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Defenseman goal scoring analysis from the 2013-2014 National Hockey League season

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Bachelor' Thesis
Degree Proramme in Sport and Leisure management
May 2015

Abstract

HAAGA-HELIA
University of Applied Sciences

Date of presentation

Degree programme

Author or authors Michael Marshall	**Group or year of entry** XI
Title of report Defenseman goal scoring analysis from the 2013-2014 National Hockey League season	**Number of report pages and attachment pages** 48 + 6
Teacher(s) or supervisor(s) Pasi Mustonen	

The purpose of this thesis is to determine how defenseman score goals. Scoring goals is an important part of the game but often over looked by a defenseman.

The main object is to see how the goals are scored and if there are certain ways that most goals are scored. Previous research has been done on goal scoring as a whole, but very few, if not any have been done on defenseman goal scoring,

The work and findings were done using the 2013/2014 NHL season. Using different variables, the goals were recorderd to show what was involved in how the goal was scored.

The results for defenseman scoring that can be made are that quick, accurate shots are the best shooting type to score. Getting to the middle of the ice and shooting right away was also a key finding. For defenseman, it was important that when the puck is received, either shot right away or to hold onto the puck and wait till a play develops in front of the net.

Keywords
Defenseman, Scoring, Shooting

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1 Introduction

In the game of ice hockey, it is imporant to score. Scoring is what wins games. In the game of hockey, the team that score the most wins. Hockey is a game where scoring is very important. Without scoring it can sometimes lead to very boring games. In the best league in the world, the National Hockey League (NHL) is where you can find most of the best goal scores in the world. They range from all different countries, come in all different sizes, and come with different skill sets.

When it comes to goal scoring in hockey, there has already been research done to show many different factors of goals. What is often shown is how a team or players score. A part of the game that is often overlooked is defenseman goal scoring. Defenseman are often looked at as the players who are the last line of defence for the team before the goalie. They are normally players who move the puck to the forwards. Of course the forwards on the team generate most of the goals, but it is always an added bonus when the defenseman score.

The purpose of this thesis is designed to look at previous studies done on goal scoring in the NHL and to take a closer insight on how the defenseman scores. The reason this topic is important is because there has never been a study done on how defenseman score. It is important to know and understand how most of the defenseman score their goals because it can show other defenseman how to score or even how to defend. As well as helping goalies understand how they score. The main object is to see and understand how they score using different variables shown through out the thesis.

2 Literature Review

The game of ice hockey has been around since the 1800s, but the first official game has said to be recorded in 1875 where captain Creighton's McGill defeated Captain Fred Torrence's Victoria team by the score of 2 to 1. (IIHF The early beginnings.) It wasn't until two years later that the first team was organized in Montreal. Following the first game came the National Hockey League (NHL), which started in 1917. It included five teams. (NHL 2008) Following the 1925 season, the NHL introduced the Stanley Cup to the winning team of the playoffs. Today there are 30 teams playing all over North America include players from all over North America and Europe.

There have been previous studies and research done in regards to goal scoring at the professional level, so it is important to make sure that those are looked at before going into defenseman goal scoring. According to a thesis done by Niels Garbe in 2013, out of the 7721 goals scored in the 2006/2007 NHL season, there were 1086 scored by defenseman. Accounting for about 14% of the goals scored in that season. (Garbe 2013) As show in Figure 1, goals scored by defenseman have been going up in the NHL every season.

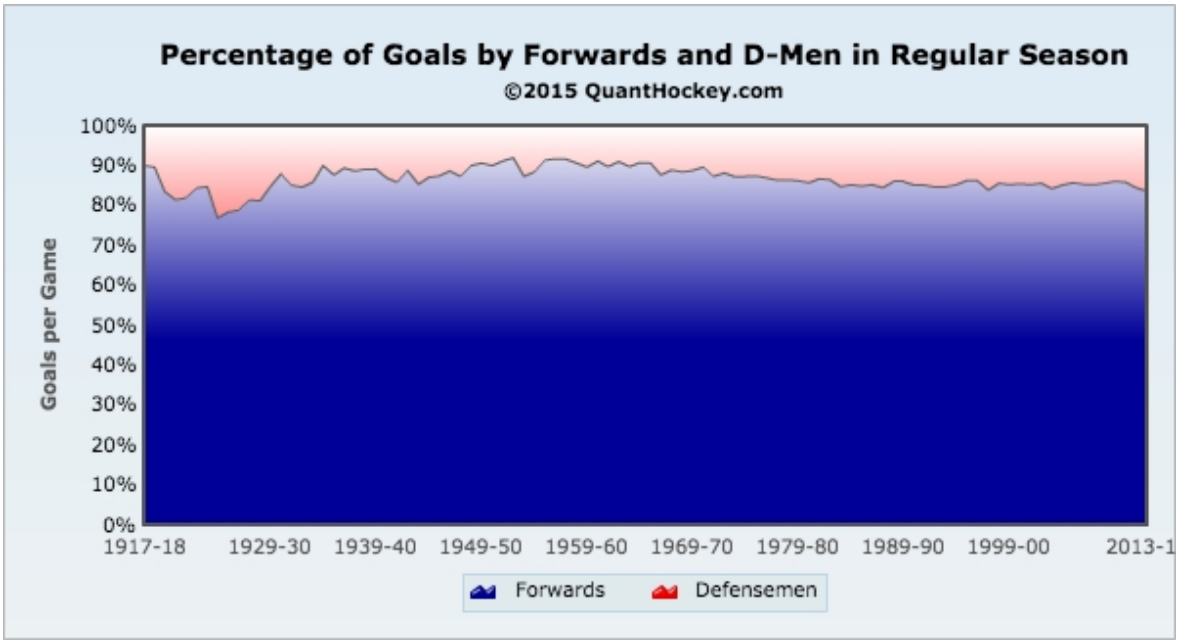

Figure 1. Percentage of Goals by Forwards and D-man in Regular Season (Quant Hockey 2015)

The main variables that were used in the findings for defenseman goal scoring will be looked at from previous studies done about goal scoring.

2.1 How the goal was scored

For every goal scored, it is important to see how it was scored. It can come from many different situations during the game. A study done by Kari Savolainen with the help from Degree Programme students in regards to goal scoring from the 2009 to 2013 Sm-Liiga season has shown that 30% of goals have been from Power play while 20% have been from Straight attacks. (Savolainen 2013) In table 1 we see the results of the goals scored in those seasons.

Table 1. Goal scoring results from Sm-Liiga from 2009-2013

	09/10	10/11	11/12	12/13	Total	% of Goals compared to whole
Straight Attack	428	912	443	424	1783	20.54%
Turnover	405	916	423	298	1744	20.90%
Offensive Zone Play	391	814	483	599	1688	19.45%
Power Play	763	1281	626	639	2670	30.76%
Short Handed	62	34	67	61	224	2.58%
Face off winning	76	176	52	46	350	4.03%
Empty Net	87	140	100	96	423	4.87%

In another research done by Mensonen and Salo on Effective Offensive Play – Scoring analysis of World Championship 2005 & Olympic Games 2006, they found that during even strength (5 on 5, 4 on 4) that 43.9% came off direct attacks, 34.3% came off turnovers, 20.1% came from cycling in the offensive zone play and 1.7% came from Face offs. (Mensonen & Salo 2008,36)

Josh Andrews also researched it in the 2006/2007 NHL season that the top five teams scored 58% of their goals from offensive zone play, and 21% came from even strength rushes or straight attacks. (Andrews 2009, 55)

2.2 Scoring Area

The scoring area is very important in hockey. It is where all the goals come from. Using scoring areas, it can show the exact area and percentage of the goals. Different scoring areas have evolved to what most use today. It started off with a study done by Mikkola in 1987 where he used "The scoring circle."

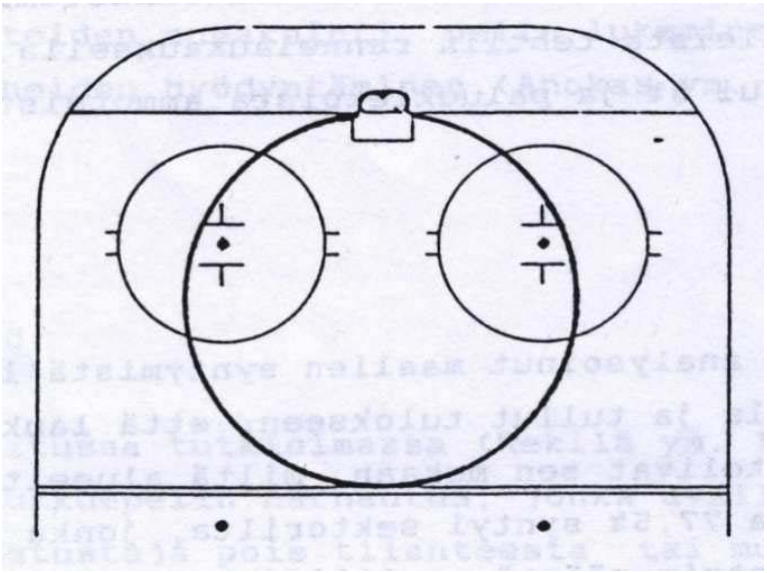

Figure 2. The scoring circle (Mikkola 1987, 11)

Later research done by Sumkin and Vourinen in 2005, in which they used a different chart that didn't involve the scoring circle is shown in figure 3.

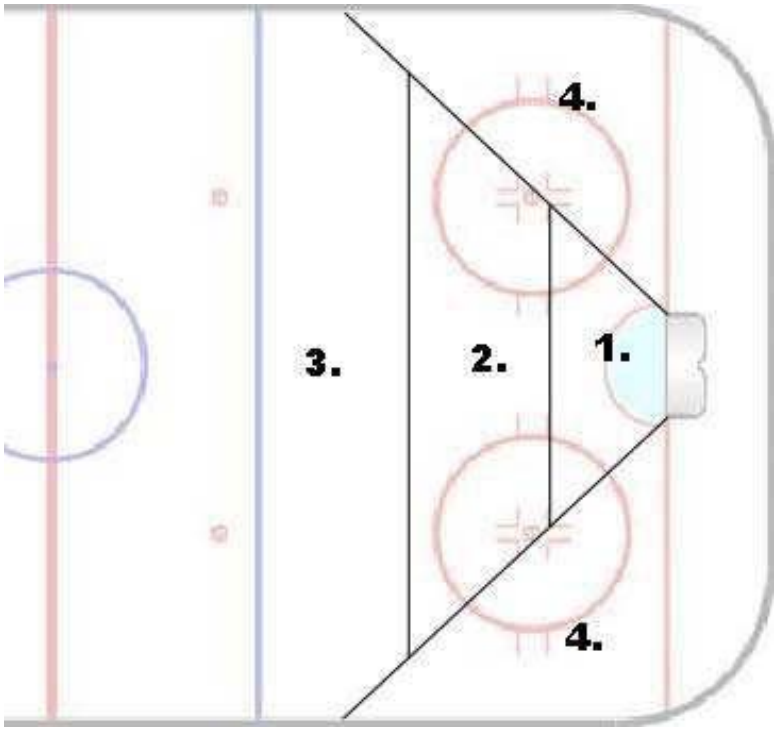

Figure 3. Scoring area chart (Sumkin & Vourinen, 2003)

In their research they found that 57.3% of the goals were scored in zone 1. Zone 2 had 29.5%; zone 3 had 8.5% and zone 4 contributed for 4.6% of the goals. (Sumkin & Vourinen, 2003)

Since the Mikkola's, Sumkin and Vourinen studies, a lot of research on goal scoring has been done using the IIHF scoring zones as shown in figure 4.

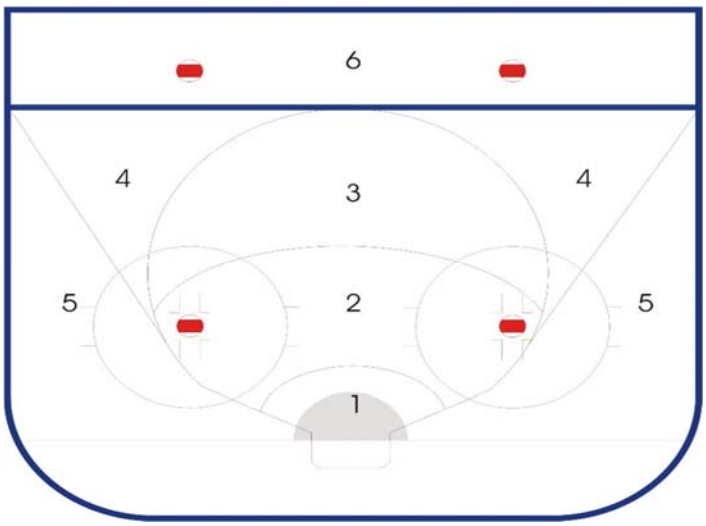

Figure 4. IIHF Scoring Areas

Using this chart, Mensonen and Salo found zone 1 contributed for 222 goals of 479 (46.3%). Zone 2 had 28.4% of the goals, while zone 3 had 15.2%. Zone 4 had 5.4%, which was 26 goals, and Zone 5 had 4.2%. (Mensonen & Salo, 2008,39)

Research done by Levent Atali, Burak Gürer, and Eray Atali titled Ice hockey world championship - analysis of total shots and shots of goals scored (U18-DIV III-group B/2013) used the same chart and found similar results. In their research they found 62% of the goals in that tournament were from zone 1. While zone 2 had 20.6% of the goals. Zone 3 had around 12%, zone 4 had 1.7% and lastly zone 5 had 3.4% of the goals. (Atalı, Gürer, & Atalı 2014, 485)

Andrews found in a later study that the top 15 scorers in the 2006/2007 NHL season scored 72% of their goals from zones 1 and 2. He also noted that 83% of the goals by the top 15 goal scorers were scored in the main zones (1,2 and 3) (Andrews 2009, 42)

In Garbe research he found that the top teams in the NHL score 39.4% from zone 1 and 34.8% from zone 2., which results in 74.2% of goals scored. While 72.3% of the bottom teams in the NHL that season scored from zone 1 and 2. (Garbe 2013, 35)

Steve Valiquette and Chris Boyle have also shown that most goals come from zones 1 or 2. However, he mentioned that over 22% of goals scored come from a pass across the "Royal Road" ss shown in figure 5. The "Royal Road" is a different way to analyse the scoring area.

