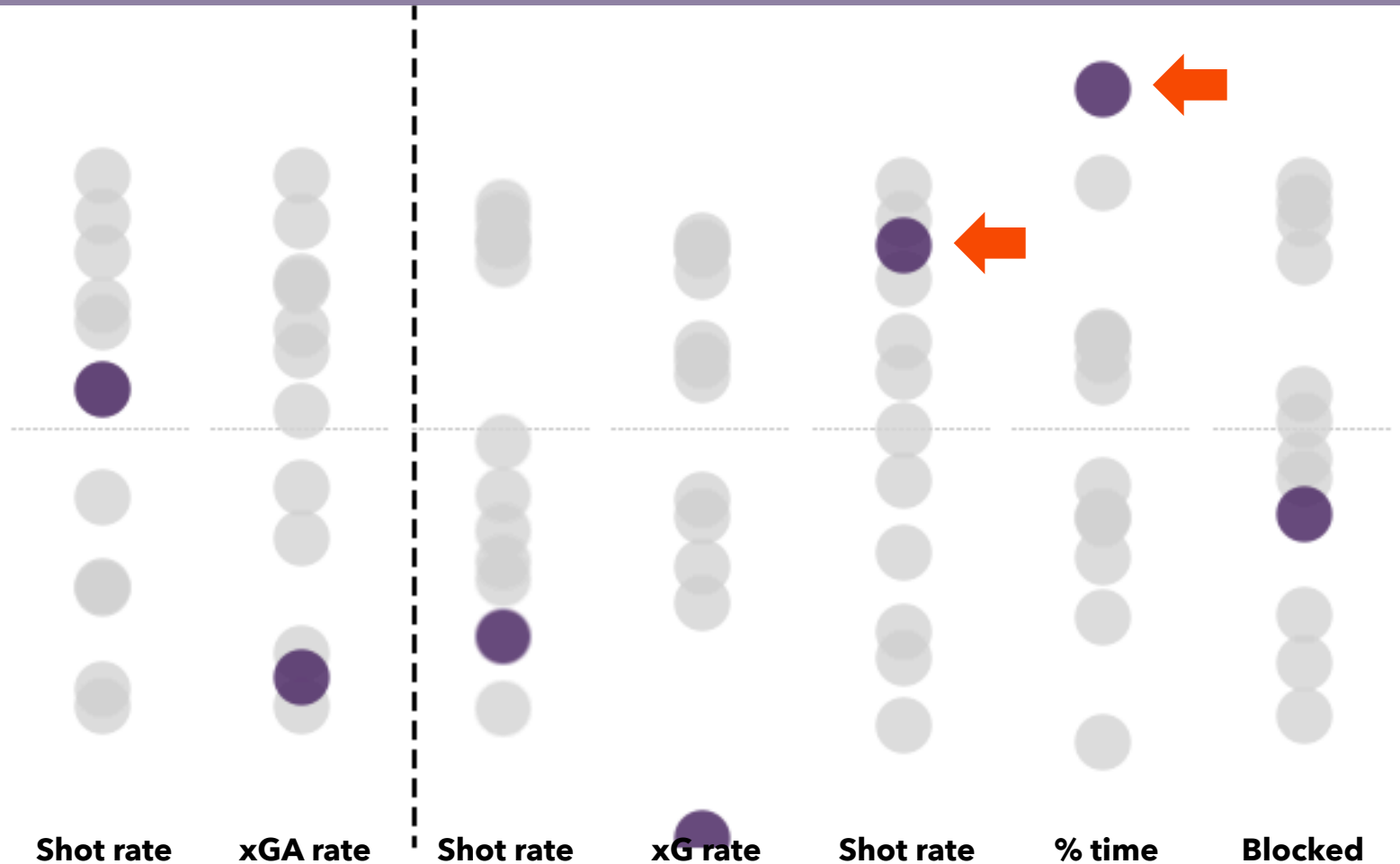
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