



# Implication of Puck Possession on Scoring Chances in Ice Hockey

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<p><b>Supervisors</b> Antti Pennanen Kari Savolainen</p> <p>Much of the conventional wisdom in ice hockey suggests that moving the puck forward, towards the opponent's goal, is the best strategy for producing scoring chances.</p> <p>Past research has lent credence to this wisdom. Studies have consistently shown that scoring chances in hockey are produced from fast attacks and short possessions of less than 10 seconds.</p> <p>Thus, many coaches the world over preach a brand of hockey that sacrifices puck control for constant forward motion. As a consequence, hockey is often reduced to a game of Pong – teams exchange the puck back and forth until someone commits a fatal error and a goal is scored.</p> <p>Previous studies have given only a partial picture of the nature of scoring chances. They have implied that the production of a chance is dependent only on the possession immediately prior to that chance.</p> <p>This study will expand on the earlier research by examining the ten possessions prior to a scoring chance, and how they affect the production of that chance.</p>	
<p><b>Key words</b> Puck possession, Scoring chances, Scoring efficiency, Possession, Hockey Tactics, Hockey Offense</p>	

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## 1 Introduction

In a 2009 New Yorker magazine article, author Malcolm Gladwell wrote:

In the Biblical story of David and Goliath, David initially put on a coat of mail and a brass helmet and girded himself with a sword: he prepared to wage a conventional battle of swords against Goliath. But then he stopped. “I cannot walk in these, for I am unused to it,” he said. . . and picked up those five smooth stones. What happens when the underdogs likewise acknowledge their weakness and choose an unconventional strategy? When underdogs choose not to play by Goliath’s rules, they win.

(Gladwell2009)

Gladwell's proposition has striking implications for our game. In a standard hockey match, where both coaches implore their players to move forward, always forward, as quickly as possible, the bigger, faster, stronger team will always have a better chance of winning. Keeping possession of the puck, and directing the play away from the corners and end-boards may be the key to victory for smaller, physically weaker teams. If such teams avoid playing the type of game that the big teams want to play, are they more likely to succeed? Does keeping the puck have any impact, positive or negative, on the creation of scoring chances?

In attempting to answer these questions, this study will review earlier research conducted by the International Ice Hockey Centre of Excellence and others and attempt to build on it, creating a more complete picture of the nature of a scoring chance. This study will attempt to quantify scoring chances, and length of possessions in relation to scoring chances.

This paper is organized as follows: The first section is the introduction. The second section is the theoretical framework, which depicts earlier research in the area of scoring chances and possessions, and offers expert opinions on the nature of possession and scoring chances. The

third section is empirical in nature and discusses the research problem and research method, identifying data collection, methods, and presenting the results of this research. Finally, the fourth section will review the key results, limitations of the study, and offer conclusions based on the research.

## **2 Theoretical framework**

This section will define key terms related to this area of research; review various existing opinions of possession and scoring chances in ice hockey and their origins; and present findings from previous research.

### **2.1 Clarification of terms**

In order to understand the content of this thesis, it is important to define some key terms, prior to delving into the subject at hand.

#### **2.1.1 Possession**

When one team is controlling the puck, that is, it is on the stick of one of the players on that team, the team is said to be *in possession* of the puck. In a single game of hockey, the puck changes possession many times, and possession of the puck can be gained in a number of ways. A team can intercept a pass; it can gain the puck through a defensive action (steal the puck from an opponent's stick, etc.); it can win a face-off; it can retrieve the puck after a dump-in or a shot on goal; or it can gain control of a loose puck (Saarinen, Mensonen & Small 2009, 15).

Various estimates exist regarding how often possession changes in a single game. Widely distributed materials from the Suomen Jääkiekkoliitto (SJL) and the International Ice Hockey Centre of Excellence (IIHCE) state that each team gains possession of the puck approximately 200 times per match (Alatalo 2005. 30), and that possession is generally distributed evenly between the two teams. Appendix A shows the current model for puck possession and transfer between two teams in a game.

#### **2.1.2 Possession vs dump and chase**

Perhaps Possession hockey can best be described in terms of what it is not. Possession Hockey is the antithesis of Dump and Chase Hockey. Dump and Chase, of course, is a strategy where a team attempts to advance the puck into the neutral and then the offensive zone, without necessarily retaining possession of the puck. In a sense, the team makes an investment – it gives something (the puck) away in order to regain it later in a more dangerous place on the ice (deep in the offensive zone, etc.). Offensively, this manifests itself when a team dumps the puck into the offensive zone, then pressures the opposing puck carriers as they attempt to breakout, causing turnovers in high-percentage scoring areas. In order to be effective, “the object should not be,

however, to give up possession of the puck, but rather to penetrate the offensive zone with the likelihood of regaining puck control. Unless this purpose is absolutely clear, you have simply given up the puck foolishly” (Perron, Chouinard 1991, 206).

Dump and Chase can also be used as a defensive maneuver – rather than attempt to breakout of their defensive zone with a controlled passing play, a team might use a fast breakout or attempt to chip the puck off the glass and out of the zone, both of which “...emphasize the quickness of moving the puck out of the defensive zone while sacrificing – relatively speaking – certain principles of attack such as puck control” (Perron, Chouinard 1991, 189).

A Puck Possession team approaches the game in a much different way from a team focused on Dumping and Chasing. Rather than simply dumping the puck away from their own goal and towards the opponent's goal, a Puck Possession team aims to retain control of the puck, even when forward progression of the puck is impeded (Turpin 2007). Teams can maintain control of the puck by aborting and reorganizing their attack, or regrouping.

### **2.1.3 Regroup (mid-fast breakout or regroup)**

Sometimes, a team elects to abort a forward rush, but maintains control of the puck by moving back (with a pass or by skating) towards their own defensive zone. If a puck-carrier finds himself approaching the offensive zone with no support from his teammates, or the offensive team is outnumbered by defenders as it approaches the offensive blue line, the puck carrier is forced to make a decision. He may choose to continue attacking, and attempt to create a scoring chance despite being out numbered by defenders; he might dump the puck behind the defenders, hoping to retrieve it on the forecheck, deep in enemy territory and with more support; or he might choose to abort the attack, passing or skating away from the offensive zone in order to maintain control of the puck and reorganize with his linemates (Turpin, 2007). This final option is known as 'regrouping'. The time and type of regroup employed is dependent on the situation and the puck-carrier.

