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Creating Offense off the Rush
An Investigation into Maximizing Zone Entries

Data provided by: Stathletes

Introduction

Around 70% of all goals in the NHL are scored within 10 seconds of entering the offensive zone (Tierney, 2016)[1]. It is reasonable to assume that this percentage remains quite similar at many levels of hockey. As such, creating chances off the rush should be an important point of focus for coaches and players alike.

By investigating patterns in zone entry data from the NWHL and women's ice hockey at the 2018 Olympic games, we can get an idea of the zone entry situations from which the most dangerous opportunities goal scoring opportunities are created. The goal of this project was to identify what zone entry conditions are the most dangerous (entry location, entry type, handedness of player). I was not hoping to make any grand discovery into rush tactics but rather to quantify the differences in offense creation from different zone entry types. Hopefully, this information will allow coaches and players to make informed decisions around their rush offense processes.

The Conventional Thinking of Rush Offense

This section is included as a quick overview of traditional hockey knowledge with regards to zone entries as reasoning for why the zone entry data factors of *type*, *location* and *handedness* of the player entering the zone were chosen as important factors for describing zone entry conditions.

Zone Entry Type: The three ways of entering the zone are to have the puck carried, played and dumped. Traditionally, carried and played entries are considered more dangerous as the puck is on the attacking players stick allowing them to control the situation. Dumped entries often allow the defending team the opportunity to get to the puck first and to regain possession and thus are considered the least dangerous of the three.

Zone Entry Location: Coaches will often encourage their players to "get to the middle of the ice". Entering the offensive zone closer to the middle of the ice allows the attacking player more options

1. Tierney, Sean. "Rush Shots – Why We Care and Who Generates the Most." *NHL Game Charts*, 16 Apr. 2016, https://gamecharts.wordpress.com/2016/04/16/rush-shots-why-we-care-and-who-generates-them-most/.

as well as a better angle to shoot from. The closer the zone entry is to the middle of the ice, the more dangerous it should be.

Handedness of Puck Carrier Entering the Offensive Zone: Conventional hockey knowledge states that a player entering the offensive zone on their off-wing (i.e., a right hand shot entering on the left or a left hand shot entering on the right) should be more dangerous. This is due to their handedness; carrying the puck on their forehand results in the puck being closer to the centre of the ice giving them a better angle to shoot and also allows them to receive and shoot pucks more quickly.

These three facets led to the following three questions that I sought to quantify through this project:

1. How much more dangerous is a carried entry to a played entry to a dumped entry?
2. How much more dangerous is a middle entry to a left or right entry?
3. Is a player entering the zone on their off-wing more dangerous? By how much?

Process

To achieve my goal of determining the differences between zone entries, I had to fulfill two separate tasks: find a way to quantify shot quality and use that data in conjunction with zone entry data to analyze the quality of any given zone entry.

In order to assess shot quality, I built an expected goals model using 2578 shots from the NWHL and 2018 Olympic data. This model uses four variables to give all shots an expected goal value (xG) which corresponds to the probability that a shot under the same conditions is a goal. I recognize that there are many factors that affect the probability of scoring that the model does not account for. However, seeing as my main objective was not analyzing expected goals but rush offense from different zone entries, I decided not to spend too much time fine-tuning it (although that is something I look to do in the future).

The model variables are:

1. Shot Type: whether the shot was a slap shot, wrist shot, snap shot or wraparound.
2. Distance: the distance from the shooter to the centre of the net.
3. Traffic: whether there was traffic between the shooter and the net (yes/no value).
4. One Timer: whether the shot was a one timer (yes/no value).

This model allowed me to give all shots in the data set an xG value.

The zone entry data contained the following chosen key factors:

1. Type: whether the entry was carried, played or dumped.
2. Location: where the entry occurred. I classified each entry as either left, middle left, middle, middle right or right.
3. Player: the player carrying the puck into the offensive zone. Importantly, whether this player shoots left or right. Handedness data was compiled from eliteprospects.com.

Next, to analyze zone entries I had to combine the shot data (now with associated xG values) with the zone entry data. To do this, I filtered the data set to include all zone entries and all shots that occurred within 10 seconds of the zone entry. The chosen limit of 10 seconds is somewhat arbitrary however my logic for choosing 10 seconds is twofold. I wanted to filter out offense created due to prolonged offensive zone possession, but I also wanted to include shots taken in a developing play, perhaps a defenceman entering the zone late.

After these two steps, I had a full working data set of zone entry data and shots created off the rush from each zone entry that I could filter by entry type, entry location and handedness of player.

Findings

1. How much more dangerous is a carried entry to a played entry to a dumped entry?

Below is a table compiling the zone entry and shot data from the NWHL and 2018 Olympics. I wanted to focus on rush offense so only shots taken within 10 seconds of the entry were counted.

Entry Type	# of Zone Entries	# of Shots	Total xG	xG/Zone Entry
Carried	1766	1140	40.17	0.0227
Played	207	111	4.49	0.0217
Dumped	1038	125	4.88	0.0047

Looking at the xG generated per zone entry, the above data confirms that carried and played entries are more dangerous than dumped entries. As expected, carried entries are the most dangerous. I interpret a played entry to be when a player enters the offensive zone on the catch (i.e. in the process of receiving the puck). As such, it is not surprising that a played entry is roughly just as dangerous as a carried entry. Dumped entries are around 4.5 times less dangerous than a played

entry underlining the importance of being able to gain a controlled zone entry to offensive production off the rush. It is important to mention that many of the dumped entries were executed with the intention of going for a line change as opposed to generating offense and therefore the xG per zone entry is underestimated. However, much more offensive production is created from carried or played zone entries.