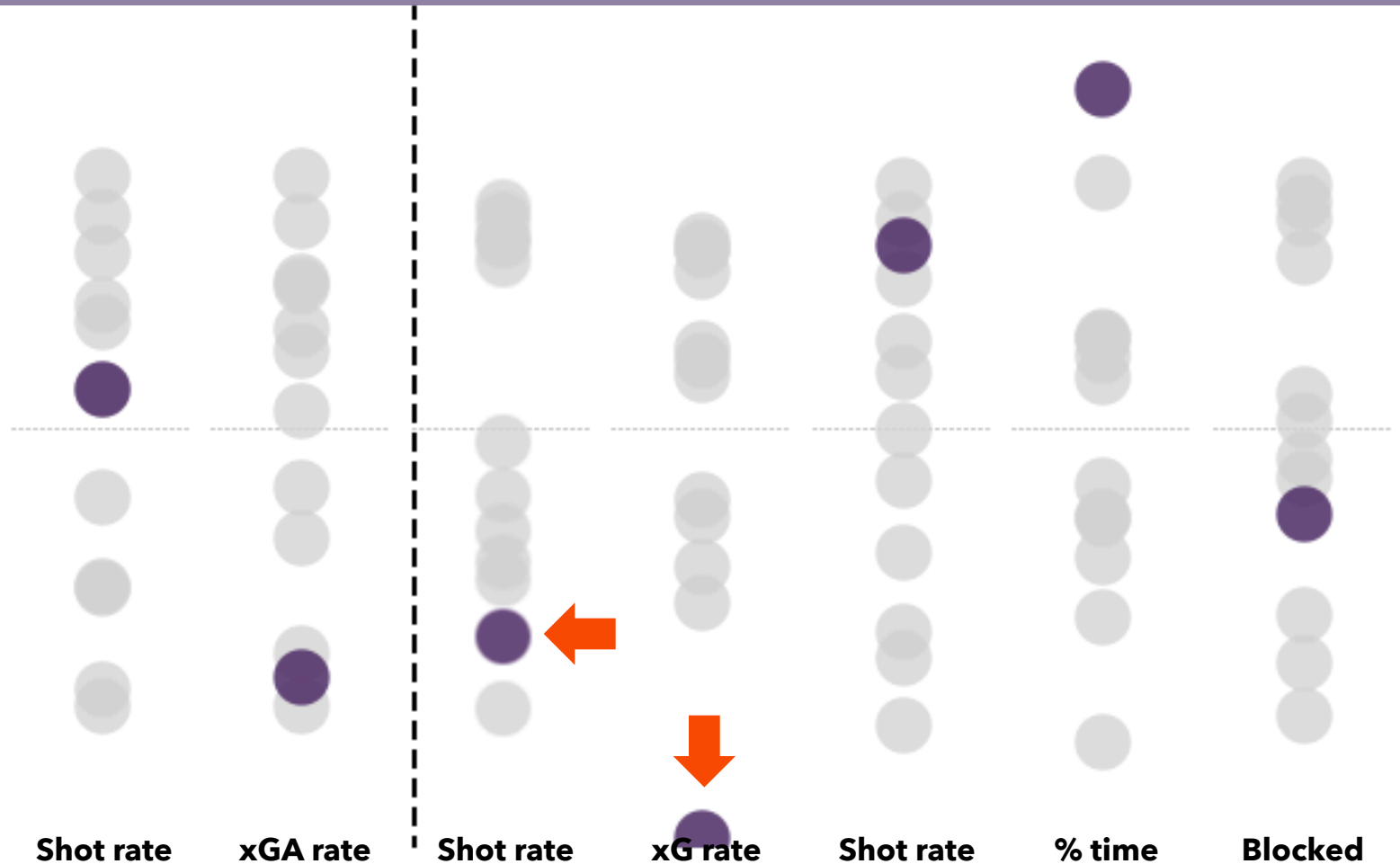
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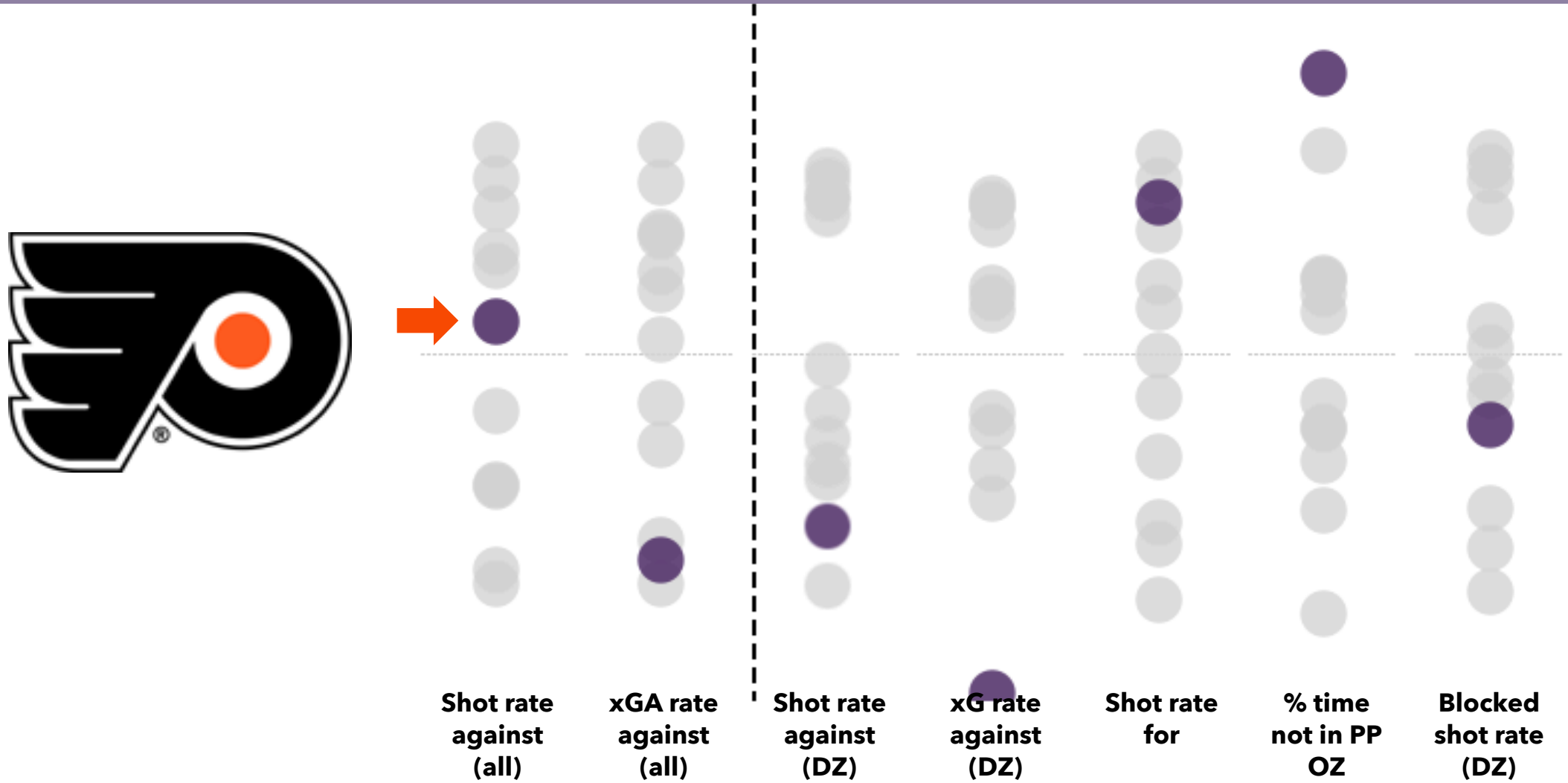
