Using Shot Location Data for Team and Player Strategy

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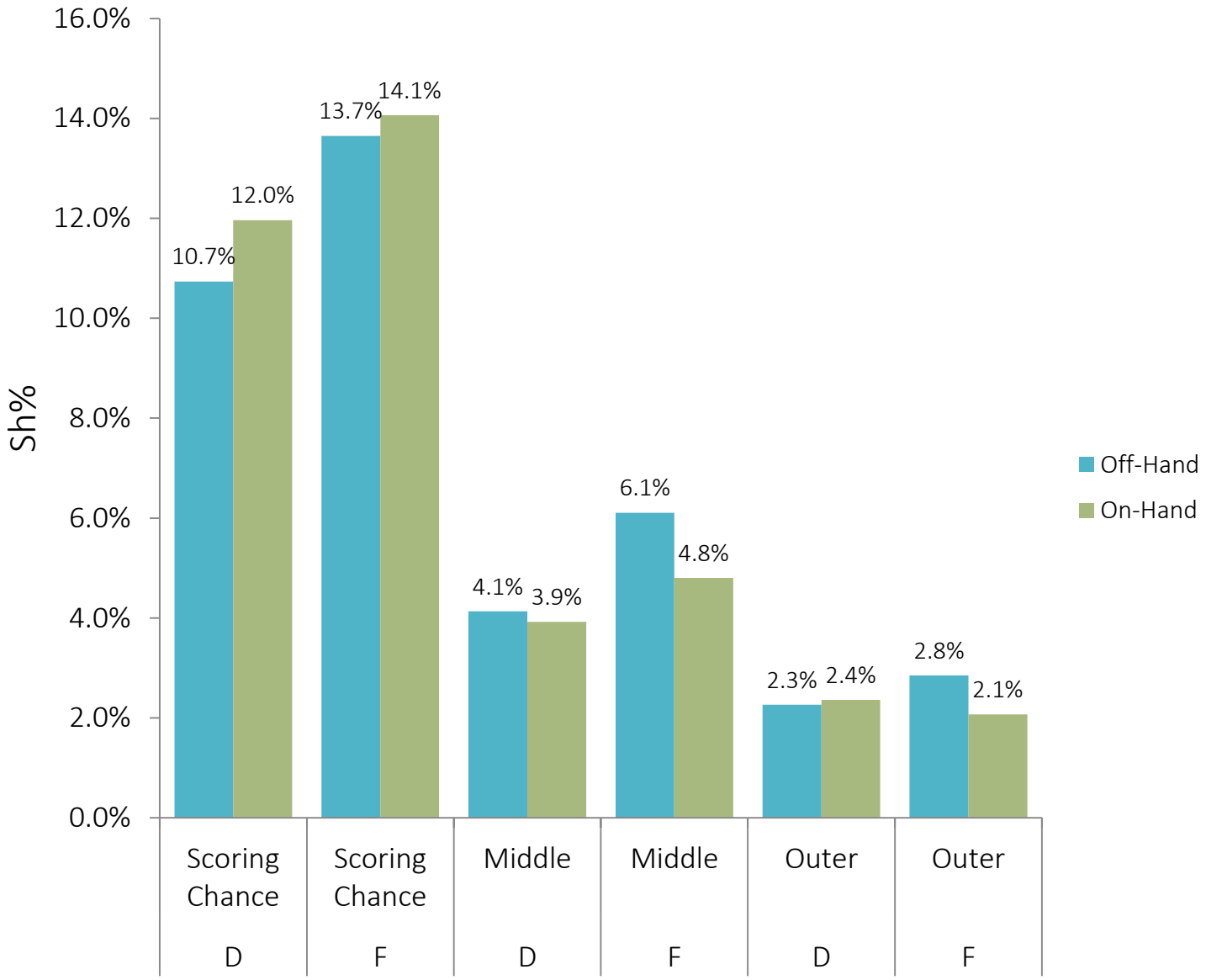
Introduction