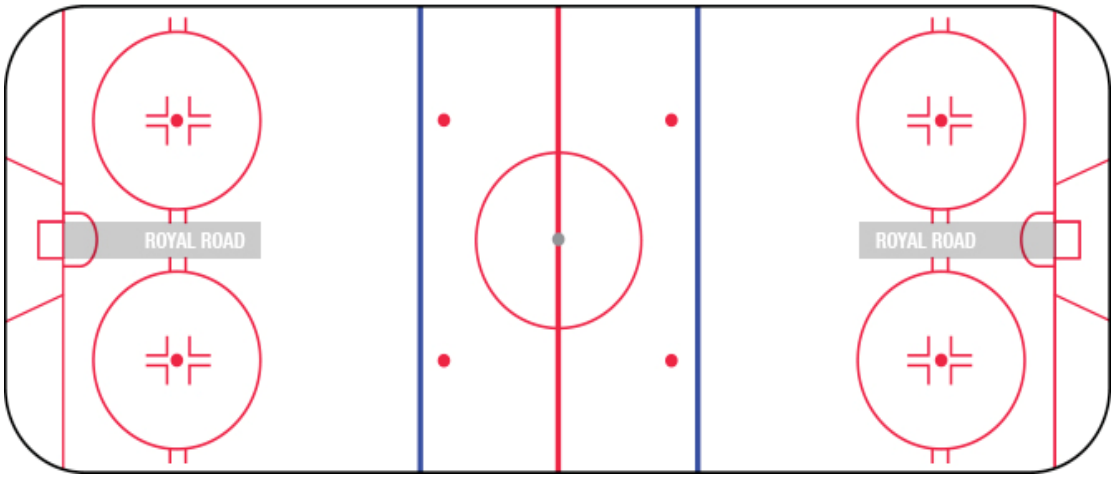

Figure 5. "Royal Road" (Boyle & Valiquette 2015)

Using this research with all three scoring area charts, it can be shown that most goals in hockey are scored from zone 1 or 2 or from the big circle.

2.3 Scoring type

Scoring in the game of hockey is the most important and exciting part of the game. There are many different types of shots that are used in goal scoring. The wrist shot, snap shot, slap shot, backhand, and tip/deflect.

Previous studies have show that most goals come from a wrist or snap shot. In Mensonen and Salo findings, they found that 50.7% of the goals they saw came from a wrist shot and only 23% came from the more powerful slap shot. (Mensonen & Salo 2008, 41) As shown in figure 6 from their findings, the results are clearly shown.

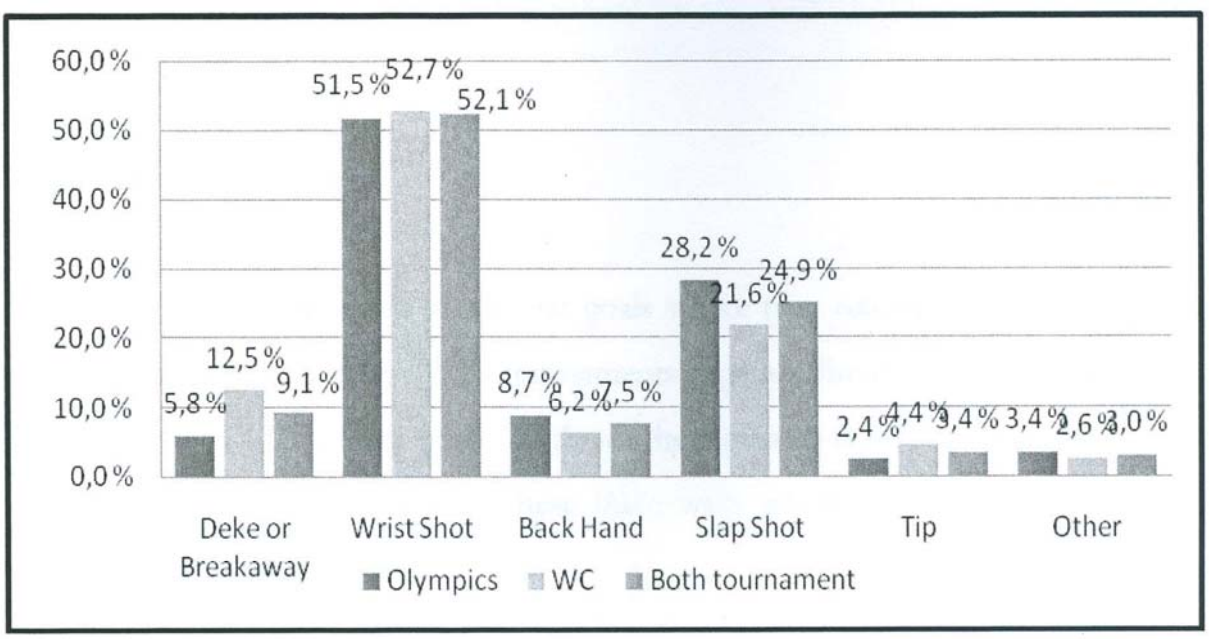

Figure 6. Technique of scoring, Olympic games vs. World Championships and together. (Mensonen & Salo 2008, 41)

Studies from Andrews and Garbe found similar results when it comes to the goal scoring technique. Andrews found that the top 15 goal scorers in 2006/2007 NHL season used the wrist or snap shot to score over half of their goals. The shooters scored 59% using this technique and only 17% with slap shots. While Garbe found that the top teams in the same year scored 59% using the wrist shot and 15.9% used the slap shot to score. They also found that around 8% of the goals were scored using the backhand. As well, less then 15% of goals were scored from a tip or breakaway. (Andrews 2009, 42; Garbe 2013, 36)

Research done by the Toronto Star newspaper found that during the 2011/2012 NHL season, 3 369 goals came from the wrist shot. That accounted for 48.5% of all goals that season. They also found that Steven Stamkos, who scored the most goals that season with 60, scored over half his goals using the wrist shot. (McGran 2013)

With the game becoming better and better every year, and goalies becoming better and better, it is important that the quickest and most accurate shot is used to score. As shown by the research done before, the wrist shot is the most common shot in hockey to score a goal.

2.4 Length of time puck carrier has the puck

When the player has the puck, it can be said that the quicker the puck is released from the blade, the better the chance they have of scoring. Mensonen and Salo found that 40.5% of all goals are scored from a one-timer shot. They also pointed out that when the player receives the puck and then shoots it is around 24%. The biggest thing they found was 79.5% of all goals are scored from; a one-timer, player receives the puck and shoots, and when the player receives the puck and controls it for a short moment and shoots. (Mensonen & Salo 2008, 42)

Andrews also found that the best way to score is off a one-timer and stated that this is because the goalie has a shorter time to get his angles set and a shorter time to get set for the shot. (Andrews 2009, 62)

However, sometimes the player can't get the shot of quickly. So in many cases it is import to use a fake or change the direction of the puck when the player has it. In a study done by McMillan, he showed that when the goalie is set up and the player is read to shoot, the goalie is ready for the shot as seen in figure 7. But when the player moves the puck in his feet or moves it away from the body, the angle get different, requiring the goalie to get into a new position as shown in figure 8.

Figure 7. Goalie is square to the shot (McMillan 2012, 18)

Figure 8. Player moves puck in towards body (McMillan 2012, 18)

When it comes to shooting it is important to either get it off as quick as possible or make the goalie change their position so they are not ready or set for the shot.

2.5 Goal scored on goalie

When shooting the puck on the goalie, it is important to have an idea of where the player is going to shoot.

> Thomas Magnusson (2010) was quoted as saying "You miss just about 100% of the shots that don't hit the net"

With that being said, if the player misses the net there is no chance at a second chance, but if the player hits the post, there is a slight chance of another chance. (Magnusson 2010) Normally, the net is divided up into five different sections: high and low blocker, high and low glove, and between the legs (five hole).

In a recent study done by Kontsas and Lehtola, they were able to show the direction of shots from three leagues that were looked at.

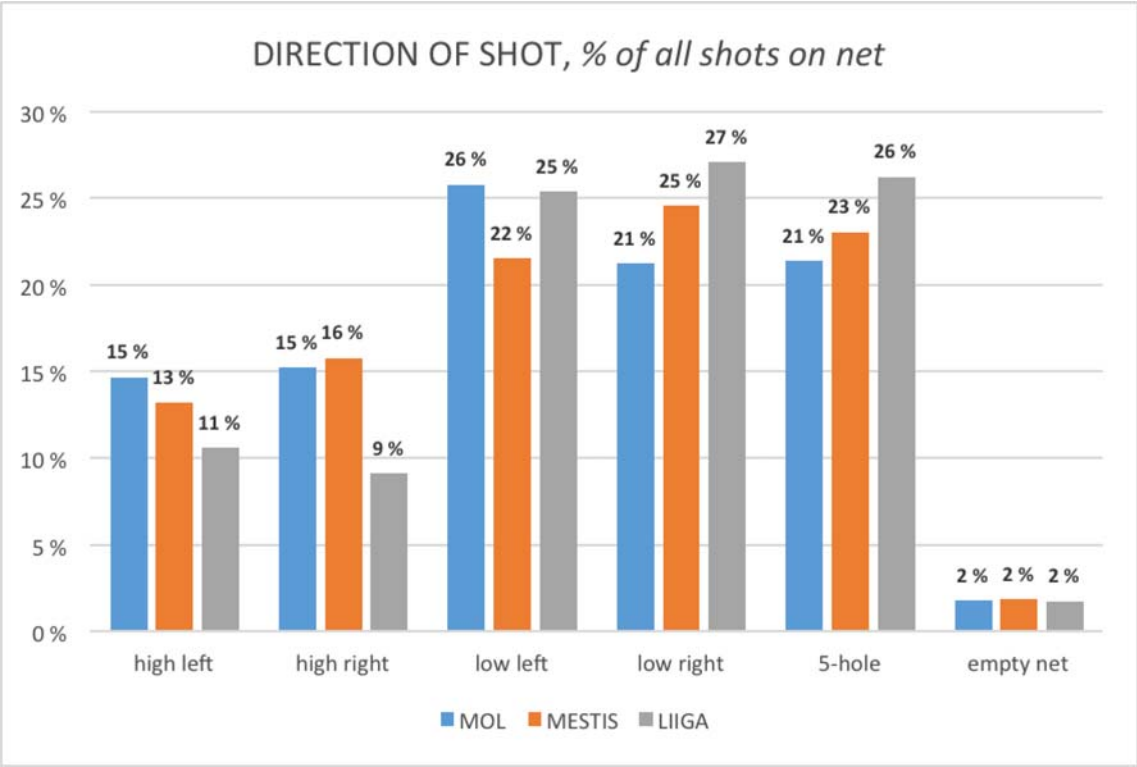

Figure 9. Direction of Shot (Kontsas & Lehtola 2014, 32)

They mentioned that shots directed at the net were low due to the fact that the team is looking to create a rebound as a scoring chance. (Kontsas & Lehtola 2014, 32)
From the direction of shots taken, it is good to look at where the shots are scored. Mensonen and Salo found that most goals scored were low blocker and the least amount of goals scored was high blocker as shown in figure 10.