In 1976, sports researcher Guy Boulonne analyzed the Russian Red Army team's regrouping tactics used in the '72 Summit Series against Canada. Boulonne described regrouping as the interaction of a number of concepts:

1. Back-passing and/or carrying the puck back
2. Spreading the defense with one higher than the other
3. Forwards interchanging, accelerating and developing good width (lanes) and depth (zones)
4. Isolation with eventual support
5. Improvising to “take” whatever the defense is giving

(Boulonne 1976, 16)

#### **2.1.4 Counter-attack**

The counter-attack is another form of transition, moving up ice more quickly than the regroup. When a team wins possession of the puck, the puck carrier must read the situation and decide if the puck should immediately be advanced (by skating, passing or dumping) or if a regroup should be initiated (by turning or passing back towards one's own goal). If the puck is immediately and quickly advanced, this is known as a counter-attack.

Counter-attacks are important in hockey. Quick counter-attacks can result in attacking with a numerical advantage. Indeed, game analysis has shown that at the Men's International level, approximately 30% of goals are created by counter-attacking (Saarinen, Mensonen & Small 2009, 17). A good example of a counter-attack leading to a scoring chance might be a defenseman stopping his opponent attacking 3 on 2, then quickly passing the puck up to his teammates, who might then be able to attack with their own numerical advantage. Fast counter-attacks in the offensive zone can create scoring chances against a disorganized defense. The opposite of this fast counter-attack is an organized attack.

#### **2.1.5 Organized attacks**

Organized attacks can originate in any of the three zones of play. When the play originates in the defensive zone, we will term it a slow or organized breakout. Slow breakouts usually occur when the team with the puck has “enough time to set up a specific play known by all the attacking players, most commonly when the forechecking by the opposition is rather unaggressive” (Perron, 1991, 188).

#### **2.1.6 Organized attacks, offensive zone**



When a team's initial rush into the Offensive Zone does not produce a shot on goal, the team must find another way to organize an attack on net. As noted by Chouinard and Perron (1991, 231) “Many initial attacks do not culminate with a shot on net, with the result that you are now attempting to redesign a play to attack the net. You did not lose possession of the puck; you either opted to postpone or were forced to delay the action of going to the net.” There many different forms of organized attack in the offensive zone. Some include cycling, perimeter passing and setting up below the goal line (Chouinard 1991, 231-237).

### **2.1.7 Scoring chance, scoring efficiency, offensive efficiency**

The International Ice Hockey Centre of Excellence has defined and analyzed numerous game situations and variables. Some of these are:

- Scoring chances – A scoring chance can be defined as a shot taken from a 'dangerous' area (the 'scoring area', normally defined as the area directly in front of the goal and extending through the face-off dots to the top of the face-off circles) (Saarinen, Mensonen & Small, 2009) on the ice, a shot on net combined with the screening of the goaltender or a deflection, or a shot produced from an odd-man rush (3-on-2, 2-on-1, etc.). This is different from a shot on goal, which may be taken from anywhere on the ice, but is unlikely to produce a goal (Walter & Johnston 2009, 53).
- Scoring efficiency – The number of goals the team scores divided by the number of Scoring Chances (IIHCE 2008, 7).
- Offensive efficiency – The number of scoring chances divided by the number of attacks from the defensive zone, neutral zone or offensive zone (IIHCE 2008, 7).

**2.1.8 Zone** – When discussing game situations, the rink is divided into 3 zones, as in figure 1: the Offensive Zone (OZ or HA), the Neutral Zone (NZ or KA) and the Defensive Zone (DZ or PA).

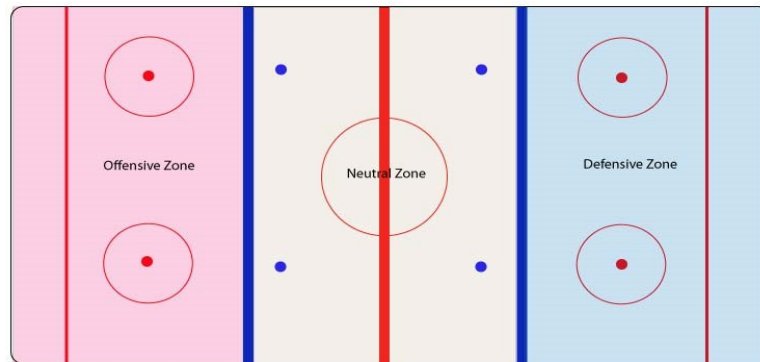


Figure 1. The Three Zones of a Hockey Rink (hockeyiseverything.com 2010)

The zones are relative to the puck-possessing team, so that, if a player has the puck and is standing near to his own goaltender and goal, he is said to be in the Defensive Zone. Of course, his Defensive Zone is his opponent's Offensive Zone.

### 2.1.9 Transition

Transition can be defined as the moment a team must move from offense to defense or vice-versa. This happens many times over the course of a period, as the puck changes possession from one team to the other due to steals, turnovers, rebounds, faceoffs and other regular occurrences (Perron 1991, 152).

Upon gaining possession of the puck, a team may either elect to move up the ice quickly, with an intentional pass (Fast), regroup and move up ice (Mid-Fast), set up an organized or controlled attack (Slow), shoot the puck away into the enemy's Defensive Zone (Dump), or thoughtlessly lose the puck (Flipper). These are the options available to a team in offensive transition.

### 2.1.10 Undetermined possession phase

The game of hockey features many moments of ambiguity; times known as “the 'undetermined possession' phase during the game – neither team is in control of the puck and some players are striving to regain possession while others wait to see the outcome.” (Perron 1991, 150). These

phases can occur after a shot and rebound, after a missed pass, a faceoff or any number of unpredictable circumstances.