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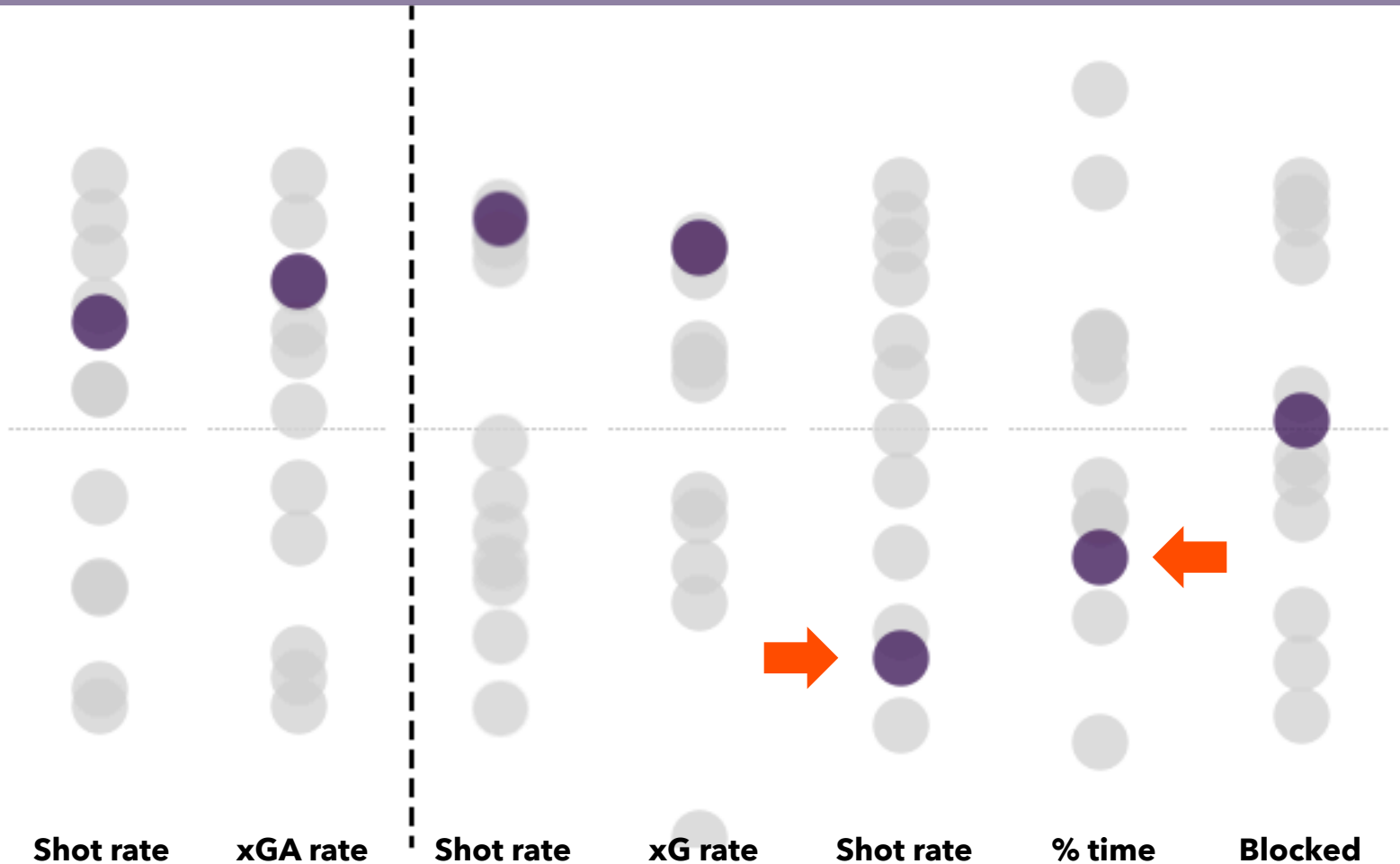