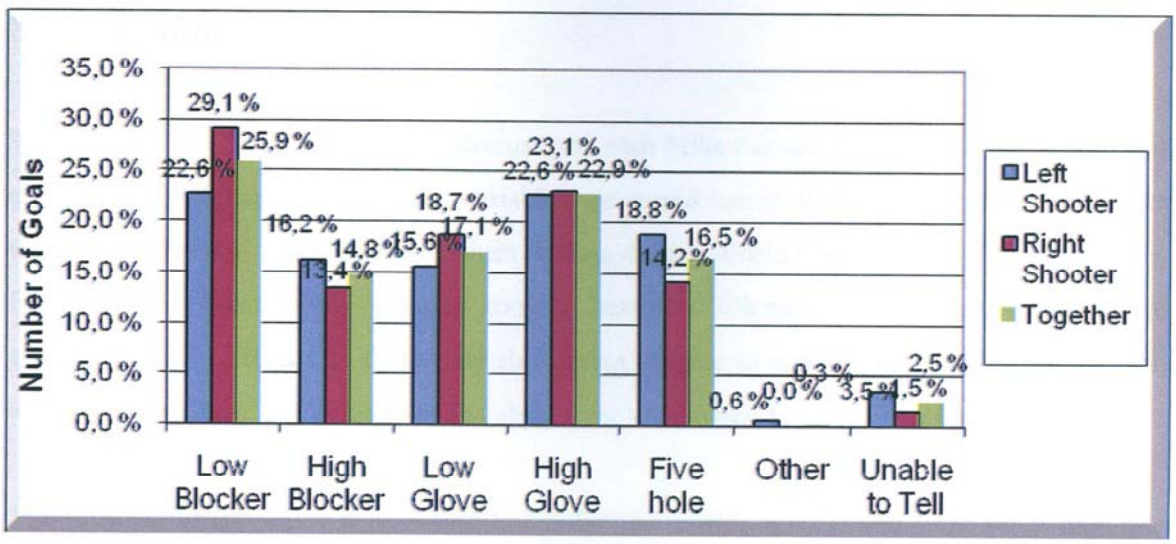

Figure 10. Area of the net, goals scored by position of goalie (Mensonen & Salo 2008, 45)

When looking at the best players in the NHL, Andrews found that 22% scored high glove, 18% scored low glove, 18% were scored five hole, 17% was scored low blocker and 15% was scored high blocker. He also determined it was clear that the best places to score are high glove and low blocker when he looked at the best players as well as the best teams. (Andrews 2009, 43)

During the 2006 International Coaching Symposium Ted Sator stated that the player should shoot very low or very high. Medium height shots don't score goals. (Sator 2006)

In regards to defenseman shooting, during the 2009 International Coaching Symposium held in Zürich, Chris McSorley mentioned that when defenseman shoot, it is important that they shoot 30 centimetres or higher because a 3-dimentional puck can be tipped at a lot of different directions. (McSorley 2009) After looking at research that have been done and these statements, it is clear that low blocker and high glove are the best spots to shoot on a goalie.

2.5.1 Goalie Position

In todays hockey there are three main style used for a goalie. The butterfly, half butterfly, and butterfly (Niemelä 2011, 15) The main purpose as a goalie is to stop the puck as quick as possible and to minimize the rebounds. Stated by McMillan, if a goalie is prepared, then scoring is extremely difficult. (McMillan 2012, 28) With that being said it is important for goal scoring to have "traffic" or screens in front of the goalie. During the 2009 IIHF coaching symposium, Chris McSorley mentioned that if the goalie can't see it, he can't stop it. (McSorley 2009) When the goalie has traffic or has players in front of them, it is very difficult to get set and ready for the shot because they cannot see it.

2.6 Puck possession gained

In hockey, it is important to gain the puck from the other team. Puck possession is now such an important part of the game because the team that can control the puck often wins more. With that being said, where the puck is gained in order to get possession is important to understand where the play starts before a goal.

Using Mensonen and Salo research, it is clear that goals are scored most often when the possession is gained in the defensive zone or in the middle of the offensive zone as show in figure 11.

All goals at all strengths in both tournaments		Frequency	Percent
Valid	Defensive zone down low	86	18,0
	Defensive zone middle	105	21,9
	Defensive side in the neutral zone	58	12,1
	Offensive side in the neutral zone	44	9,2
	Offensive zone middle	133	27,8
	Offensive zone down low	53	11,1
	Total	479	100,0

Figure 11. Area of gaining possession of the puck (Mensonen & Salo 2008, 28)

Andrews found similar results, however he noticed that 46% of the time the puck was gained in the offensive zone and only 18% of the time the team gained the puck in the defensive zone. (Andrews 2009, 54)

It can be seen that most teams score when they gain the puck in the defensive and offensive zone. This could be due to control breakouts from the defensive zones and attacking the other team as a whole unit (five players). While the team can create more

turnovers in the offensive zone and has a shorter or quicker distance to score in the offensive zone.

2.7 Length of play

When puck possession is gained, the offensive team is then trying to score. The length of possession can sometimes lead to quick goals or long goals. In a study done by Rollins, she found that the average length of all possessions was 8.81 seconds. She also pointed out that the average time of a scoring chance was 12.59 seconds. She also found that teams who score possess the puck for over 50% of the time in the prior 10 possessions. (Rollins 2010, 30, 33)

Andrews found that the top teams score almost half of their goals within the first five seconds of gaining puck possession. (Andrews 2009, 75) While Garbe found that 80% of all goals are scored within zero to ten seconds of having possession. He also noted in his study that there was no major impact on the length of time the team had the puck when he compared the best teams to the worse teams. (Garbe 2013, 33)

Rollins also pointed out that scoring chances may have little use for coaches because they are not a standalone event. Meaning that in a possession many factors can happen in the event itself. (Rollins 2010, 30)

Length of play can determine how long the team has the puck for before the goal. This could be helpful for some teams to know and understand that if your opponent has the puck for a long time, that it might help or affect their chance at scoring. On the other hand as Rollins stated since it is not a standalone event, sometimes puck possession or length of play may not be needed.

2.8 Passes in Possession

Passes in a possession can be very important when it comes to goal scoring. That is why it has a big correlation to how the goal is scored. For example, it has already been

stated in chapter 2.4 that almost half of the goals scored are scored from a one-timer, which includes one pass. (Mensonen & Salo 2008, 42; Andrews 2009, 62)

Andrews also found that the best teams scored most of the goals on the rush when they made two or less passes between maintain the puck and scoring the goal. (Andrews 2009, 75) Garbe found similar results as the top teams had 22.3% of the goals include one pass and 18.6% involved two passes. He also found that the top, middle and bottom teams had under 12% of their goals when there was three passes, while zero passes resulted in under 13%. (Garbe 2013, 34)

2.9 Strength

When it comes to scoring, if a team can score when they play 5 on 5 it can really help their team. However, when a team can score when they are on the power play that is a big benefit. That can include scoring 5 on 4 or 5 on 3. Mensonen and Salo found that almost 33% of goals scored from both tournaments were on the power play. That accounts for one third of the goals as shown in figure 12.

	World Championships	*Olympic Games*	*Both Tournament*
Even Strengths	62 % = 169 goals	58 % = 120 goals	60 % = 289 goals
Power Play	32 % = 86 goals	34 % = 69 goals	33 % = 155 goals
Short Handed	3 % = 9 goals	5 % = 10 goals	4 % = 19 goals
Others	3 % = 9 goals	3 % = 7 goals	3 % = 16 goals

Figure 12. Goals in different strength (Mensonen & Salo 2008, 27)

In Garbe's findings, he noticed that all teams score about 62-64 % of their goals when they are at 5 on 5. He also found a very similar result as Mensonen and Salo that power play goals account for around one third of the team's goals. (Garbe 2013, 23)

From looking at the SM-Liiga goals scored by Savolainen, it is clear that a lot of goals are scored on the power play. From 2009-2013, 30.76% of the goals have been scored on the power play. That is the most in all of the categories that he looked at. From all of his work, he found 13.19% of all the goals scored on the power play came from a set play. That was the second most percentage of goals scored that Savolainen looked at in all of his categories on goals scored in SM-Liiga. (Savolainen 2013)

It can clearly be shown that most goals in hockey are scored 5 on 5, however it is very important if the team can score when they are on the power play because it accumulates for a big portion of the teams overall goals. If they have a good power play and can score, the team can have a better percentage of scoring and can take advantage of being one skater extra.

3 Purpose of study

The main purpose of this study is to identify how defenseman score in hockey. That is why I decided to pick the NHL for the study because it is a league that has the majority of the best players in the world playing in it. Previous studies as shown above have been done on goal scoring as a whole but few have looked at defenseman scoring.

3.1.1 Research problems

How do defenseman score most of their goals in the NHL?

Is there a certain way, or area that defenseman score?

Does defenseman goal scoring related to previous studies done about goal scoring?

Is there a difference from regular season to playoffs?

3.1.2 Research objectives

With this study the main objective is to give the facts of how a defenseman scores. It allows us to see many factors of the goals that are scored. Instead of choosing to look at a player, I decided that it would be more valuable to look at the goals as a whole league.

4 Research methods

The goal analysis was completed using the National Hockey League 2013-2014 season. This included all the goals scored in the regular season and playoffs. The number of goals looked at in the regular season was 1045 and 92 goals were scored by defenseman in the playoffs. This totals for 1137 goals which were examined. This thesis was designed as a quantitative study to help find how the goals were scored, using my own data-collection to find how the goals were scored.

4.1 Study Design

The design of this study was created to look at 11 key variables for every team and connected them to a "master" sheet. Within these key variables, some had different sub variables that made analyzing the goals easier. Using this I was able to see how and what made up all the goals scored.

4.2 Data Collection

Using the NHL website and NHL GameCenter Vault, I was able to see every goal that was scored along with the highlights of the goals from different camera angles. Using the NHL GameCenter Vault to look at how the full play developed and what occurred before the puck entered the net. Prior to every game, I would gather the rosters from the teams playing to make sure players were playing defence instead of some defenders who might play forwards.

4.3 Data Analysis

For the information gathered, it was important to look at previous studies that have been done and find what type of system they used or variables that were looked at. During my studies, I had the chance to do the SM-Liiga studies with Kari Savolainen. With that I was able to have a base knowledge of what type of variables I could look at. With using his ideas and gaining permission from Josh Andrews (2006-2007 NHL Season Goal Scoring Analysis: Top 15 Goal Scorers & Top 5 Goal Scoring Teams) I was able to create my own variable list that would fit best for defenseman goal scoring.

Using Microsoft Excel, I created an excel workbook that had a "master" copy of all the data entered as well as a sheet with every team. When each team had a goal, I would apply those results to their sheet and it would automatically add them to the master sheet. Master sheets were made for both regular season teams as well as playoffs teams. Since this was all manually entered, I would go back after every two weeks of the games and make corrections and make sure that the goals were correct.

4.4 List of Variables

The 11 key variables included; How the goal was scored, passes in possession, scoring area, shooting type, where it was scored on the goalie, strength, where the puck was gained, length of play, length of time the defenseman had the puck for, before the shot, and goalies.

4.4.1 How the goal was scored

The different variables within this key variable are:
Straight Attack – Even and Odd man. In the straight attack, it was looked at when the defenseman joins in the rush. It can either be 5-5 or 4-4 or 3-3 for even, and for odd man it can be when the team is either outnumbered or outnumbering the opponent team.

Offensive Zone – One timer, Pass + Shot, Pass + Control + Shot, Rebound, Cross-zone pass, and Deflect.
One Timer – When the defenseman gets the puck and shoots right away with out receiving the puck.
Pass + Shot – When the defenseman receives the puck, then shoots
Pass + Control + Shot – The defenseman receives the puck and stickhandles the puck or gains control, then shoots.
Rebound – The defenseman gets the goal off a rebound from the goalie or player.
Cross-zone pass – The goal comes from when a pass is made across the zone from one side to the other.

Deflect – When the goal is scored as a deflection. Whether it is from a tip, or a shot off the player or a shot that hits the opponent player and goes in.

Faceoff – Direct shot, Scramble play, Pass to other Defenseman, and Set play.
Direct Shot – Off the faceoff the defenseman takes the shot right away or controls it and shoots.
Scramble play – When the puck is loose in the faceoff or the puck bounces to the defenseman and shoots.
Pass to other Defenseman – A pass from one defenseman to the other off the faceoff.
Set play – When the team has a set or planned play off the faceoff.

Power play – Straight Attack, Turnover, 1-3-1 (Umbrella), Set play, Tip/Deflect, Face off and Rebound.
Straight Attack – The goal comes from the attack once crossing the blue line without setting up.
Turnover – The team creates a turnover (takeaway) and scores off that.
1-3-1 (Umbrella) – The goal comes off a 1-3-1 set up in the offensive zone.
Set play – The goal comes off a set play. Either low, half boards, or a set play that the team uses.
Tip/Deflect – The goal comes on the power play from a tip by the defenseman or a deflection off the defenseman or when they shot and it hits someone on the opponent team and goes in.
Rebound – Defenseman gets the goal when the puck comes off a save or off a player and they shot and score.

Short Handed - The goal comes when the team is down one or two players and is on the penalty kill.

Empty Net – Goal is scored when the opponent team pulls the goalie.

4.4.2 Passes in Possession

In this variable the number of passes that are made before the goal is looked at. When looking at this it is important to see how many passes are made and if there is a certain amount that most goals have. The number of passes looked at was: 0,1,2,3,4, and more then 4 in a possession.

4.4.3 Scoring Area

For this variable I looked at what zone the goal was scored on the ice. Using the IIHF scoring areas, I am able to see where exactly the goal comes from in the offensive zone.