## 2.2 Perspectives on regrouping, counter-attacking and dumping

### 2.2.1 Regrouping vs counter-attacking

Traditionally, the decision to abort an attack, any attack, has not been widely supported in North American hockey circles. It is generally thought foolish to ever turn back into the neutral zone, for fear of relinquishing the puck closer to your own net. Better to dump the puck into the opponents' zone where, even if the opposing defensemen recover it, the other team needs to attack the full length of the rink to produce a scoring chance (Johnston 2009). Thus, North American strategy has generally called for a dump-in, rather than a regroup. As noted by Canadian journalist Justin Bourne, for years, “teams would mount their charge, and if it was well defended, they'd say 'well all right then. Well done. Here it is. Your turn to take a crack at us’” and dump the puck away (Bourne 2010). A puck possession team, facing the same situation would more often opt to keep the puck, and turn back into the neutral or defensive zone in order to reconfigure their attack.

Many hockey scholars credit the classic '72 series between the Soviet Union and Canada with introducing more complex neutral zone plays and regroups to the North American hockey scene.

At that time, North American teams were playing a very linear game, with wings staying in their lanes, and centres always in the middle of the ice, much like the old table-hockey games. The Russians were very good at controlling the puck with their defensemen while their forwards skated to openings laterally and diagonally, organizing and executing an attack with all five players. Russian players were encouraged to skate to any area of open ice, unconfined by a coach's declaration to “stay in your lane”... In some cases, the Russians would approach the attacking blue line in possession of the puck and turn back to regroup, hoping to form a better attack (Gendron 2003, 78).

Despite the success of the Soviet system, many well-respected coaches on both sides of the Atlantic Ocean still believe that the puck should always move forward – away from one's own goal and towards the opponent's. In his classic memoir, *The Game*, Hall of Fame goaltender Ken

Dryden makes his opinions on possession and counter-attacking rather clear:

Hockey is not a *possession* game, nor can it ever be [. . .] A possession game is hyperbole. The puck changes teams more than 6 times a minute, more than 120 times a period, more than 400 times a game, and little can be done to prevent it. [. . .] It is the nature of the game, North American or European. If possession is a team's style, it will be frustrated. Worse, if it is attempted, it will make the game cautious and predictable (Dryden 1983, 129).

Dryden is not the only one with such strong opinions on the subject. Following the Olympic Men's Hockey Final played between Canada and the US in 2010, Team USA head coach Ron Wilson's post-game comments riled many fans, coaches and players in Europe.

The game tonight had so much intensity. Canada and the United States play the game like it should be – not sitting back on your heels and waiting for something bad to happen and counter-punching, but actually going on the attack [. . .] I'm teaching [my players] to play the right way; not the Slovakian, Czech or Russian way where you sit back and wait and wait and wait. We are on the attack. [. . .] The game was invented in Canada and I think we in the United States have morphed into the same style of play. It is exactly the way the game should be played (Roarke, 2010).

### **2.2.2 Possession vs dumping**

Puck possession is power. The team that has the puck can often dictate the speed, direction and nature of play. When a defender gains the puck in his own defensive zone, for instance, he may skate the puck up ice quickly, he may make a long stretch pass to a teammate, he might make a lateral pass to his defense partner in an attempt to open up passing options, he might skate behind his own net to set up an organized attack, or he might simply dump the puck out of the zone. The choice he makes is, of course, dependent on the game situation and the nature of the pressure he faces from the opposing team, but he, nonetheless, can choose what to do with the

puck. And what he does with the puck will influence the movement of every other player on the ice. Why, then, might so many teams be in such a hurry to dump or relinquish control of the puck? As one North American coach explains it:

The answer is fairly simple. When you are approaching the center red line or the attacking blue line and the likelihood of a successful entry is poor while the likelihood of a turnover and counter attack by the opponent is high, why not dump it in? If the puck is dumped in, you have a chance to get it back. That's good. If the puck is dumped in, the opponent has to return it 200 feet to score a goal...If the puck is not dumped in but rather turned over to an opponent who counter attacks, well...that's not so good!  
(Gendron 112.)

So, then, relinquishing control, or dumping, can be a defensive action made by the offensive team.

## **2.3 Perspectives on organized breakouts**

### **2.3.1 Organized breakouts – North America**

On the smaller ice surface (61m x 26m) of North America (as opposed to the International specifications of 61m x 30m) (IIHF 2004), most teams do not have the opportunity (or the desire) to break out slowly during even strength (5-on-5) play as the reduced playing area makes aggressive forechecking a common and effective strategy (Lehkonen 2010). An exception is when playing against a trapping defense – the trap often allows or invites the offensive team to break out of its own end, but then clutters up the neutral and high offensive zones, making continued forward progress difficult. A slow or organized breakout allows the offensive team to attack as a unit; when done correctly, this can open holes in the opponent's trap. According to respected coaches Ryan Walter and Mike Johnston, the keys to successful slow or organized breakouts are “(1) the four players without the puck move with speed, and (2) the puck carrier knows the options and picks the best one. In [this] setup, the puck carrier is like a quarterback who knows the routes of the receivers and picks which option is open” (Walter & Johnston 2010, 14). Despite the awareness of organized, slow, breakout tactics, the North American philosophy dictates that the puck should spend as little time as possible in your own team's defensive zone.

*“By minimizing the amount of time spent in the defensive zone, good teams reduce the probability of allowing goals... The ideal situation is to be able to get the puck out with either a carry or a pass, perhaps two, so that possession is maintained and the attack can continue. However, the bottom line is to ensure that the puck gets out of the defensive zone”*  
(Gendron 2006, 63).