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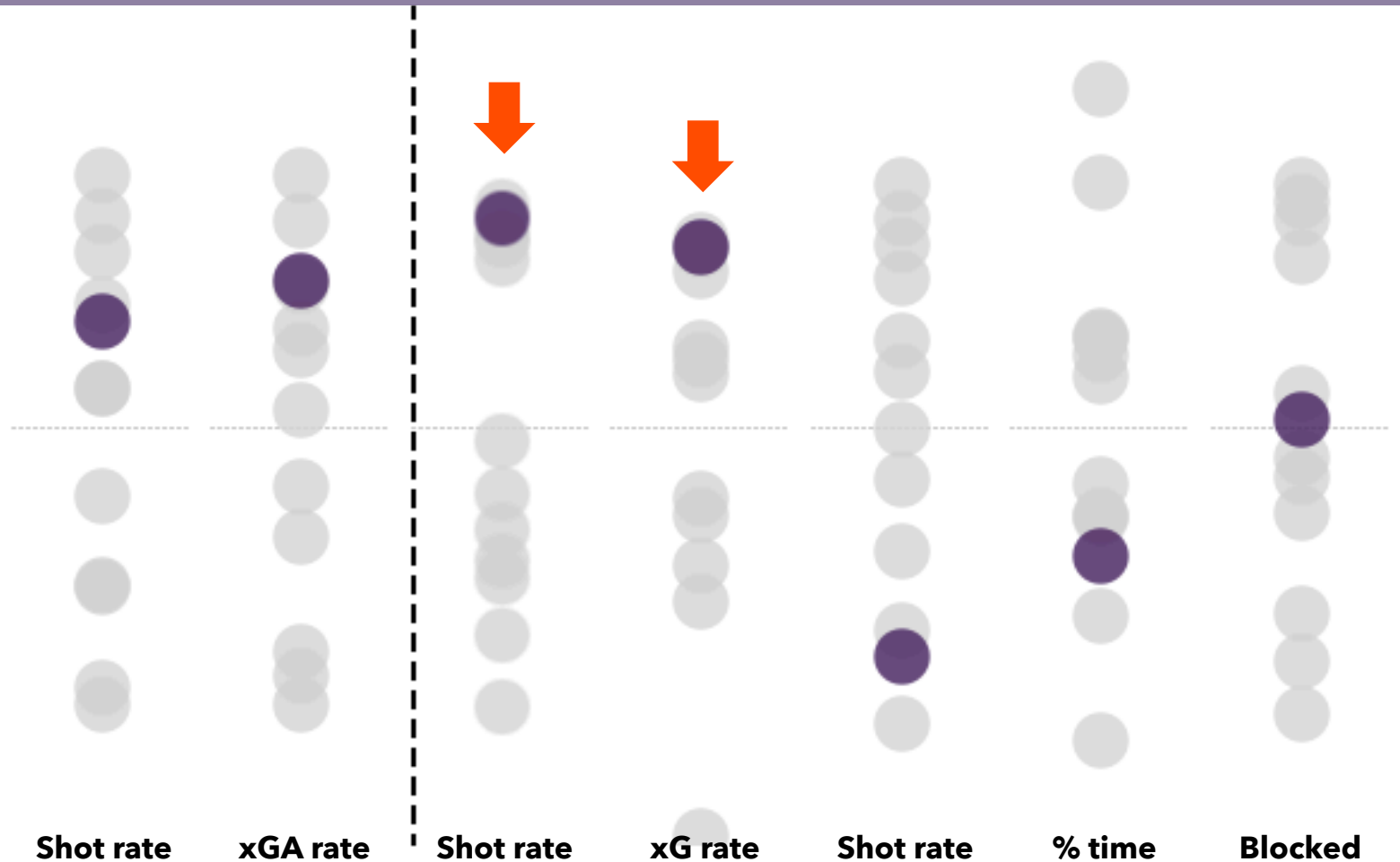