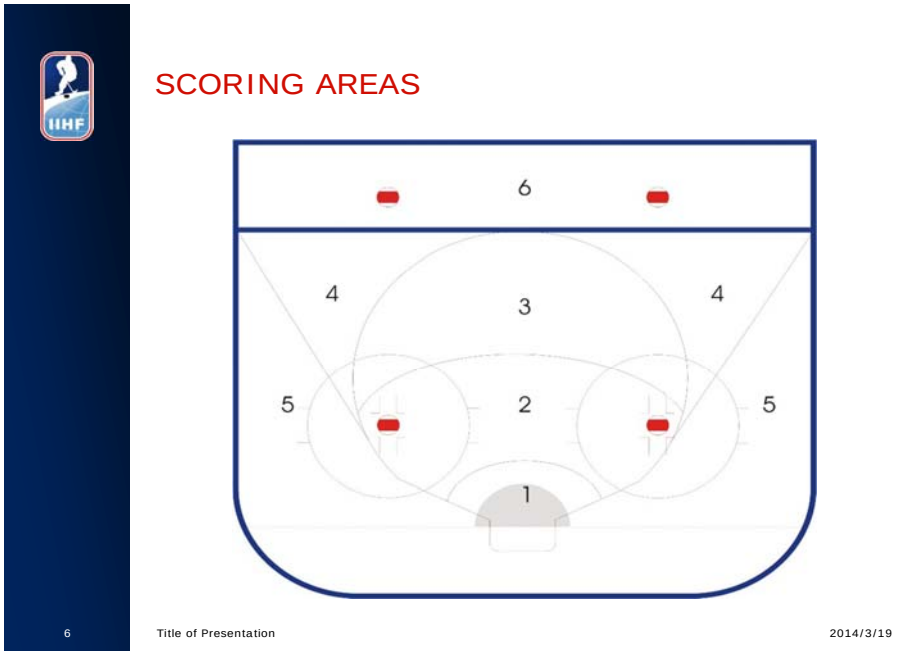

Figure 13. IIHF Scoring Areas

4.4.4 Shooting/Scoring type

When looking at shooting type it is important to see what shot the defenseman uses to score. The old saying would be to use a hard shot (Slap Shot) or use a quick shot (wrist shot). The variables looked at were; Wrist/Snap Shot, Slap shot, Backhand,

Tip/Deflect, and Breakaway. When looking at Tip/Deflect in this section, it occurs when the defenseman tips or deflects a shot that was taken.

4.4.5 Where it was scored on the goalie

In this variable I looked at the 6 main points of where goals are scored: the Five-Hole, High glove, Low glove, High blocker, Low blocker and no goalie. These are important in this study because we can see where the goal goes in on the goalie and if there is a spot at which the goalie has the hardest time saving the puck. No goalie meant that the goal came from an empty net goal or the goalie left the net to play the puck and the puck went in.

4.4.6 Strength

When looking at strength of when the goal is scored, I looked at the following; Even (5-5, 4-4 and 3-3), Power play 1 man advantage, Power play 2 man advantage, Short handed 1 man disadvantage, Short handed 2 man disadvantage, 6-5 for and 6-5 against. It is important to see how many goals by defenseman are scored on even strength, power play and even when the team is short handed.

4.4.7 Where the puck was gained

For this variable I looked at where the scoring teams gains control of the puck. There are three zones that were looked at (Defensive zone, Neutral Zone, and Offensive Zone). In these variables I wanted to find out if there was a certain zone that had more or less in comparison to each other and to see what zone was more common for where the puck was gained.

4.4.8 Length of play

When looking at length of play I wanted to find out how long the team has possession for before the goal is scored. I broke this down into four times. The team has the puck for 0-5 seconds, 5-7 seconds, 8-12 seconds and more then 12 seconds. The time started when the team or defenseman gained full control of the puck and stopped

when the puck crossed the goal line. The time I used was the game clock that was provided in each video.

4.4.9 Length of time the Defenseman has the puck for

In this variable I wanted to see how long the defenseman has the puck before he takes the shot. The player has the puck for 0-1 second, 1-3 seconds, 3-6 seconds and more then 6 seconds. It was important to start counting when the defenseman has full control of the puck if it is longer then 0-1 second.

4.4.10 Before the shot

Before the shot is important as a defenseman because a lot of players are taught to "walk the line" when playing. That is why I wanted to look at if the defenseman; uses a fake shot, makes a fake pass, if the D is walking the line or stationary on the blue line. I believe this is a very important variable for defenseman and to see if most goals are scored when they move or walk the line or if they stay still and shoot from the blue line.

4.4.11 Goalies

When looking at goalies I wanted to see what style they used and how important a screen is when scoring. For the goalie I looked at if the goalie was stationary or moving side to side when the goal was scored, and if the goalie was in butterfly/down on the ice or stand up when they scored on. For screening I looked at how many screens were involved (1,2, more then 2) and were they high or low screens based on where the players were.

5 Results

In the 2013-2014 NHL season there were a total of 1137 goals scored by defenseman. Using the 11 key variables mentioned in the previous chapter, all the goals will be shown how they were scored.

5.1 How the goal was scored

During the regular season a total of 1045 goals were scored. While during the playoffs only 92 were scored.

Table 2. How the goal was scored

	Regular Season	% Regular Season	Playoffs	% Playoffs
Straight Attack	119	11.3%	15	16.3
Offensive Zone	556	53.2%	41	44.6%
Face Off	44	4.2%	1	1.1%
Power Play	286	27.4%	30	32.6%
Short Handed	18	1.8%	2	2.2%
Empty Net	22	2.1%	3	3.3%

In table 2 it can be seen that half the goals in the regular season come from offensive zone plays at 53.2%. While the same can be said that most of the goals during the playoffs came from the offensive zone as well at 44.6%. Power play also plays a key finding in the fact that almost one third of the goals come from when a defenseman scores on the Power play.

5.1.1 Straight Attack

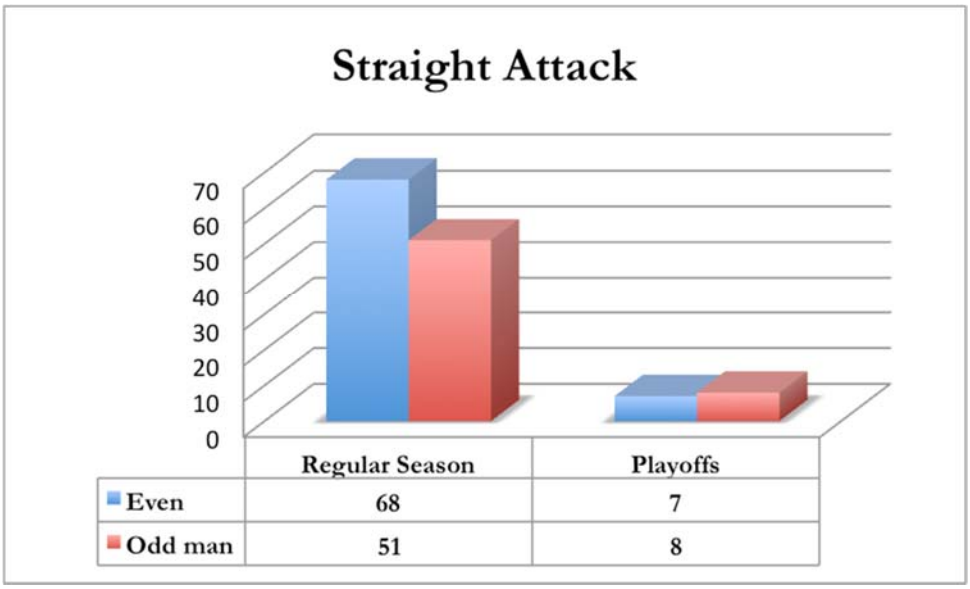

Figure 14. Straight Attack goals scored

In straight attack goals during the regular season, 57.1% involved an even number attack while 42.9% was odd man. During the playoffs 46.7% of the straight attacks were even and 53.3% were odd man attacks.

5.1.2 Offensive Zone

In the offensive zone it can be seen that the one timer and pass + control + shot goals make up the majority goals with 49.1% during the regular season (one time 24.3% and pass + control + shot 24.8%). This was the case when the defenseman got the puck off right away, or had time to control the puck first and then get the shot off. A big result is that 18.5% (almost 1/5th) of the goals came from when the puck changes direction and goes in the net. Majority of the time it was off of a player and went in. Pass + shot consisted of 17.3 % and rebounds had 12.6% of goals in the regular season. In the playoffs 26.8% of the goals came off a deflection, either by a tip or hit a player and went in. Pass + shot during the playoffs had 19.5% of the goals while one timer, pass + control + shot and rebound goals were each 17.1% as seen in figure 15.

Figure 15. Offensive Zone goals scored

5.1.3 Face off

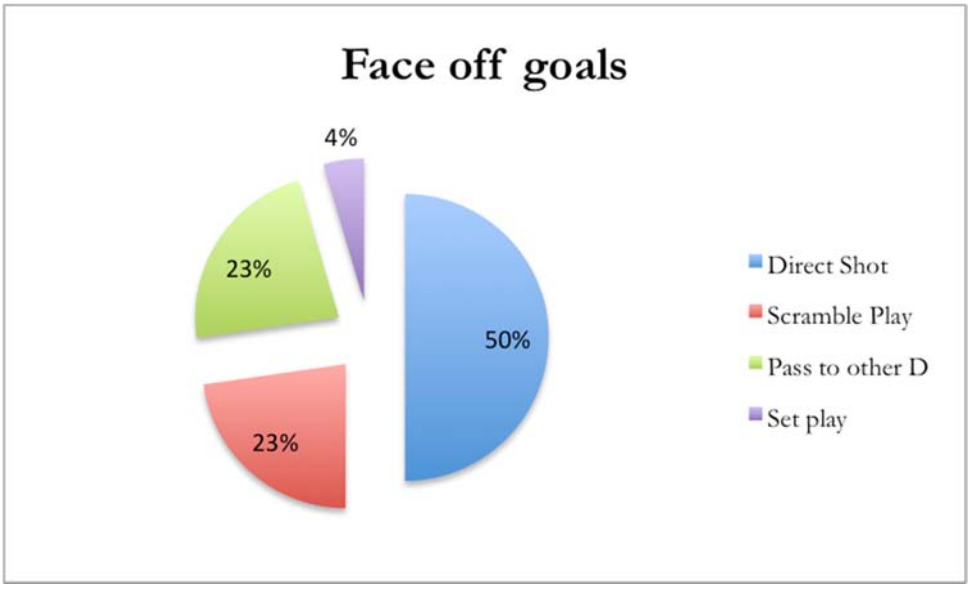

Figure 16. Percentage of Face off goals during regular season

As seen in figure 16 it is clear that 50% of the goals scored off a face off came from a direct shot at 22. While scramble play (10) and pass to other D (10) made up almost the other half. When watching the goals it was clear that only 2 goals are scored of a set play. It is important to note that only 1 goal came off the face off in the playoffs (Pass to other D).

5.1.4 Power Play

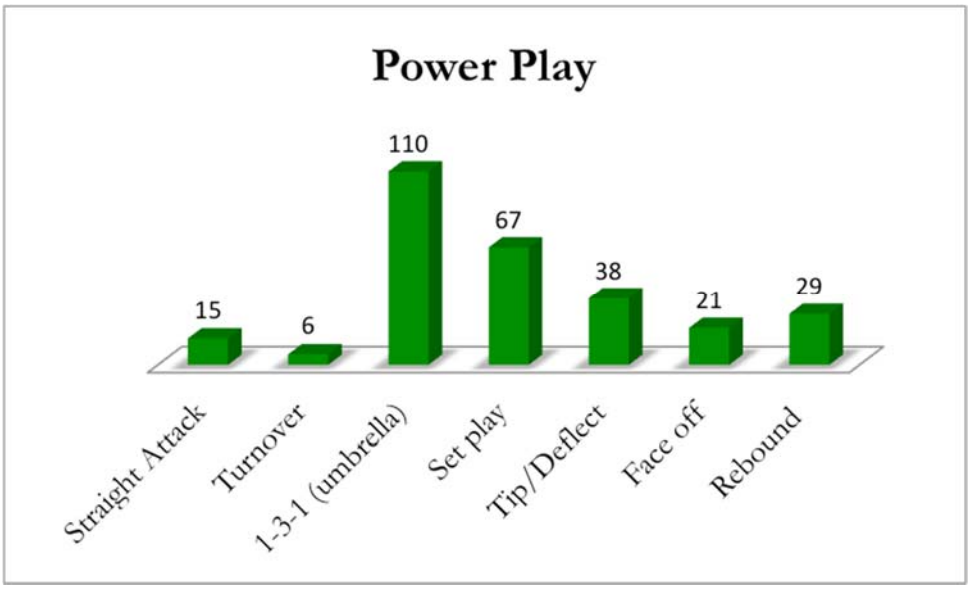

Figure 17. Power play goals in regular season

As shown in figure 17 it is clear that most goals that defenseman scored were when their team sets up in a 1-3-1 umbrella. This accounted for 38.5% of all goals that were scored on the power play. Set plays had 23.4% of goals scored on power play. That makes 61.9 per cent of goals are scored from a set system/play or set position on the ice. Tip/deflect had third most goals with 13.3% and rebound was fourth with 10.1% of goals. Only 7.3% of goals scored on the power play came of a face off, with straight attack only having 5.2%. It is clear that most power play goals scored by defenseman are scored when the team sets up in the offensive zone.