### **2.3.2 Organized breakouts – Europe**

The larger European ice surface demands a different forechecking strategy which, in turn, has produced a different philosophy on the use of slow or organized breakouts. Trapping, or less aggressive (1-2-2, 1-4) forechecking systems are much more common in Europe, as teams try to prevent 'losing' a forechecker deep in the opposition's zone, as may happen if a player skates in hard, but is beaten with a quick pass up ice. Due to the sheer size of the rink, it is easier for puck-carriers to avoid being checked deep in the defensive zone (Lehkonen 2010). In Finland, however, after a dump-in, teams are regularly allowed to collect the puck, make a leisurely line change, and organize their breakout, all with the defensive team standing calmly by, patiently

waiting for the game to resume. The focus is not necessarily on moving with speed, but rather on moving with *support* and *balance*. Teams are not afraid to keep possession in their own defensive zone, because, due to the wide rink, smart passing with good support can tire the forechecking team, cause breakups in their defensive system, and widen gaps between defenders and oncoming attackers (Pennanen 2010).



## 2.4 Existing research on scoring chances and puck possession

A 2008 study conducted by the International Ice Hockey Centre of Excellence indicates that most attacks (75 out of 125, or 60%) originate in the Defensive Zone (table1) , but only 25% percent of goals are produced from those attacks, as seen in table 2. Thus, attacks originating in the Defensive Zone are not particularly efficient.

Table 1. Zones Where Attacks Begin, Average, Per Team, Per Game (125 Attacks Total)

Zone in Which Attack Originates	Quantity of Attacks
Defensive Zone	75
Neutral Zone	30
Offensive Zone	20

(IIHCE 2008, 2.)

Table 2. Percentage of Goals Produced

Attack Originates in:	Percentage of All Goals Scored
Defensive Zone	25.00%
Neutral Zone	15.00%
Offensive Zone	25.00%

(IIHCE 2008, 2)

In addition to knowing from where attacks originate, it is important to note how scoring chances, and goals, are produced. Table 3 indicates the manner in which goals were scored in the 2008 IIHCE study.

Table 3. Type of Attacks that Produce Goals

How Possession is Gained	Percentage of Goals
Stolen Pucks	40%
Opponent Dump	10%
Rebound	40%
Face Off Win	10%

(IIHCE 2008, 3)

These statistics indicate that if we score 5 goals on 125 scoring chances, 3.5 of those goals, on average, will come from only 25 fast counter-attacks. The remaining 1.5 goals will come from 90

organized attacks. When viewed in this manner, the statistics seem to indicate that fast counter-attacks are more efficient at producing goals than organized attacks (table 4).

Table 4. Effectiveness of Counter-Attacks vs Organized Attacks

Attack Type and Quantity	Goals Scored	Effectiveness
Counter-Attack 25	3.5	14%
Organized Attack 90	1.5	1.6%

(IIHCE 2008)

Using these statistics, many coaches and experts have come to the conclusion that most scoring chances are the result of fast counter-attacks (Alatalo 2005), and they train their teams accordingly.

#### 2.4.1 Prior possessions in relation to scoring chances

Other studies by the IIHF and the International Ice Hockey Centre of Excellence have examined the length of possessions that directly lead to scoring chances. The IIHCE studied attacks at the 2006 Olympics and 2005 World Championships. Figure 1 displays the results from their research.

Duration of Attack in Even Strength and Power Play Situations  
Olympics 2006 & WC 2005

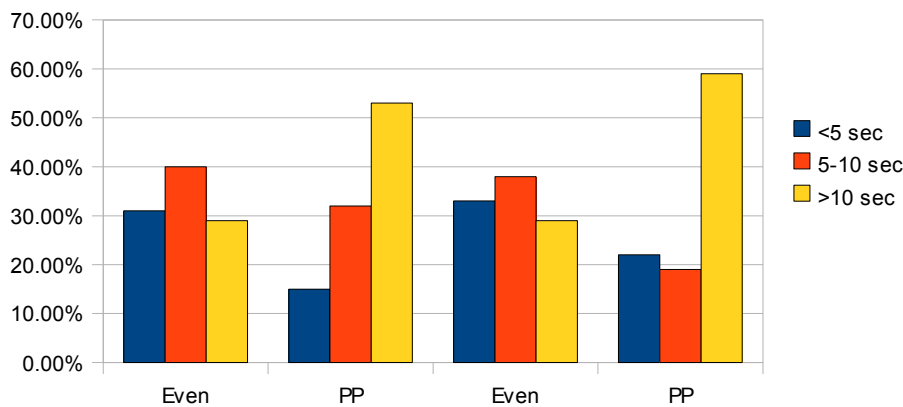


Figure 1. Duration of Attack in EV and PP Situations, IIHCE

In the study, of the even strength attacks which produced goals, approximately 72% lasted less than 10 seconds, which would seem to suggest that, at even strength, quick attacks (as in counter

attacking) are the most effective.

This research is interesting, but leaves many unanswered questions. Namely, if we accept that fast counter-attacks and short possessions produce scoring chances and goals, what circumstances produce those fast counter-attacks? How does a team get into a position where it has the opportunity to make a fast attack?

### **3 Research problem**

The purpose of this study will be to determine whether the length and ratio of possession prior to a scoring chance (SC) has an effect on the production of that scoring chance. The objectives of this study are:

- 1) To determine the average ratio of possession in the 10 possessions before a scoring chance is produced.
- 2) To determine whether the team producing the scoring chance tends to have the puck for a majority (% of  $t = >50\%$ ) of the time in the 10 possessions prior to a scoring chance.
- 3) To determine how manpower (even-strength, power play, penalty kill) affects possession ratios prior to a scoring chance.

## 4 Research Methods

This study was conducted using video of 4 junior hockey games and recorded data for 1479 team possessions, including 2978 successful passes, 189 scoring chances and 20 goals. Each possession was tabulated using 12 different categories which included 59 variables. The Method was designed to 'draw a picture' in numbers of each possession within the game. The main focus was to measure possession and possession sequences in an attempt to answer the aforementioned research questions.

### 4.1 Collection and handling of data

DVDs of 13 hockey periods played by the Hämeenlinna Pallo Kerho (HPK) A and B Junior teams (Hämeenlinna, Finland) in 2010 were selected at random. Each game was watched and its data recorded on a data collection sheet. All games were watched and data collected by the same researcher, both in the interest of producing comparable results, and because only one researcher was available. An Open Office spreadsheet was used to record data, and a standard DVD player with remote control used for the playing of DVDs. Most possessions were viewed 1-4 times in order to record all necessary data. Each period averaged 121 total possessions, or 60.5 possessions per team.