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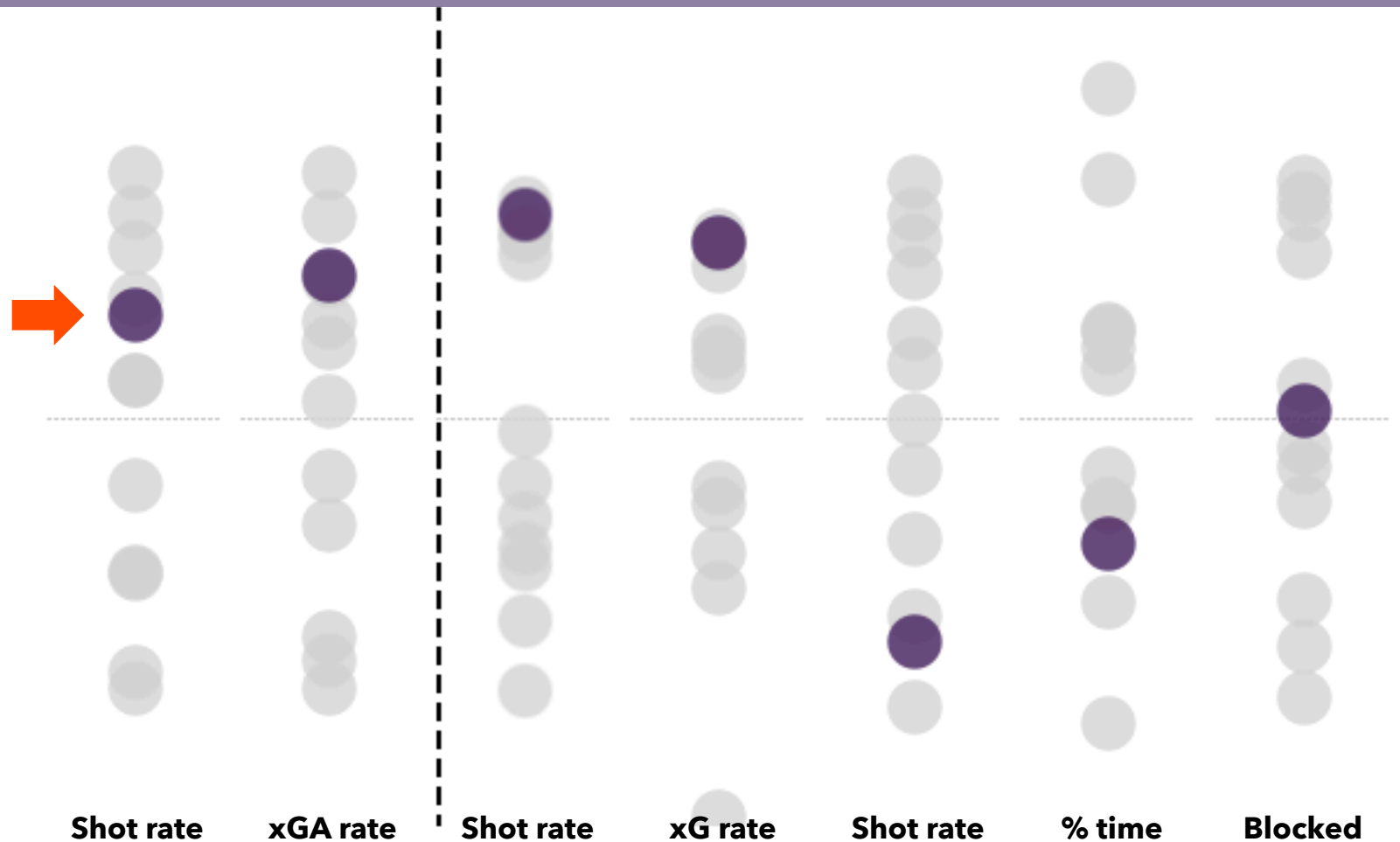
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