- NHL has been collecting shot location data since 2007-2008
  - Since 2010-2011, the NHL has also been including on-ice data in these files
- Most of the analysis done to date has focused on likelihood of scoring from a particular location (for example, Hextally)
- Going to look at 2 questions today:
  1. How do shooter position and handedness factor into shooting percentage?
  2. What other information can we infer from shot location data, and how can we apply it?
- Focus on 5v5 play and data from 2010-2014 (with on-ice data)

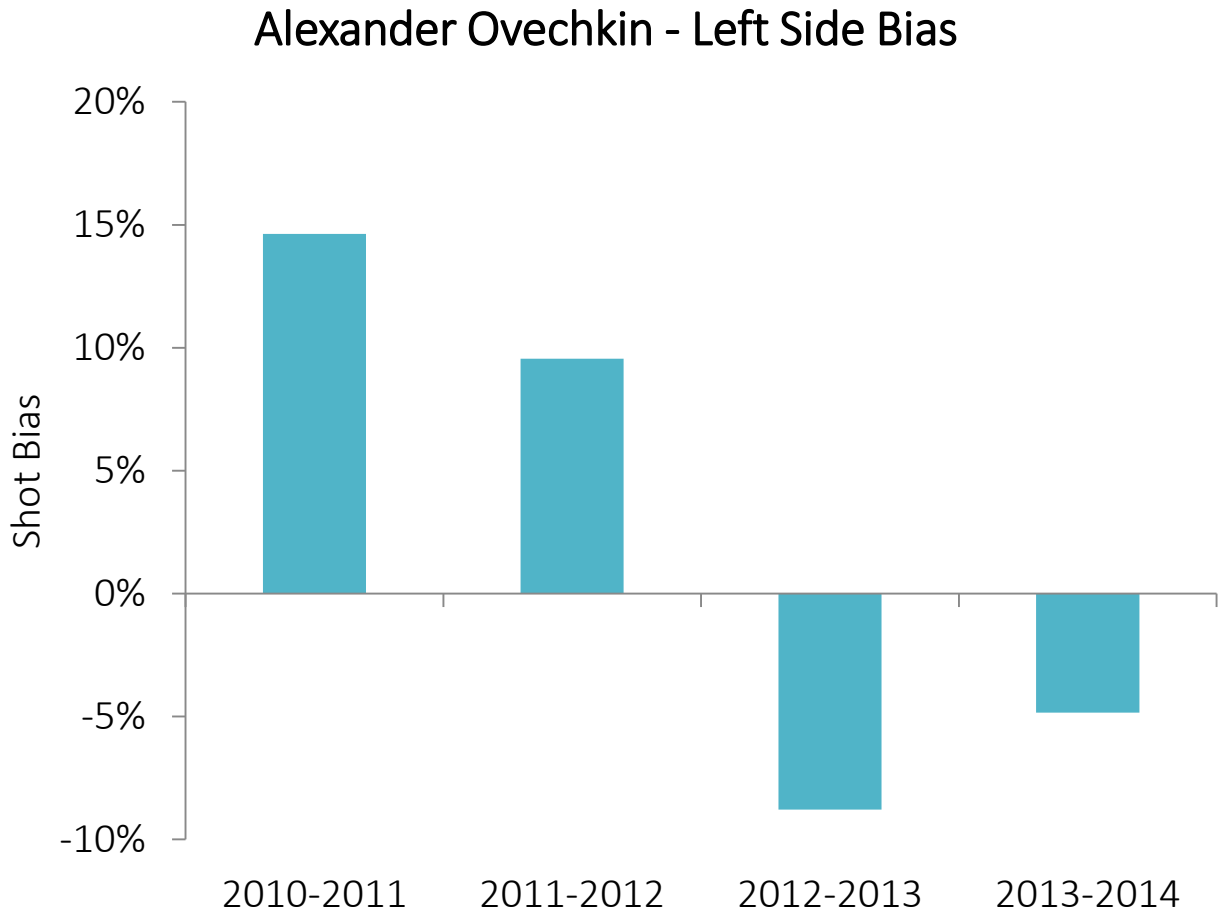


Players Shoot Better on their Off-Hand

- In aggregate both forwards and defensemen shoot better from their off-hand
- F: 9.9% Off-Hand vs. 8.6% On
- D: 4.8% Off-Hand vs. 4.1% On
- Outside of the Scoring Chance area forwards tend to score on a higher percentage of shots from their off hand
- In general, forwards tend to be better shooters than defensemen, regardless of shot location

So does this mean everyone should play on their off-hand?