Detailed statistics were collected for each HPK and opponent possession, classifying each possession on the basis of 59 variables grouped into 12 categories. Categories and variables were as follows in table 5:

Table 5. Data collection categories and descriptions

Possession Begins	Example: 24.01 (this indicates the video time rather than actual game-clock time, and was only used as a reference tool)
Possession #	Example:3 -- the home team's 3 <sup>rd</sup> possession of the period
Zone Gained (See Figure 1.)	Zone in which the team took possession of the puck
Consecutive Passes	Number of passes team executed before losing possession
Possession Time	Number of seconds team possessed the puck
Zone Advance	Advance a zone (+), stay in same zone (/) or lose a zone (-)

	See Figure 1.
Transition	Slow, Mid-Fast, Fast, Flipper or Long Dump
Off. Zone Entry?	Did team advance into Off. Zone? Y/N
Shot?	Did team produce a shot on goal?
Corner Play?	Did team set up its offense in the offensive zone? Y/N
Off. Zone Entry Type	HOW did the team enter the Off. Zone? Dump, Carry, Pass; with man advantage (+); with even strength (/); undermanned (-)
Off. Zone Possession	What did the team do upon entering the OZ?
Scoring Chance	What type of chance was produced? (ie: rush, cycle, etc.)

A notation was also made to indicate if the home team was playing at Even Strength, on a Power Play, or Penalty Killing. HPK statistics were recorded in white columns, opponents statistics in gray.

The following table 6.1 is a sample of the data recorded for seven consecutive possessions in one game. These first six categories indicate the basics of the possession: which team had the puck, in which zone was possession gained, length of team's possession (in seconds), consecutive passes before relinquishing possession, was the puck advanced, and type of transition used.

Table 6.1 Sample Tabulation of 7 Possessions

PKA-Magnitogorsk 12.8.20								
pos begins		113	120	122	132	135	148	151
<b>Poss. #</b>				*				
		1	1	2	2	3	3	4
<b>Zone Gained</b>								
	HA				1			1
	KA	1		1				
	PA		1			1	1	
<b>Consec Passes</b>								
	#	2	0	3	1	2	1	0
<b>Poss. Time</b>								
	Sec	6	1	10	2	13	3	1
<b>Zone Ad.</b>								
	+	1	1			1		
	/				1		1	1
	-			1				
<b>Transition</b>								
	Slow							
	Mid-Fast	1		1				
	Fast					1		
	Flipper		1				1	1
	Long Dump							

The next four categories (Table 6.2) concern the beginning of the attacking phase of the possession. Did the puck enter the offensive zone, and if so, was there a shot, or a corner play? Finally, an indication of how the team brought the puck into the offensive zone – was the puck carried, passed or dumped, and did the attacking team enter the Offensive Zone with a man-advantage (+) at even-strength (/) or at a man-disadvantage (-).

Table 6.2 Sample tabulation of 7 possessions

<b>OZ Entry?</b>							
	Y	1			1		
	N		1	1		1	
<b>Shot?</b>							
	Y				1		
	N	1				1	1
<b>Corner PI?</b>							
	Y						
	N	1			1	1	1
<b>OZ Entry Type</b>							
<b>Dump</b>	+						
	/						
	-	1					
<b>Carry</b>	+						
	/						
	-				1		
<b>Pass</b>	+						
	/						
	-						

Finally, in Table 6.3, if the puck did advance into the Offensive Zone, a notation of the result of that entry: straight attack from the rush; cycling in the corner; passing around the zone's perimeter; a carry and shot by an individual; a giveaway or turnover. If there was a scoring chance, a notation for the type of chance: straight, powerplay, set attack, a shot followed by a rebound, etc.



Table 6.3. Sample tabulation of 7 possessions

OZ Poss.							
Cycle Low							
Cycle High							
Below GL							
High (DtoD)							
Indiv Dangle					1		
Perimet passing							
Imm.Shot							
BlckSht							
Unsuc pas to slot							
Lose imm.							
D2Opp.		1					
Flipper Giveaway							1
<b>Scoring Chance</b>							
Straight				1			
Rebound							
EQ							
YV							
AV							
Breakaway							
Corner Play							
IndivCarry+Shot							
Point Shot+Screen							
Point Shot +Tip							
Gretzky's Office							
Rebound							
Cross-ice pass				1			
D Pinch							
Tip							
Steal/pass/shot				1			
Miss from slot							
Middledrive				1			

The decision was made to analyze the characteristics of every scoring chance, not just goals. It is important to note that any analysis of scoring chances involves some discretion on the part of the data collector. Though there are guidelines regarding what is and is not a scoring chance, there are no absolutes. What one person might classify as a scoring chance, another might discard as an *almost* chance. There are occasions, indeed, where there is no actual shot on goal, but a scoring chance is still awarded to the offensive team for the simple reason that all of the aspects of a scoring chance were in place, but a shot did not occur because of a bad bounce, or a broken stick on a shot or another unlucky circumstance. The offensive team had maneuvered itself into

an optimum scoring position, had beaten the defense, but, for one reason or another, the puck did not go to the goal.

## 4.2 Method of analysis

After the completion of data collection, the data were analyzed. For each completed period of play, total possession time, undefined possession time, possession time per team, percentage of total possession time per team, length of an average possession, minutes of total possession per team, scoring chances and goals were calculated as in table 7 below.

Table 7. Sample calculation of one period's possession statistics

<b>Period 3:</b>
Period: 1200s
Total pos: 1093s
Undefined pos: 107s = 1min 47s = 8.9% of period
HPK pos: 64 pos = 533s = 8.33s/pos = 48.7% of pos = 8.53mins of pos
Magnitogorsk pos: 64 pos = 560s = 8.75s/pos = 51.3% of pos = 9 mins 20s of pos
HPK Scoring Chances: 6
HPK Goals: 1
Magnitogorsk Scoring Chances: 8
Magnitogorsk Goals: 2

Next, results for all games were compiled in a database. Conclusions were drawn with the use of this wealth of data.