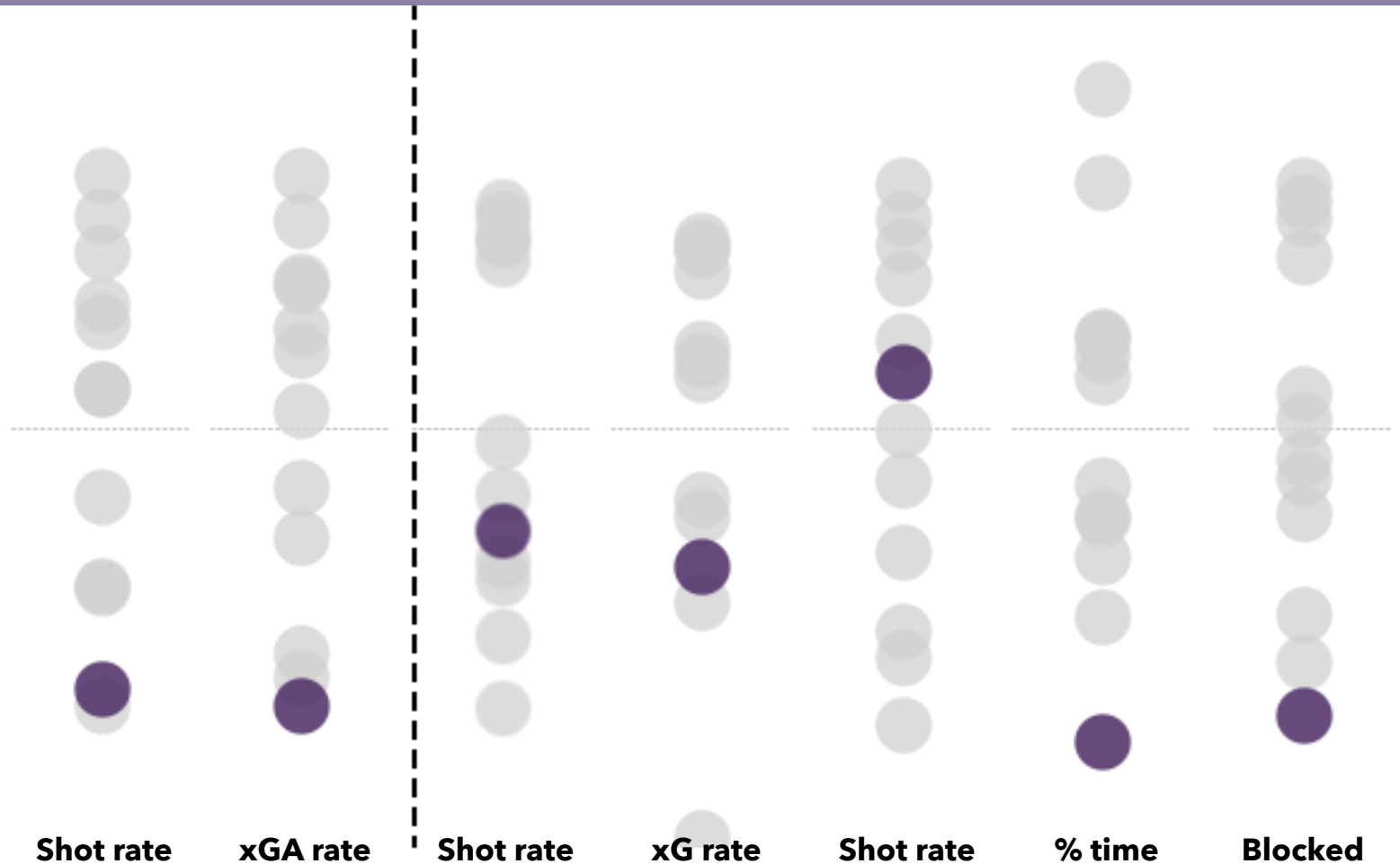
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