During the playoffs the same findings were made. 53.3% of the goals came from the 1-3-1 umbrella set up. With 13.3% coming from a set play in the offensive zone. Those two plays made up for 66% of the goals. Rebound (10%) and straight attack (10%) made up 20% of the goals, while tip/deflect and face off both had 6.7 % of goals. Findings from the playoffs can be seen in figure 18.

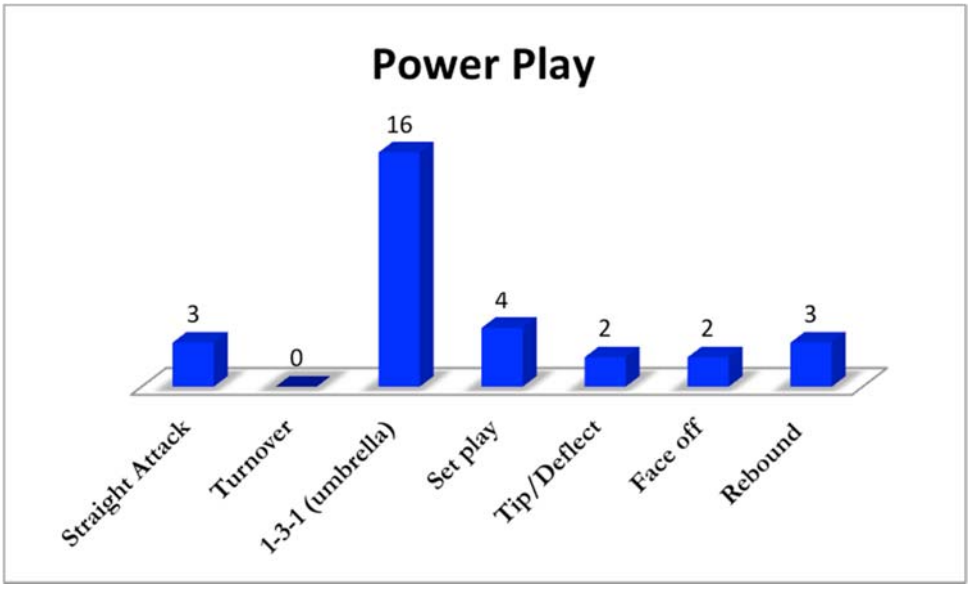

Figure 18. Power play goals scored in Playoffs

5.1.5 Short Handed and Empty net

During the regular season 18 goals were scored shorthanded while 2 came in the playoffs. That accumulates for 1.8% of all goals in the regular season as seen previously in table 2. Empty net goals were scored 22 times in the regular season and 3 times in the playoffs. With these findings we can see that these goals are the least common for defenseman to score.

5.2 Passes in Possession

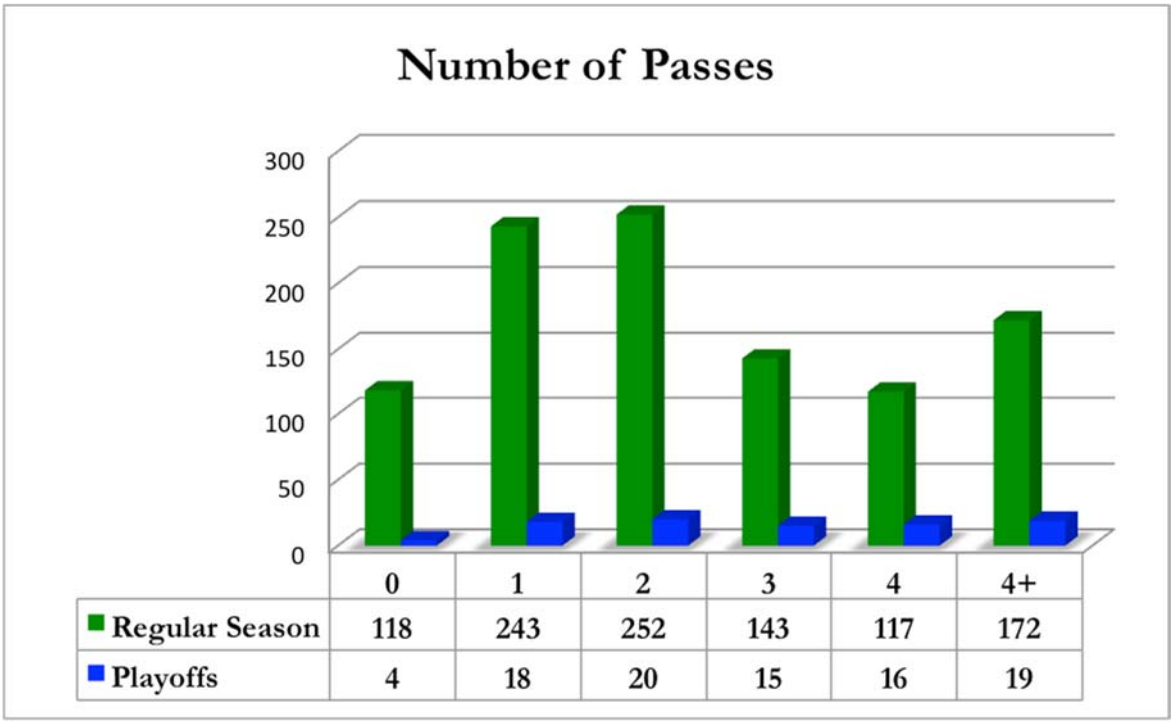

Figure 19. Number of passes made in possession before the goal was scored

As seen in figure 19 it is clear that most of the goals come from when there are only 1 or 2 passes involved. 24.1% or one quarter of the goals are scored when two passes are made and 23.3% of goals scored are when only one pass is made during the regular season. More then 4 passes had 16.5%, 3 passes had 13.7% and 0 passes had 11.3% of the goals scored. 11.2% happened when 4 passes were made. During the playoffs two passes had 21.7% and one pass had 19.6% of the goals. More then 4 passes had 20.7%, 4 passes had 17.4% and 3 passes had 16.3% of the goals scored. Lastly, during the playoffs, 0 passes consisted of 4.3% of goals.

5.3 Scoring Area

When looking at where the goals came from on the ice during the regular season, zone 2 and 3 had the most. Zone 2 had 301 goals (28.8%) and zone 3 had 281 goals (26.9%). Zone 4 had 17.7% of the goals while zone 1 had 12.6%. This was due to the fact that active defenseman would score goals from rebounds or playing in front of the net on the power play. Only 11.5% of the goals were scored from zone 5, outside or

behind the net and 2.5% were scored from outside of the blue line (zone 6) as seen in figure 20.

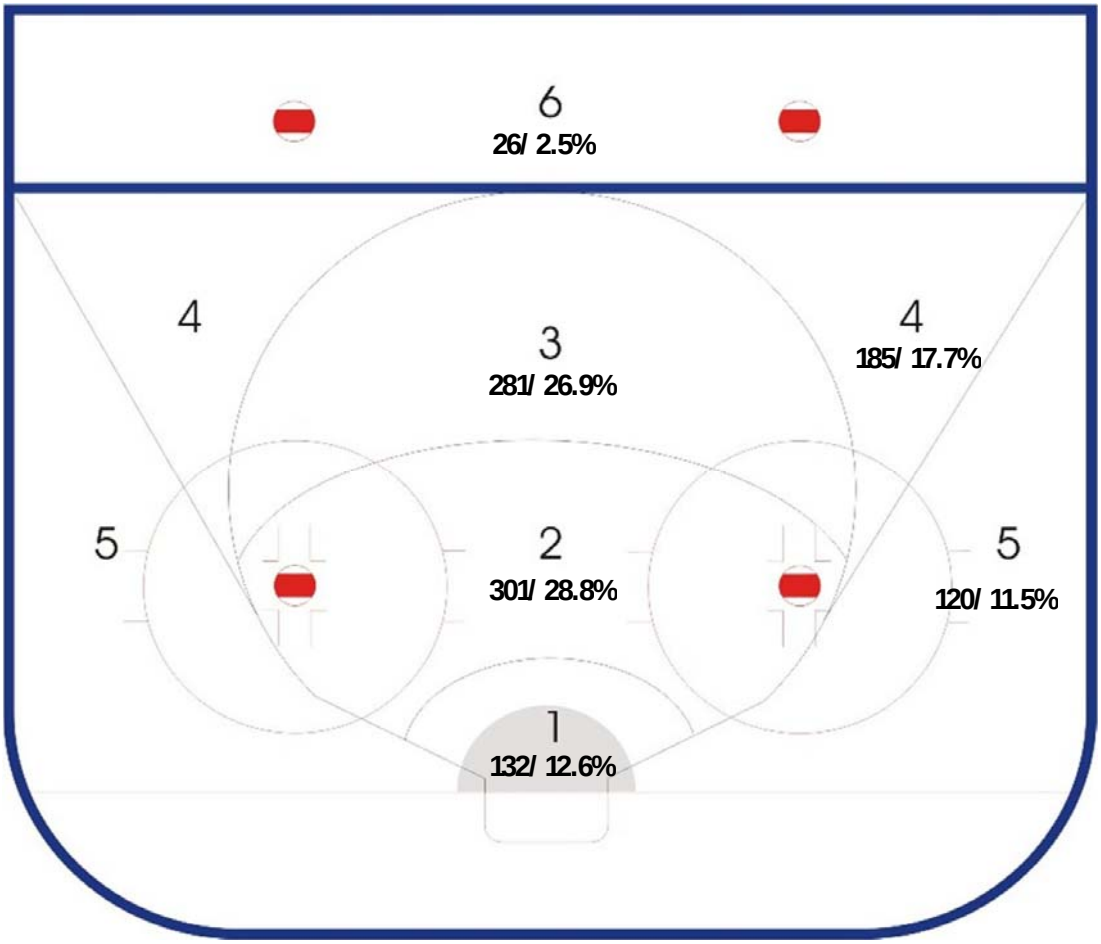

Figure 20. Goals scoring area regular season

The same numbers can almost be said during the playoffs. Zone 2 had the most with 31 goals (33.7%) and zone 3 had 25 goals (27.2%). The third most goals came from zone 4 with 17 goals (18.5%), followed by zone 1 with 11 goals (12%). Zone 5 had 7 goals (7.6%) and zone 6 only had 1 goal (1.1%) during the playoffs.

5.4 Shooting/Scoring type

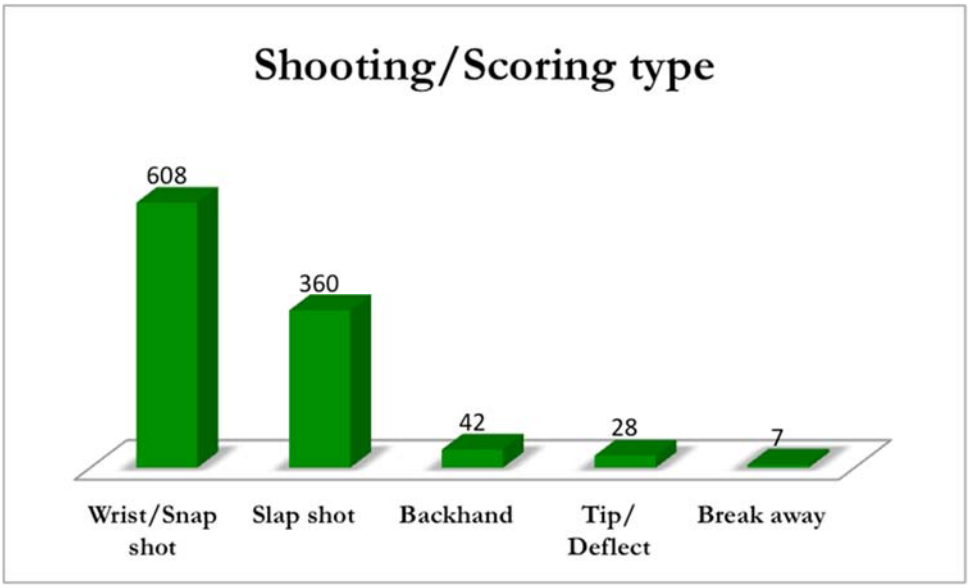

Figure 21. Shooting/Scoring type in regular season (number of goals)

As seen in figure 21 most goals that are scored come from a wrist/snap shot. The wrist/snap shot consist of over half the goals with 58.2%. The harder shot, the slap shot was 34.4%. The backhand technique scored 4% of the goals. Tip and deflect was when the defenseman intentionally tipped or deflected the goal in accounted for 2.7% of the goals, while 0.7% of the goals came from when the defenseman had a break away or penalty shot.

In the playoffs the same finding can be made. 55.4% of the goals came from a wrist/snap shot and 34.8% of the goals came from the slap shot. The backhand, tip/deflect, and break away made up 9.8% of the goals scored in the playoffs as seen in figure 22.