The key finding here is that a carried entry is around 4.5 times more dangerous than a dumped entry. This could help coaches make better decisions concerning when and how often they encourage their players to risk carrying the puck into the zone rather than simply dumping the puck in.

2. How much more dangerous is a middle entry than a left or right entry?

To quantify the difference in offense generation from middle entry than a left or right entry, I split the rink into five lanes of equal width: left, middle left, middle, middle right, and right. By filtering the zone entry and shot data by zone entry location, I could find the xG per zone entry location. This data is in the following table.

	Left Entry		Middle Left Entry		Middle Entry		Middle Right Entry		Right Entry	
Entry Type	# of Entries	xG/Entry	# of Entries	xG/Entry	# of Entries	xG/Entry	# of Entries	xG/Entry	# of Entries	xG/Entry
Carried	921	0.0209	394	0.0213	307	0.0336	311	0.02182	973	0.0222
Played	83	0.0154	46	0.0391	43	0.0323	51	0.0156	95	0.0194
Dumped	457	0.006	72	0.0021	79	0.0008	76	0.0055	479	0.0044

This table provides a few interesting findings. First, there is no great difference in the xG per carried entry on the left to the middle left or from an entry on the right to the middle right. The only sizable increase is from a carried middle entry which are on average roughly 50% more dangerous. Knowing this, coaches and players could use this information to alter their instructions and transition behaviours. Perhaps entering the zone on the left or right (which judging by the total number of carried entries is much easier) will be more encouraged rather than trying to partially cut to the middle of the ice in the neutral zone.

Played entries somewhat follow the same pattern as carried entries. The outlier in the played entry data is for middle left entries. I believe that the abnormally large value for xG/entry is due to the small number of total tracked played entries and that with more data, it should decrease and settle around the same value as for a played middle right entry.

Lastly, dumped entries seem to get less dangerous the closer to the middle of the ice they occur. The fact that they also occur much less frequently than dumped entries along the outsides of the rink suggest to me that players and coaches have an intuitive knowledge of this and that if they have the puck in the middle of the ice, they are willing to (or encouraged to by their coaches) to take the risk and attempt a carried entry which will create the most offensive opportunity.

I believe that the above knowledge – that there is no sizable difference between a carried left/right entry and a middle left/middle right entry and that dumped entries are less dangerous towards the middle of the ice - will help coaches develop better transition gameplans and will allow players to make more informed decisions to maximize the outcomes of each offensive zone entry.

3. Is a player entering the zone on their off-wing more dangerous? By how much?

Traditionally, wingers are played on their strong side (or wing side): left shooting players play left wing and right shooting players play right wing. Recently however, coaches and players have realized that playing wingers on their off-wing allows them to generate more dangerous opportunities on the rush with greater frequency. The drawback of playing wingers on their off-wing is that this forces players to receive passes on their backhand on breakouts – a more advanced technical skill which increases the chance of a missed reception, a turnover and no entry at all. To investigate how much more dangerous off-wing entries are, I sorted each zone entry by the handedness of the player entering the zone. I excluded dumped entries from this analysis. Each number in the following table represents the xG per zone entry type.

	Left Entry		Middle Left Entry		Middle Entry		Middle Right Entry		Right Entry	
	LHS	RHS	LHS	RHS	LHS	RHS	LHS	RHS	LHS	RHS
Carried	0.0185	0.0241	0.0175	0.0272	0.0302	0.0372	0.0257	0.0177	0.0260	0.0190
Played	0.0100	0.0268	0.0219	0.0564	0.0532	0.0170	0.0208	0.0094	0.0245	0.0140

The above data confirms that wingers on their off-wing are able to generate offense off the rush at a greater rate than wingers on their strong side. On carried entries, off-wing entries average around 30% to 50% more xG per entry. On played entries, the difference between strong side entries and off-wing entries is even more marked being around 60% to 100% more dangerous (although there remain the same sample size concerns as in the previous section). The fact that this pattern is reflected in both carried and played entries as well as on entries to the left, middle left, middle right and right emphasizes the offensive benefits of playing wingers on their off-wings.

Hopefully, the knowledge that carried off-wing entries are around 30 to 50% more dangerous and that played off-wing entries can be 50 to 100% more dangerous than their respective strong side entries will allow coaches to more accurately weigh the benefits and drawbacks of how to deploy their wingers. For example, a coach who normally plays their wingers on their strong side may decide to switch them to their off-wings if trailing late in the game. Knowing this, players may be encouraged to place more emphasis on practicing the backhand receptions necessary in order to carry the puck into the offensive zone on their off-wing.

Next Steps

First, I would like to make a more sophisticated xG model. Having a more accurate model will make the zone entry analysis more accurate as well. Specifically, I would like to the angle from the shooter to the centre of the goal as well as a change of angle variable to try to build side-to-side goaltender movement into the model.

I would also love to do this same analysis on different leagues including the NHL to see whether the findings remain accurate. What are the possible reasons for any deviation?

Conclusion

Overall, I was able to answer my three original questions; summarized here:

1. Carried entries are roughly just as dangerous as played entries and are around 4.5 times as dangerous as dumped entries.
2. Carried and played middle entries are around 50% more dangerous than their respective middle entries to the left, middle left, middle right or right. Dumped entries are less dangerous the closer they occur to the middle of the ice.
3. Carried entries by a player on their off-wing are on average 30% to 50% more dangerous. Played entries by a player on their off-wing are 60% to 100% more dangerous.

Hopefully, coaches will be able to use this quantification of the danger of different zone entry conditions to create better rush offense gameplans and allow players to more smarter decisions to create more dangerous scoring opportunities on the rush.