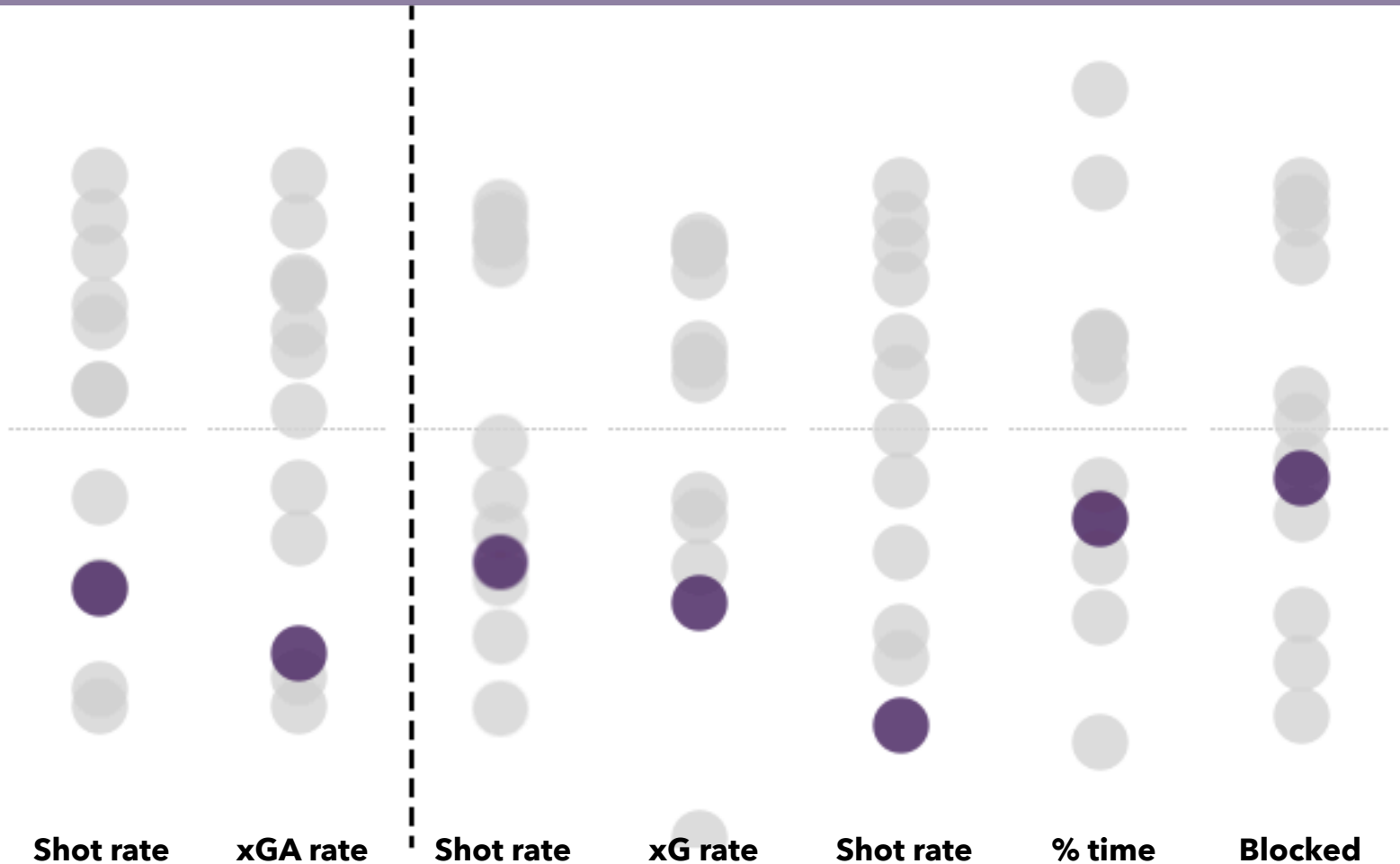
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LIMITATIONS