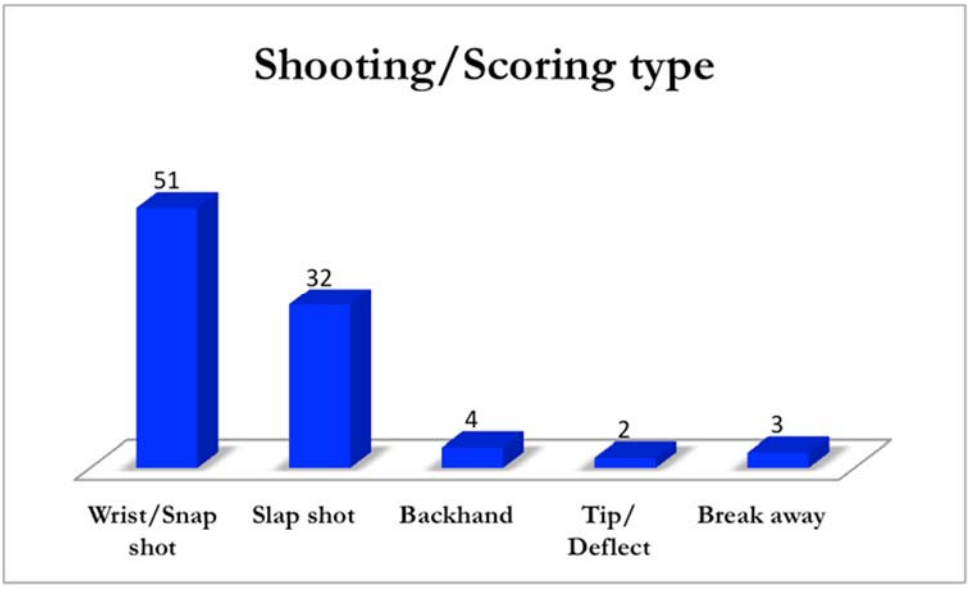

Figure 22. Shooting/Scoring type in playoffs (number of goals)

5.5 Where it was scored on the goalie

After looking at the shooting/scoring type that was used, we can now see where those goals went in against the goalie. The most common place for defenseman to score in the regular season was the high glove (25.9%) and low blocker (23.5%). The third most common place to score was high blocker (19.5%) followed by low glove (16%). The least amount of goals were scored five hole (12.7). The no goalie was not very common because it came during an empty net goal or when the goalie came out to play the puck and the puck took a bounce and went it. These results can be seen in figure 23.

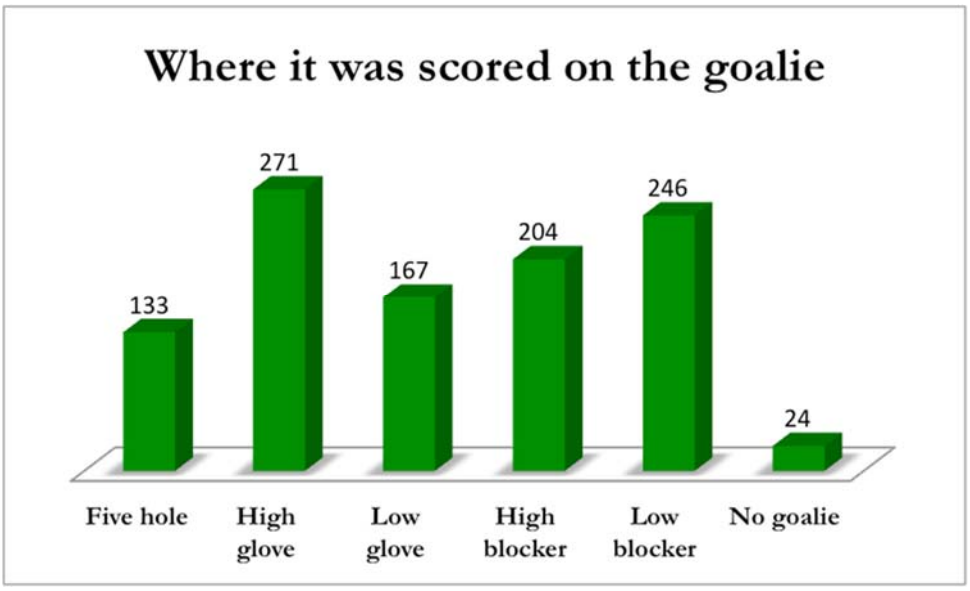

Figure 23. Where it was scored on the goalie in the regular season (number of goals)

During the playoffs 30.4% of the goals were scored high glove. While high blocker and five hole each had 19.6% of the goals. Low blocker consisted of 16.3% of the goals. As seen in figure 24 below, low glove had the lowest amount of goals when a goalie was in the net with 10.9%.

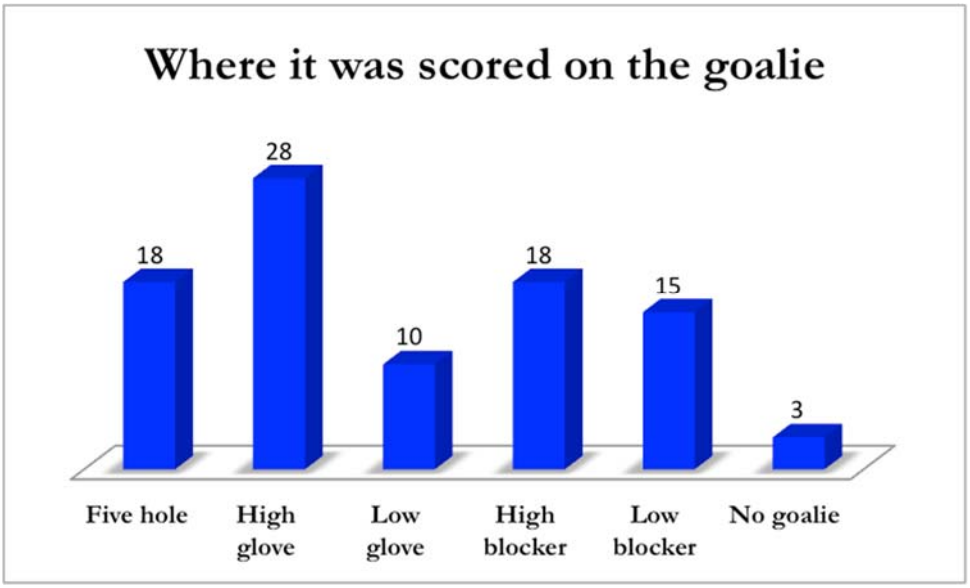

Figure 24. Where it was scored on the goalie in the playoffs (number of goals)

5.6 Strength

As seen in table 3 below over 90% of goals in both regular season and playoffs come from even play and when the team has a 1-man advantage on the power play. The third most goals are scored when the team is 6-5 against with 2.0% and 3.3%.

Table 3. Strength when goal is scored

	Regular Season	% Regular Season	Playoffs	% Playoffs
Even	707	67.7%	58	63.0
Power Play + 1	271	25.9%	30	32.6%
Power Play + 2	16	1.5%	0	0%
Short Hand – 1	18	1.7%	1	1.1%
Short hand – 2	0	0%	0	0%

6-5 for	12	1.1%	0	0%
6-5 against	21	2.0%	3	3.3%

5.7 Where the puck was gained

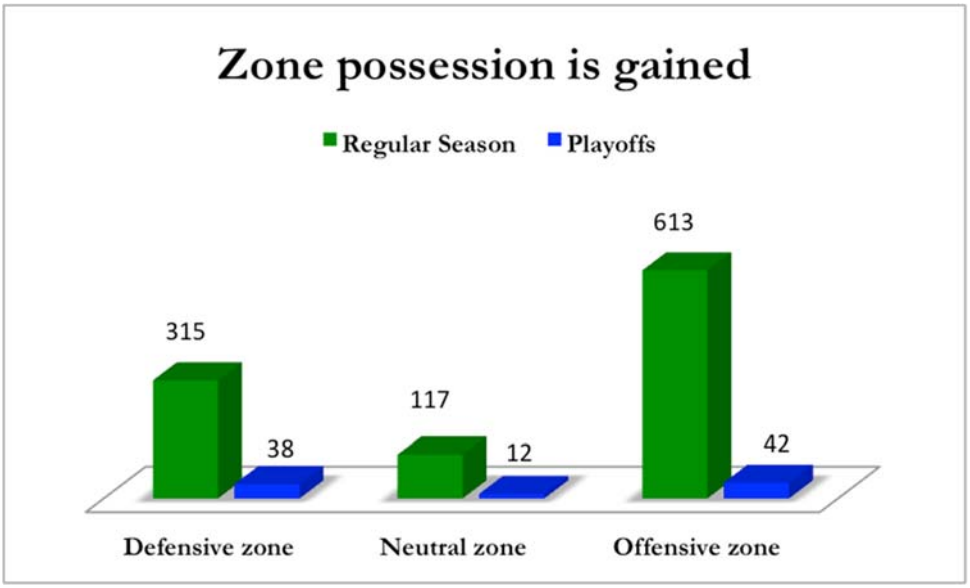

Figure 25. Zone possession is gained (number of goals)

As we see in figure 25 goals in both regular season and playoffs come from when the team gains possession in the offensive zone (58.7% and 45.6%). While the second most comes from the defensive zone. During the regular season 30.1% of the goals came for the defensive zone and 41.3% during playoffs. Lastly, the neutral zone had 11.2% of the goals in the regular season and 13% in the playoffs.

5.8 Length of play

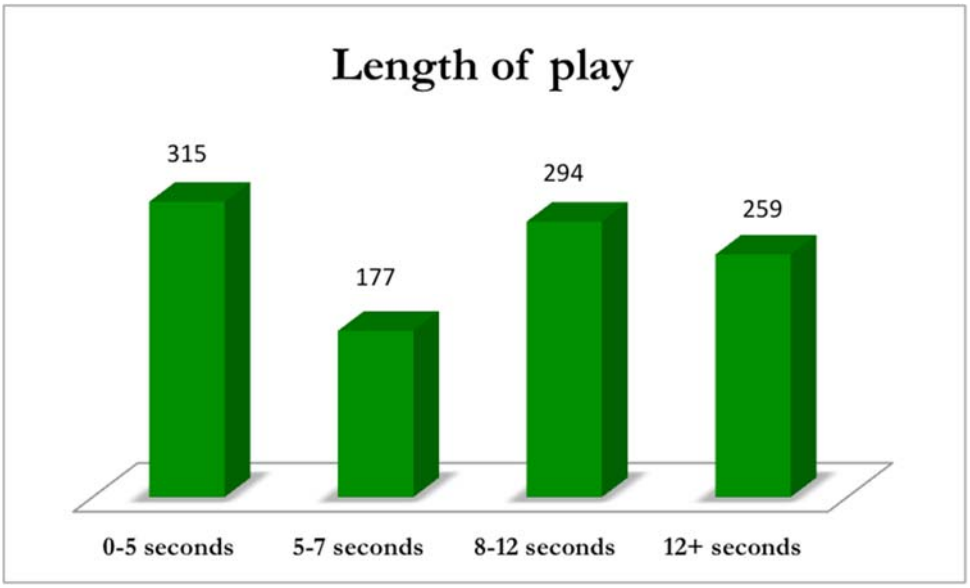

Figure 26. Length of play in regular season (number of goals)

As seen in figure 26, 30.1% of the goals are scored when the play is under 5 seconds. The second most common was 8-12 seconds with 28.1% of the goals. Thrid most common was when the team had more then 12 seconds of possession before the goal was scored (24.8%). The least ammount of goals came when the team had the puck for 5-7 seconds with 16.9%.

During the playoffs most goals came when the team had control of the puck for 12 or more seconds with 37%. Second most was when the team had the puck for 8-12 seconds (27.2%). Thrid most came in under 5 seconds (18.5%). And just like in the regular season, the least ammout of goals came during 5-7 seconds with 17.4% of the goals, as seen in figure 27.

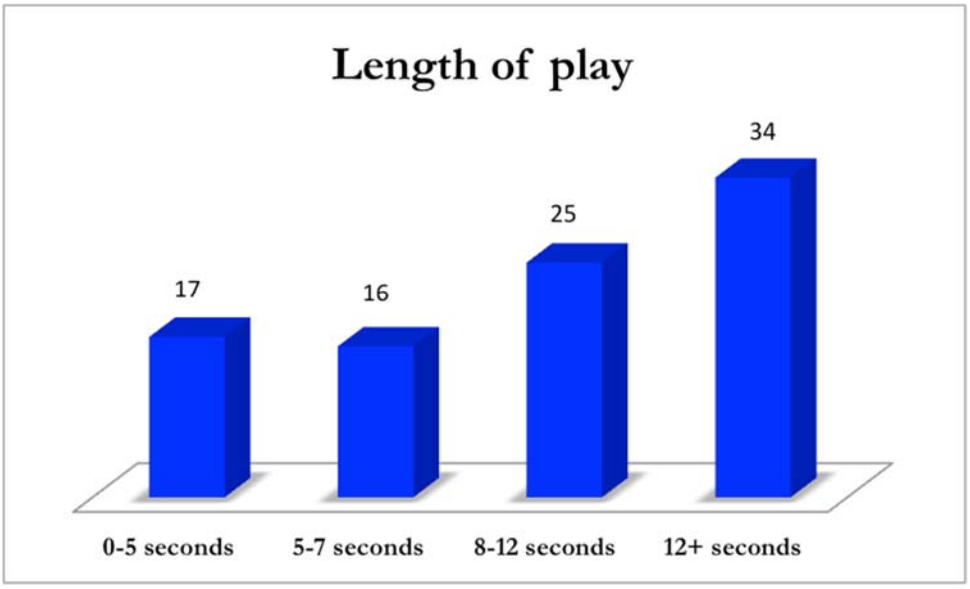

Figure 27. Length of play in playoffs (number of goals)

5.9 Length of time defenseman has the puck for

As shown in figure 28, 58.2% of goals that defenseman scored in the regular season are when they have the puck for less then 1 second. 33.4% of the goals came from when the defenseman has the puck for 1-3 seconds. 6.7% came from 3-6 seconds and 1.7% came from when the defenseman has the puck for over 6 seconds before shooting.