## 5 Results and discussion

In this study, it appears data regarding goals and scoring chances are similar to those compiled in earlier studies, as seen in tables 8, 9 and 10:

Table 8. Manpower when goals scored

	This Study	2006 Men's Olympic Games
Even-Strength	50.0%	58.3%
Power Play	44.4%	33.5%
Short-handed	5.6%	4.9%

(Saarinen, Mensonen & Small 2009, 13)

Table 9. Type of attack when goals scored

	% of All Goals (17 total)	Even-Strength (8 goals)	Power Play (8 goals)	Short-handed (1 goal)
Counter Attack	35.3% (6)	62.5% (5)	0% (0)	100% (1)
Organized Attack	52.9% (9)	25% (2)	87.5% (7)	0%(0)
Face-Off Win, Shot	11.8% (2)	12.5% (1)	12.5% (1)	0%(0)

Table 10. Type of attack, when goals scored, even-strength only

	This Study	IIHCE 2007 Study
Counter-Attack	62.5%	70.0%
Organized Attack	25.0%	30.0%
Other	12.5%	0.0%

(IIHCE 2007)

Roughly 65% of even-strength goals are produced from counter-attacks, while roughly 27% of even-strength goals come as the result of organized attacks. It would be easy to conclude, then, that when playing at even strength, quick counter-attacks are the most efficient way of scoring. These statistics on attacking efficiency are, however, deceiving. The statistics do not give a realistic picture of the game, simply because they observe each possession as a standalone

occurrence. But a scoring chance is produced by a *string of events*, not a single event. For instance, a long, organized possession of 20 seconds or more may not directly produce a scoring chance, but it will likely tire and frustrate the defensive team, meaning that when they do gain the puck, they are unlikely to be able to mount an effective counter-attack. Failed counter-attacks often result in 'flipper giveaways' (Sihvonen, P. 2009), or quick, thoughtless losses of puck control. The resulting *counter-counter-attack* may be more likely to produce a scoring chance. Thus, although the initial organized attack did not directly produce a scoring chance, the counter-attack chance that *was* eventually produced came as a result of that first organized rush. A hockey game, unlike an American football game, is not stopped and re-set after every change of possession. The game has flow – action, reaction, re-reaction.

Imagine this scenario: two teams are playing at even strength. Team 1 wins a face-off in their own defensive zone, and makes a quick breakout up the ice. As Team 1's puck-carrying left-winger approaches the offensive blue line, he recognizes that he is outnumbered by Team 2's defenders. He quickly turns back, and fires a pass to his defenceman, who has followed the play up ice. The defenceman skates backwards drawing Team 2's forecheckers towards him. He then passes diagonally forward and across to his defense partner, who in turn chips the puck off the boards and up to his right-winger, who has come back to support. The right-winger and centre, having gained speed and a new point of attack from the regroup, now attack an isolated Team 2 defenceman 2-on-1. The defenceman makes a desperate play, throwing his body to the ice to stop the pass. The scoring chance is averted. The puck bounces to the boards, where it is picked up by Team 2's backchecking centre. Tired, the centre attempts to dump the puck out of the zone, only to have it stolen by Team 1's right winger, who sends a hard pass into the slot that is deftly deposited in the net by his left-winger. Goal scored.

The IIHCE's statistics would call this a goal scored from a steal and counter-attack. But that would neglect 75% of the story! The opportunity to counter-attack against a tired and disorganized team was caused by Team 1's previous *organized* attack. The circumstances that lead to the final moment of success are of tremendous importance. Just as wars do not spontaneously break out without any cause or reason, goals and scoring chances do not magically drop from the sky. Goals are the result of some predicating action. It seems plausible that that action is prolonged puck-possession.

Furthermore, very little separates a goal from a save or a shot that hits the goalpost. By examining only goals-scored, and not all scoring chances, we are implying that goals are scored from chances that are somehow of a *different quality* than those that produce saves or ricochets off goalposts. However, as noted by journalist David Staples,

... it really hits home that little separates a goal from a great save, a scoring chance from a goal. Most goals are scored on the very best of scoring chances, leaving the goalie with little chance of making a save, but some goals are scored on marginal scoring chances, or on shots that can't be considered scoring chances at all. There's some luck that comes into play here.

(Staples, 2010)

To really understand goal-scoring, then, we need to examine all scoring chances, not just those that produce goals. And to understand scoring chances, we need to examine the *string of possessions* that produce them.

### **5.1 Prior research: mistakes in generalization of data**

This study's data indicate that, in a 20 minute period, the puck is loose (that is, not clearly possessed by either team) approximately 128 seconds, or 10.7% of the period. The rest of the time, one team or the other is in possession of the puck. But distribution of the puck is often not equal. The SJL's Transition diagram claims that each team has the puck approximately 50 percent of the time. But, upon subtracting undefined possession time (when no team has clear possession of the puck), we see, in table 11 that possession percentages can vary between teams as much as 15% over the course of a game.

Table 11. Possession differences per team per game

Game	# of Pos.	Undefined Pos	Pos. Time	% of Possession	% Difference	Time Difference
HPK	163	373s = 10.4%	31m	57.60%	15.60%	8m13s
Tappara	164		22m47s	42.00%		
HPK	183	296s = 8.2%	28m20s	51.7%	3.40%	1m46s
HIFK	189		26m36s	48.3%		
HPK	202	529s = 14.2%	29m42s	55.6%	11.20%	6m0s
Ässät	212		23m42s	44.4%		
HPK	188	314s = 8.7%	30m03s	54.7%	9.40%	5m20s
Magnit.	178		24m43s	45.3%		

Apparently, the SJL study measured its possession statistics by merely averaging the possession percentages for each team in a single game, meaning that the average percentage of possession always appears to be 50%. This gives the impression that true Possession Hockey is a falacy – that, over the course of a game or the course of a season, teams will always control the puck for roughly equal amounts of time. As the statistics above show, however, possession ratios can vary wildly from period to period and game to game.