Lots!

TAKEAWAYS: QUESTION 1

Possibly separate skills:

DZ defense and offense generation

DZ defense and ability to keep PP out of the zone

TAKEAWAYS: QUESTION 2

DZ defense is most important (surprise)

Keeping the PP out correlates with quantity more than quality

The more shots blocked, the fewer given up

TAKEAWAYS: QUESTION 3

Indicator that teams could have different "profiles" and find PK success in different ways

FUTURE WORK

More data!

Entries and exits

Examining causal relationships

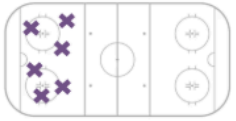
DATA IS AVAILABLE

Viz by Meghan Hall
@MeghanMHall
November 2019

DISCRETE DEFENSIVE STRATEGIES ON THE PK

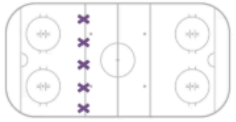
From a presentation at the Ottawa Hockey Analytics Conference, 11/16/2019
Slides available at the link

While doing previous research into aggressive offensive play on the penalty kill, I became curious as to *how* teams were able to find success on the penalty kill, in terms of broad, discrete strategies. I looked at four distinct methods, shown at right, and was interested to know 1) if these were separate skills, 2) which methods correlated most strongly with the rate of unblocked shot attempts and expected goals allowed (i.e., shot quantity and quality, a basic measure of PK success if the influence of the goalie is removed), and 3) if teams found success using varying methods.



Play good defense, measured by **limiting shots and expected goals allowed, per time in the defensive zone.**

Play good offense, measured by **generating shots and expected goals in the offensive zone.**

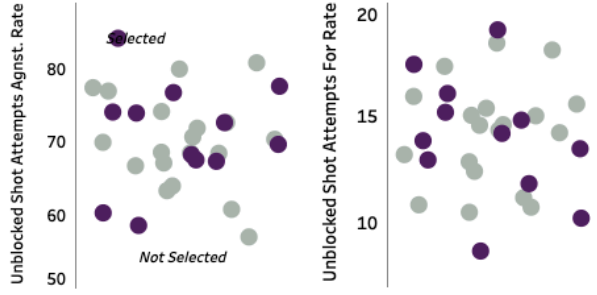


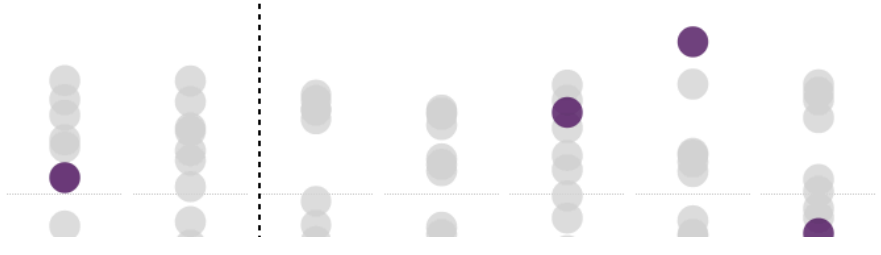
Keep the power play out of the zone, measured by **percent of time the power play doesn't have OZ possession.**

Block shots, measured by **the percentage of shots that are blocked** and **rate of blocked shots allowed, per time in the DZ.**

CHI		NYI	
COL		NYR	
DAL		PHI	
EDM		VAN	
FLA		VGK	
N.J		WPG	

In order to create these metrics, I tracked 1,146 minutes of 4v5 penalty kills, spread across 12 teams from the 2018-19 season. This averages to about a quarter of all 4v5 time in the season for each team. (The unblocked shot attempts against rate for in-sample games correlates well to that of out-of-sample games, indicating that the sample is decently representative.) The teams, shown at left, were selected in a quasi-random fashion in order to pick teams that had varying shot attempts rate, both for and against (shown at right).





The tracked metrics of interest are shown at left, select a team below to highlight. The data is scaled to make for easier comparisons across categories, but the raw values are available by hovering over the points. In all cases, the "better" outcome for the penalty kill (e.g., a lower shot rate or a higher percentage of time spent out of the power play's offensive zone) is at the top of the axis.

Select PK Team
PHI

A couple teams of interest:

THANK YOU!

Mike Pfeil

NHLTV

Josh & Luke

Everyone who let me complain about tracking
so many penalty kills