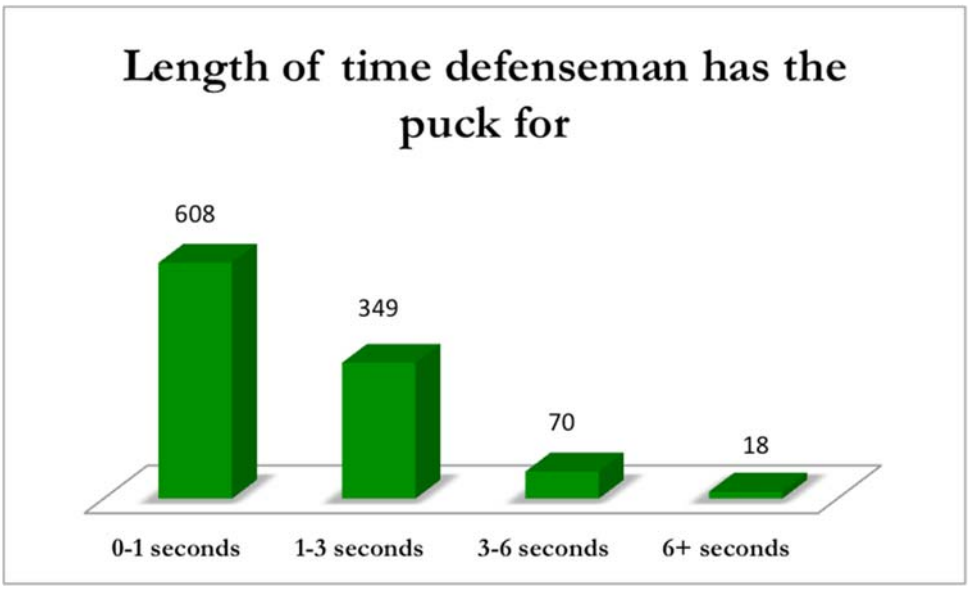

Figure 28. Length of time defenseman has the puck for before scoring in the regular season (number of goals)

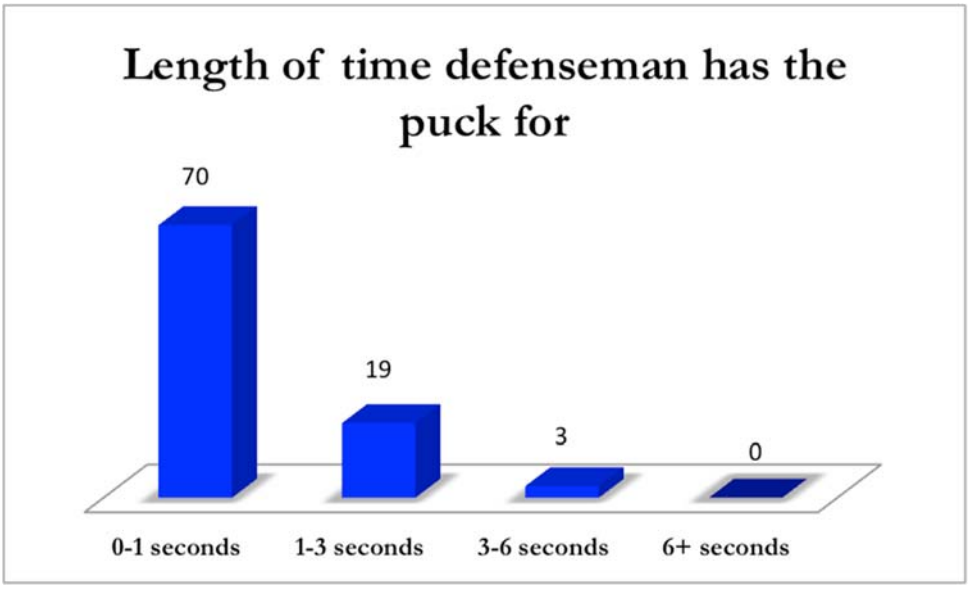

Figure 29. Length of time defenseman has the puck for before scoring in the playoffs (number of goals)

During the playoffs the same results could be found as in the regular season. In the playoffs, 0-1 seconds had 76.1% of all goals. 1-3 seconds had 20.7% of goals and 3-6 seconds had 3.4% of goals.

5.10 Before the shot

Before the shot was taken, 51 times there was a clear attempt at a fake shot and 4 times there was a "clear" fake pass that the defenseman made during the regular season. While the defenseman was on the blue line, there was 167 times that they walked the line and 119 times the defenseman was stationary. During the playoffs there were 9 clear attempts of a fake shot and there were 0 "clear" attempts of a fake pass. 17 times the defnseman took the shot in a stationary position and 15 times the defenseman was walking the line.

5.11 Goalies

Out of 1021 goals in the regular season where the goalie was in net, 775 came from when the goalie was square to the shot, while 246 came from when the goalie was moving side to side. This makes 76% of the time the goalie was square when the goal was scored and 24% of the time the goalie was moving side to side. When the goalie

was in the butterfly/ down on the ice, 964 goals were scored (94.4%) and only 57 goals (5.6%) were scored when the goalie was in a stand up position. When a screen was involved, 213 times there was just 1 player as a screen, 157 had 2 players as a screen, and 86 times there were 3 or more players involved in screening the goalie. Out of these, 367 involved a low screen while 214 involved a high screen.

During the playoffs when there was a goalie in the net, 67 goals (75.3%) were scored when the goalie was square to the shot and only 22 goals (24.8%) were scored when the goalie was moving side to side. All goals scored in the playoffs when the goalie was in the net came from the butterfly/down on the ice (89 goals). When a screen was involved in the playoffs, 18 times consisted of 1 screen, 17 had 2 players and 8 had 3 or more players as a screen. With these screens, 25 were considered low screens and 31 were considered high screens.

6 Discussion

6.1 How the goal was scored

As we can see in how the goal was scored, most goals come from offensive zone play. With 53.2% of the goals coming in the regular season and 44.6% in the playoffs. We can see that it is important that the defenseman is involved in the offensive zone play.

During a straight attack goal, 57.1% were scored in an even rush and 42.9% were during an odd man attack. This is due to the fact that the defenseman often joined the rush. However during the playoffs, the opposite occurred with 46.7% coming from a straight attack and 53.3% coming from odd man attack.

In the offensive zone during the regular season, pass + control + shot had the most of the goals with 24.8% followed by one timer with 24.3%. However, when comparing the regular season and playoff, most of the goals during the playoffs came from a tip/deflect with 26.8%. Pass + shot had 19.5% and one timer had 17.1%. This is a big difference because during the playoffs most of the defenseman just shot the puck when they could and often it would hit someone and go in. It can be seen that when the defenseman has the puck under control that they have a better chance of scoring due to the fact that they have time to aim and shoot. While one timer is affective because the goalie isn't ready. Deflection was also a common way to score in the regular season because when the defenseman shoots the puck and deflected of someone, the goalie had a hard time to react to the direction.

During a faceoff the most common goal was a direct shot because the goalie had less time to react. As well, there were normally a lot of skaters moving and creating screens. I also saw that during a scramble play and when the defenseman makes a pass to the other it created goals because the goalie had to find the puck, react and move.

Most goals on the power play came during a 1-3-1 umbrella because this allowed the defenseman to be on their "off wing" (right handed playing on the left side and left handed playing on the right side) to use their one timer shot. Set play was also a very

common way to score because it would allow the team to set up and run a play that the defensive team didn't know was coming. When comparing the regular season to playoffs, the 1-3-1 umbrella scored more in the playoffs then regular season. In the playoffs it scored 53.3% while in the regular season it scored 38.5% of the goals. Another interesting result was during the playoffs set play had one more goal then straight attack and rebound, which is a big difference compared to the regular season.

Short handed and empty net goals were the least common goals. This was due to the fact that during short-handed plays, the defenseman wouldn't jump up in the play as often. Empty net goals didn't come often because the defenseman didn't want to take the risk and go for the empty net and get an icing. That is why we don't see many empty net goals from defenseman.

6.2 Passes in Possession

Most goals that were scored by defenseman came when there was only 1 or 2 passes. 47% of the time the goals were scored using 1 or 2 passes. This was because a lot of those passes were involved in the offensive zone or during a power play. With fewer passes, the goalie didn't have the proper amount of time to set up and get set for the shot or play.

6.3 Scoring area

Most defenseman scored their goals from zone 2 (28.8%) and 3 (26.9%) during the regular season because they were active and wanted to get to the middle of the ice. Once there, they had players in front as screens and the defenseman had better angles to score in the middle. I also saw that zone 4 had one fourth of the goals because defenseman would get a pass up the wall normally and get a quick shot off from that zone. When comparing regular season to playoffs, most goals came from zones 2 and 3. I believe this is due to the fact that defenseman in both the regular season and playoffs were very active and from these zones it is easier to score on the goalie.

6.4 Scoring / Shooting type

When it came to what shot was the best for scoring, the wrist/snap shot created the most goals. This shot is a quick and accurate shot. That is why defenseman used it a lot to score. The slap shot was the second most common for scoring because it would be used for a one timer for example. It is also a harder shot which caused problems for the goalies. The biggest thing when shooting by defenseman was that they used the wrist/snap shot because they have the most control over it. When comparing the results from the regular season and playoffs, 58.2% and 55.4% of the goals came from the wrist/snap shot and 34.4 and 34.8% came from the slap shot. It is clear that the defenseman in the NHL prefer to use the wrist/snap shot.

6.5 Where it was scored on the goalie

For scoring it is important to see where the goal was scored. As looked at, we saw that high glove and low blocker were the most common places to score on the goalie. During the regular season and playoffs, high glove (25.9% and 30.4%) was the best place to score with the most percentage of goals. A big difference between the regular season and playoffs came during the regular season. Low blocker was the second most common place to score with 23.5% but during the playoffs the second most common place to score was high blocker and five hole with 19.6%. It is clear that during the playoffs there was not a specific place to score beside high glove. I found that this was the case because the goalies in the playoffs were much better then during the regular season.

6.6 Strength

When looking at the strength when the goal was scored, over 63% of goals are scored from even strength and over 25% on the power play + 1 advantage. Most goals scored were even strength because the game is played at even strength the most. Therefor, having the most goals scored during that time. Power play + 1 man was common as well because most team use their defenseman a lot and use them as shooting options on the power play. This is also a common strength during the game.

6.7 Where the puck was gained

During the regular season and playoffs we saw that most of the goals came from when the team gained possession in the offensive zone (58.7% and 45.6%) followed by the defensive zone (30.1% and 41.3%). This is due to the fact that most of the goals are scored in the offensive zone. As well as a lot of plays start from the defensive zone with out the team loosing possession. The reason there isn't much difference in the playoffs from offensive zone and neutral zone is because I found these games to be tighter. Players that got the puck in the neutral zone were able to make attacks quickly and were taking more risk.

6.8 Length of play

When looking at length of play, there were many differences during the playoffs and regular season. In the regular season, the most common way to score was under 5 seconds (30.1%). While in the playoffs most goals were scored when the play was over 12 seconds (37%). As we can see, most goals are scored in under 5 second of possession because the shot or play happens quick, leaving the other team and goalie less time to react, and from 8-12 seconds or over 12 seconds because most of these possessions happen from a breakout and involve passing the puck and creating the other team and goalie to move around more. When we compare regular season to playoffs, 5-7 seconds has the least amount of goals scored. The reason 37% of the goals came from over 12 seconds of possession in the playoffs was because teams wanted to control the puck more in these "more" meaningful games and didn't want to turn over the puck as much.

6.9 Length of time defenseman has the puck for

When the defenseman has the puck for a certain amount of time, the results found that the less amount of time is the best. Most goals came from under 1 second. The second most came when they had the puck for 1-3 seconds. This can be the issue due to the same fact that the quicker the shot came, the better chance they had to score. In the game now defenseman don't score often from holding the puck for that long or doing end-to-end rushes. However, when looking at regular season and playoffs I found that

during the playoffs the defenseman scored 76.1% of the goals when they have to puck for under 1 second compared to 58.2% in the regular season. It was shown that in the playoffs it was a bigger margin because when they got the puck they wanted to get it off quicker and score faster. The defenseman didn't want to hold on to the puck and make a mistake that could lead to a season ending goal for the opposite team for example.