A good example from this study is the game between HPK and Tappara Tampere. The following figure 2 indicates that, over the course of the game, HPK had possession of the puck 57.6% of the time to Tappara's 42.4%. This 15.6% difference in possession time translates to 8 minutes and 13 seconds of time with the puck; time that HPK could use to launch multiple attacks, and time in which Tappara could not attack at all.

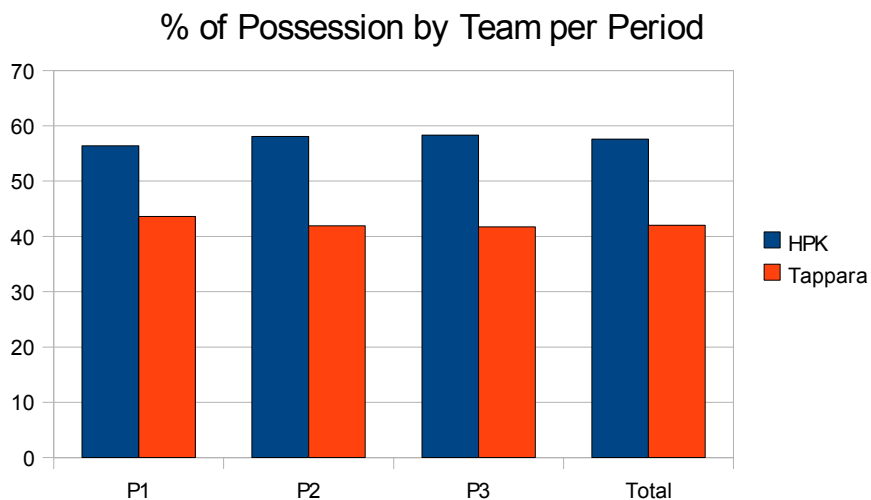


Figure 2. Possession percentages in HPK v Tappara.

The possession averages from all three of the other games (141 scoring chances), also provide similar information.

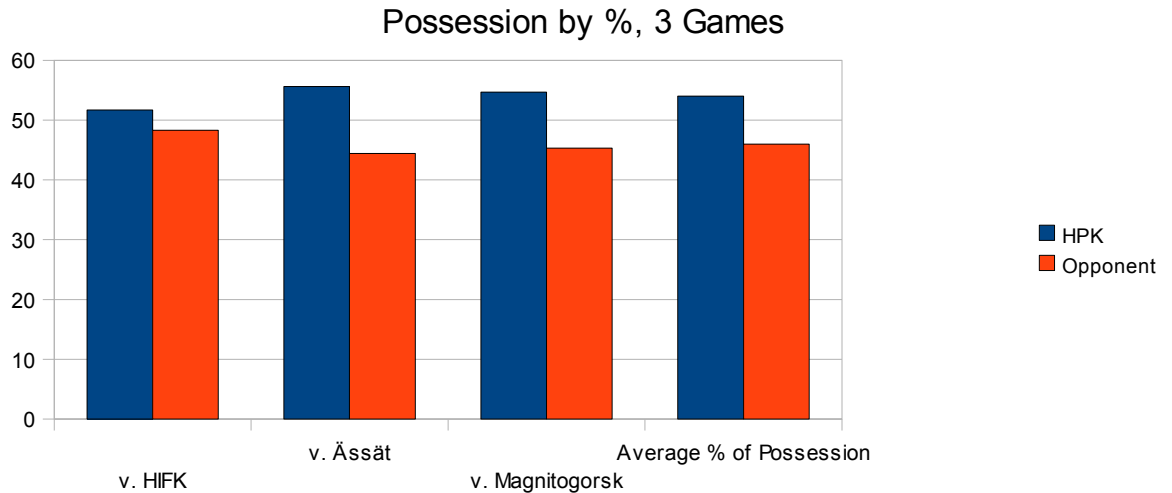


Figure 3. Possession by %, 3 games

In the first game in the chart, HPK versus HIFK, HPK had possession of the puck for 51.7% of the game, to HIFK's 48.3%. This resulted in only 112 seconds of extra puck possession for HPK, a relatively small amount. Puck possession in this game was roughly balanced. In HPK v Ässät and HPK v Magnitogorsk, however, the possession scales tilted heavily in HPK's favour.

Against Ässät, HPK controlled the puck 55.6% of the total possession time, and Ässät 44.4%. Though this is seemingly not a huge difference in possession, it translates into exactly 6 minutes of possession time. 6 minutes extra in which HPK was allowed to control the play. 6 minutes extra in which HPK could mount an attack. 6 minutes extra that Ässät had to defend, angle, read and react to the movements of the opponent and the puck. The numbers were similar in HPK's game against Metallurg Magnitogorsk: HPK's total possession was 54.7% to Magnitogorsk's 45.3%, for a total of 5 minutes 20 seconds *more* time in possession of the puck for HPK.

The following table 12 shows further possession statistics. It lists, for each game, the total number of possessions per team, the average length of a single team possession, the total

possession time per team per game, and again, the team's total possession percentage:

Table 12. Possession Times and Averages, 4 Games

Game	# of Poss	Avg time/Pos.	Total Pos. T	% of Possession
HPK	163	11.4s	31m	57.60%
Tappara	164	8.34s	22m47s	42.40%
HPK	183	9.33s	28m20s	51.7%
HIFK	189	8.55s	26m36s	48.3%
HPK	202	8.82s	29m42s	55.6%
Ässät	212	6.70s	23m42s	44.4%
HPK	188	9.59s	30m03s	54.7%
Magnitog	178	8.33s	24m43s	45.3%

The statistics on average time per possession indicate that HPK was not only able to have the puck for more total time per game, but that each of its possessions were, on average, 1-1.5 seconds longer than its opponents'.

## 5.2 Possessions in relation to scoring chances

In this study's 1479 total possessions, the average lengths of possession, in seconds, are as follows (table 13).