- Not necessarily: calculating shooting percentage isn't enough to tell the whole story
- Increase in shooting percentage may be offset by:
  - A decrease in total shots for, or
  - An increase in total shots against
- Need to know how on-hand and off-hand players are doing possession-wise
- To do that we need a way to find out when plays are on their on-hand vs. off-hand



Calculating Player Side Bias

- Wingers and defensemen tend to shoot primarily from the side they're positioned on
- *Side Bias:*

$$\frac{\#\ of\ Shots\ From\ Left\ Side}{Total\ \#\ of\ Shots} - 50\%$$

- Positive numbers = Left Side
- Negative numbers = Right Side
- Guess which season Alexander Ovechkin switched from LW to RW

Figuring out who's playing on what side

- If a defensive pairing has played together significantly (more than 10 shots each together) use their shot data together to define sides
  - If Player A takes more shots from the left side of the ice, Player A is likely the left defenseman

- If a defensive pairing has not played together significantly use each players *Side Bias*
  - The player with the higher *Side Bias* is likely the left defenseman

Shots Against for Defensive Pairings

- Same handed pairs tend to post lower Shots For % than Opposite Handed Pairs
  - However, shots aren't more likely to come from the left vs. right
  - Some of the difference could be explained by a difference in Shot Generation by same-handed pairs

Metric	L/R	L/L or R/R
# of Shots Against	125,229	71,000
Shots Against – Left Side %	48.2%	48.1%
Shots Against – Right Side %	49.6%	49.7%
Shots For %	50.1%	49.0%

Side Bias & Evaluating Defensive Ability

- We can also use our *Side Bias* numbers to evaluate an individual's defensive ability
- First we can calculate the % of shots from a defenseman's side
- $$\%\ Shots\ Against\ From\ Side = \frac{\#\ of\ Shots\ from\ Right\ Side\ of\ Ice}{(\#\ of\ Shots\ from\ Left + Right\ Side\ of\ Ice)}$$
- Second, we can calculate an alternate Shots For % using only shots from his defensive side
- $$Alt.Shots\ For\ \% = \frac{Shots\ For}{2.04 * Shots\ Against\ from\ Def.Side + Shots\ For}$$

Pittsburgh Penguins 2013/14 Stats

- % Shots Against From Side will tell you whether a defenseman was better or worse than their partner defensively
- Alt. Shots For % provides a fuller picture as it includes offensive ability
- Alt. Shots For % can highlight players whose individual defensive ability is potentially undervalued (Martin) or overvalued (Orpik)

Player	% Shots Against From Side	Alt. Shots For %	Shots For %
Paul Martin	**46.8%**	**54.9%**	**52.6%**
Matt Niskanen	49.9%	54.3%	54.6%
Simon Despres	47.5%	51.7%	50.4%
Kris Letang	49.8%	51.3%	51.4%
Olli Maatta	51.3%	51.1%	51.9%
Robert Bortuzzo	**43.3%**	**49.9%**	**46.8%**
Rob Scuderi	46.8%	47.2%	45.7%
Deryk Engelland	51.0%	45.0%	45.4%
Brooks Orpik	**56.8%**	**44.0%**	**46.9%**

Conclusion

- Players tend to shoot better on their off-hand
- We can determine which players are playing on which side of the ice using shot location data
- Same-handed defensive pairs post a lower Shots For % than opposite-handed pairs
  - Some of this loss may be offset by their higher shooting percentages
- Shot location data can be used to look at individual play in the defensive zone as well
  - One extension is to further divide the defensive zone up and add defensive responsibility for forwards
- More shot location data (for misses, blocks) will of course make our analyses more accurate and allow us to better refine our defensive metrics