6.10 Before the shot

This variable was the hardest to find and use when it comes to defenseman scoring. When it came to faking, it was hard to see if it was a "clear" fake or not. That is why the numbers are low. Same can be said about walking the line and being stationary. In most goals the defenseman is always moving. It was tough to see if the player was walking the blue line or moving in a different direction. I found that these variables could have little impact to this research. However we can still see that walking the line is still more productive then staying stationary on the blue line.

6.11 Goalie

When we look at goalies we can see that most goal scored on the goalie was when the goalie was in a butterfly stance or down on the ice. This is due to the impact of goalie coaching these days in hockey. We also saw that most goals are scored when the goalie is square to the puck versus moving side to side. An important result was that a lot of goals include screens. Even when there was one screen there were goals. One screen has the most amount of goals compared to 2 or 3 players. This is due to the fact that when more players are in front of the shooting lane it can cause for blocks or redirections away from the goalie.

6.12 Analysis of the NHL 2013-2014 season

In the 2013-2014 NHL season, it is clear that we can see that if the defenseman scores, it is off the offensive zone play or on the power play. Within the goal it is important that the defenseman shoots with a purpose. With that being said if the defenseman can use a wrist/snap shot and can aim the puck, then they will have a good chance of

scoring. The slap shot is also a very good way to score because it is hard and using that speed it is hard for the goalie to save. The biggest thing that we can find in the evidence is as a defenseman it is important to get the puck off as soon as possible if the player can, or hold on to the puck until they have full control and a screen gathers. It is also important that we see where the goals were scored from. Zones 2 and 3 were the most common areas for the defenseman to score We can see that it is important for the defenseman to be active in the offensive zone and not to just wait on the blue line to shoot. When they shot from zone 2 and 3, the defenseman were able to get a better angle. We can also see that if there is no screen on the goalie, the best places to score are high glove or low blocker.

With gathering these findings we can see that main points for defenseman are; quick shots, shoot while moving, be active in the offensive zone as well as the defensive zone, and to shoot often (especially on the power play).

6.13 Further research

In further research I believe it would be interesting to study how many scoring chances that defenseman produce. Not just to look at the goals by defenseman, but look at all the goals in the NHL and see how many the defenseman contribute it. For example to see how many goals come from a rebounds or tip when the defenseman shoots the puck in a scoring chance. It would also be an interesting topic to find if a certain hand of a player scores more then the other, especially on the power play. Another interesting study could involve the same study, but also look at Olympic size ice. It would be interesting to find out if these results for defenseman are the same on NHL ice versus Olympic size ice.

6.14 Personal Assessment

During this study I was able to get a better understanding of how defenseman score goals. One of the big findings was the time the defenseman has the puck for. The old saying of "bring the puck to the middle or walk the line" is used a lot in coaching. This is true that it should happened, but it was also surprising to learn that most goals are scored when they do not walk the line and instead shot right away. A big succession

from doing this research was the ability to find out how they were scored. I can now use this as a coaching method for defenseman by explaining the results and using the most common ways of scoring to inform the defenseman how to score. One of the biggest failures was not looking at a variable of if the defenseman who scored, scored on their off hand side. For example, it would have been a key finding if I was able to see if left handed defenseman score more on the left side or right side of the ice.

6.15 Overall Conclusion

After looking at all the goals and results, it is clear that a quick, accurate shot is the best way to score. We can see that if the defenseman cannot shoot the puck as soon as possible, then it is important to gain full control of the puck. Lastly, it is important to have screens or traffic in front of the goalie when the shot is taken. The biggest conclusion is that defenseman may only contribute in 20% of all goals, but that added up to over 1000 goals in the season. When a team has defenseman that contributes to scoring, it helps the team become more of a threat in the offensive zone which can help create more victories for the team.

References

Andrews, J. 2009. "2006-2007 NHL Season Goal Scoring Analysis: Top 15 Goal Scorers & Top 5 Goal Scoring Teams" Bachelor's Thesis. Haaga-Helia University of Applied Sciences.

Atalı, L, Gürer, B. & Atalı, E. 2014. Ice hockey world championship - analysis of total shots and shots of goals scored (U18-DIV III-group B/2013). International Journal of Academic Research Part B. Vol. 6. No. 1. Turkey. URL: http://www.tbhf.org.tr/Content/Mevzuatlar/IceHockeyWorldChampionAnalysisofTotalShots.pdf. Accessed: 12 Mar 2015

Boyle, C. & Valiquette, S. 2015. The (Royal) Road to the future of Goaltender Analytics. MSG Hockey Night Live. URL: http://www.msg.com/shows/hockey-night-live/chris-boyle/green--red-and-yellow-shots.html. Accessed: 14 Mar 2015

Garbe, N. 2013. "Goal scoring analysis based on team level in National Hockey League in the season 2006/ 2007" Bachelor's Thesis. Haaga-Helia University of Applied Sciences. Vierumäki. URL: http://www.theseus.fi/handle/10024/59885. Accessed: 6 Mar 2015.

HHOF 2013. History. URL: http://www.hhof.com/htmlSilverware/silver_splashstanleycup.shtml. Accessed: 27 Feb 2015.

IIHF 2013. The early beginnings. URL: http://www.iihf.com/iihf-home/history.html. Accessed: 27 Feb 2015.

Kontsas, J. & Lehtola, J. 2014. "Goalie and scoring analysis: MOL, Mestis and Liiga" Bachelor's Thesis. Haaga-Helia University of Applied Sciences. Vierumäki. URL: http://www.theseus.fi/handle/10024/78338. Accessed 9 Mar 2015

Magnusson, T., 2010, Creating Scoring Chances, International Ice Hockey Federation Coaching Symposium, Cologne. URL: http://www.hockeycentre.org/inEnglish/Seminars/Seminars/IIHFCologne2010/tabid/714/language/en-US/Default.aspx. Accessed: 17 Mar 2015

McGran, K. 23 Jan 2013. NHL goal scoring dominated by wrist shots, Star analysis shows. URL: http://www.thestar.com/sports/hockey/2013/01/23/nhl_goal_scoring_dominated_by_wrist_shots_star_analysis_shows.html. Accessed 14 Mar 2015

McMillan, S. 2012. "Shooting with a purpose in ice hockey" Bachelor's Thesis. Haaga-Helia University of Applied Sciences. Vierumäki. URL: http://theseus.fi/handle/10024/54090. Accessed: 3 Mar 2015.

McSorley, C. 2009. Tactical Applications in Today's Game. International Ice Hockey Federation Coaching Symposium, Zürich. URL: http://www.hockeycentre.org/inEnglish/Seminars/Seminars/IIHFZürich2009/tabid/449/language/en-US/Default.aspx. Accessed 17 Mar 2015

Mensonen, J. & Salo, O. 2008. "Effective Offensive Play. Scoring Analysis of the 2005 World Championships and the 2006 Olympics" Bachelor's Thesis. Haaga-Helia University of Applied Sciences.

Mikkola, Raimo. 1987. Scoring. Finnish Ice Hockey Association. Valolatomo Jouko Rahikkala Oy.

Niemelä, T. 2011. Goalie coach course for the IIHF. Bachelor's Thesis. Haaga-Helia University of Applied Sciences. Vierumäki. URL: http://www.theseus.fi/handle/10024/31451. Accessed 20 Mar 2015

NHL Enterprises, L.P. 2008. History. URL: http://www.nhl.com/history/timeline.html. Accessed: 27 Feb 2015.

Quant Hockey. 2015. Percentage of Goals by Forwards and D-man in Regular Season. URL http://www.quanthockey.com/TS/TS_GoalsPerGame.php. Accessed: 1 Mar 2015.

Rollins, L. 2010. Implication of Puck Possession on Scoring Chances in Ice Hockey. Bachelor's Thesis. Haaga-Helia University of Applied Sciences. Vierumäki. URL: http://theseus.fi/handle/10024/25542. Accessed 19 Mar 2015

Saperecom LLC 2013. History of Hockey. URL: http://www.historyofhockey.net/history_of_hockey.html. Accessed: 27 Feb 2015.

Sator, T., 2006, Paying the Price to Score Goals, International Ice Hockey Federation Coaching Symposium, Riga. URL: http://www.hockeycentre.org/inEnglish/Seminars/Seminars/IIHFRiga,2006/tabid/450/language/en-US/Default.aspx. Accessed: 26 Feb 2015.

Savolainen, K. 2013. Scoring Analysis of the 2008-2013 SM Liiga. Unpublished.

Sumkin, S & Vuorinen, J. 2005. Scoring in ice hockey. Case: Scoring analysis of the wsc 2003. Bachelor's Thesis. Haaga University of Applied Sciences.

Appendices

Appendix 1. Regular Season

How the goal was scored			**Passes in Possession**	
Even	68		0	118
Odd man	51		1	243
Straight Attack Total	119		2	252
Offensive Zone			3	143
One time	135		4	117
Pass + Shot	96		4+	172
Pass + Control + Shot	138		**Total**	1045
Rebound	70		**Scoring Area**	
Cross zone pass	14		1	132
Deflect	103		2	301
Total	556		3	281
Face Off			4	185
Direct shot	22		5	120
Scramble Play	10		6	26
Pass to other D	10		**Total**	1045
Set play	2		**Scoring Type**	
Total	44		Wrist/Snap Shot	608
Power Play			Slap Shot	360
Straight Attack	15		Backhand	42
Turnover	6		Tip/Deflect	28
1-3-1 (Umbrella)	110		Breakaway	7
Set play	67		**Total**	1045
Tip / Deflect	38		**Where it was scored**	
Face Off	21		Five hole	133
Rebound	29		High glove	271
Total	286		Low glove	167
Short Handed	18		High blocker	204

Empty Net	22		Low blocker	246
How the goal was scored Total	1045		No Goalie	24
Strength			**Length of Play**	
Even (5-5,4-4,3-3)	707		0-5 seconds	315
Power play + 1	271		5-7 seconds	177
Power play + 2	16		8-12 seconds	294
Short handed – 1	18		12+ seconds	259
Short handed – 2	0		**Total**	1045
6-5 For	12		**Length of time Dman has the puck for**	
6-5 Against	21		0-1 seconds	608
Total	1045		1-3 seconds	349
Hand of Shooter			3-6 seconds	70
Left	594		6+ seconds	18
Right	451		**Total**	1045
Total	1045		**Before the shot**	
Puck gained			Fake shot	51
Defensive zone	315		Fake pass	4
Neutral zone	117		D walking the line	167
Offensive zone	613		D stationary	119
Total	1045			

Regular Season Goalies

Goalie	
Goalie moving side to side	246
Goalie square to shot	775
Butterfly	964
Stand up	57
Screen	
1	213
2	157

3	86
Low screen	367
High screen	214
Goals Against Total	1045

Appendix 2. Playoffs

How the goal was scored			**Passes in Possession**	
Even	7		0	4
Odd man	8		1	18
Straight Attack Total	15		2	20
Offensive Zone			3	15
One time	7		4	16
Pass + Shot	8		4+	19
Pass + Control + Shot	7		**Total**	92
Rebound	7		**Scoring Area**	
Cross zone pass	1		1	11
Deflect	11		2	31
Total	56		3	25
Face Off			4	17
Direct shot	0		5	7
Scramble Play	0		6	1
Pass to other D	1		**Total**	92
Set play	0		**Scoring Type**	
Total	1		Wrist/Snap Shot	51
Power Play			Slap Shot	32
Straight Attack	3		Backhand	4
Turnover	0		Tip/Deflect	2
1-3-1 (Umbrella)	16		Breakaway	3
Set play	4		**Total**	92
Tip / Deflect	2		**Where it was scored**	
Face Off	2		Five hole	18
Rebound	3		High glove	28
Total	30		Low glove	10
Short Handed	2		High blocker	18
Empty Net	3		Low blocker	15
How the goal was scored Total	92		No Goalie	3

Strength			**Length of Play**	
Even (5-5,4-4,3-3)	58		0-5 seconds	17
Power play + 1	30		5-7 seconds	16
Power play + 2	0		8-12 seconds	25
Short handed – 1	1		12+ seconds	34
Short handed – 2	0		**Total**	92
6-5 For	0		**Length of time Dman has the puck for**	
6-5 Against	3		0-1 seconds	70
Total	92		1-3 seconds	19
Hand of Shooter			3-6 seconds	3
Left	55		6+ seconds	0
Right	37		**Total**	92
Total	92		**Before the shot**	
Puck gained			Fake shot	9
Defensive zone	38		Fake pass	0
Neutral zone	12		D walking the line	15
Offensive zone	42		D stationary	17
Total	92			

Playoffs Goalies

Goalie	
Goalie moving side to side	22
Goalie square to shot	67
Butterfly	89
Stand up	0
Screen	
1	18
2	17
3	8
Low screen	25

High screen	31
Goals Against Total	92