Table 13. Average, median and mode of possession (in seconds)

	Average Pos	Median Pos	Mode Pos
Game 1 HPK-Magnit. (366 pos)	8.98	6	1
Game 2 HPK-HIFK (372 pos)	8.89	6	1
Game 3 HPK – Ässät (414 pos)	7.73	6	1
Game 4 HPK – Tappara (327 pos)	9.9	6	1
All Possessions (1479 pos)	8.81	6	1

Each possession lasted, on average, 8.81 seconds. The median possession was six seconds, and the mode, or most common length of a possession, was only 1 second. This very low mode time is likely due to the high-speed nature of hockey. As much as a team might want to have possession all the time, it is simply not possible with 12 players on the ice, 10 of whom are always in motion. Possessions in general are, however, quite different statistically from possessions that produce scoring chances, as depicted in figure 4.



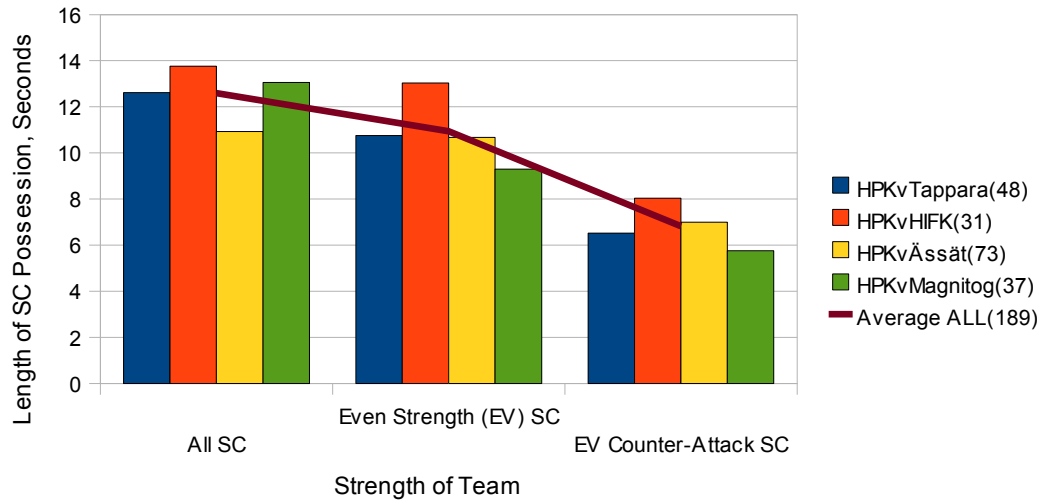
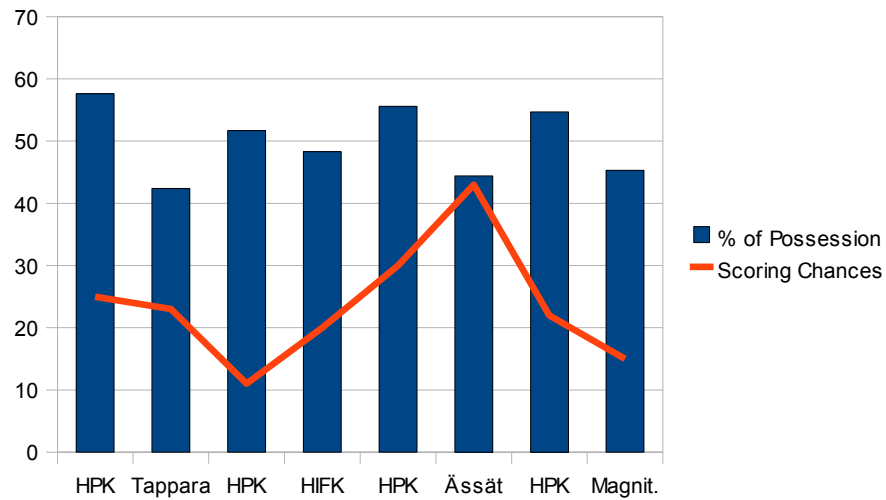


Figure 4. Possession length of scoring chances at different strengths

While the average length of all possessions measured was 8.81 seconds, the average length of a possession that produced a scoring chance (SC) was 12.59 seconds. The Even-Strength scoring chances (EVSC) averaged 10.94 seconds, and the Even-strength chances from counter-attacks (CAEV) were even shorter, at an average of 6.83 seconds. The precipitous drop in length of SC was due to the fact that 55-60% of Power Play goals are scored after possessions of more than 10 seconds (Saarinen, Mensonen & Small 2009, 20). Furthermore, CAEV tend to come from possessions of under 6 seconds (Ibid.). But simply knowing the length of the final possession before a scoring chance is of little use to a coach or analyst, because scoring chances are not standalone events. Scoring chances are the culmination of the possessions that come before them. Each scoring chance has a story, a history, that creates the circumstances from which it arises. And, somewhat surprisingly, merely having more possession time does not increase the likelihood of producing scoring chances. The following figure 5 depicts the total percent of possession in a game per team, as well as their scoring chances for that game.



**Figure 5. Scoring chances in relation to possession.**

There is not a strong correlation between total total possession time and scoring chances. In two of the games (HPKv Tappara, HPK v Magnitogorsk) the team with more possession time also had more scoring chances. In the other two games, however, the team with less possession time had more scoring chances. So, if overall possession time has little correlation to number of scoring chances, does percentage of possession in the minutes and seconds prior to a scoring chance have any influence?

### 5.3 Examining the 10 possessions prior to a scoring chance

To answer that question, it is necessary to observe the possessions prior to the scoring chances. By examining the 10 possessions prior to each of the 189 scoring chances tabulated in this study, it may be possible to recognize some patterns. The following figure 6 depicts the average total length of possession for both teams prior to a scoring chance. For instance, if Tappara and HPK each had the puck 5 times before HPK's scoring chance, and each time they had the puck, they retained control for 5 seconds, the total length of those 10 possessions was 50 seconds .

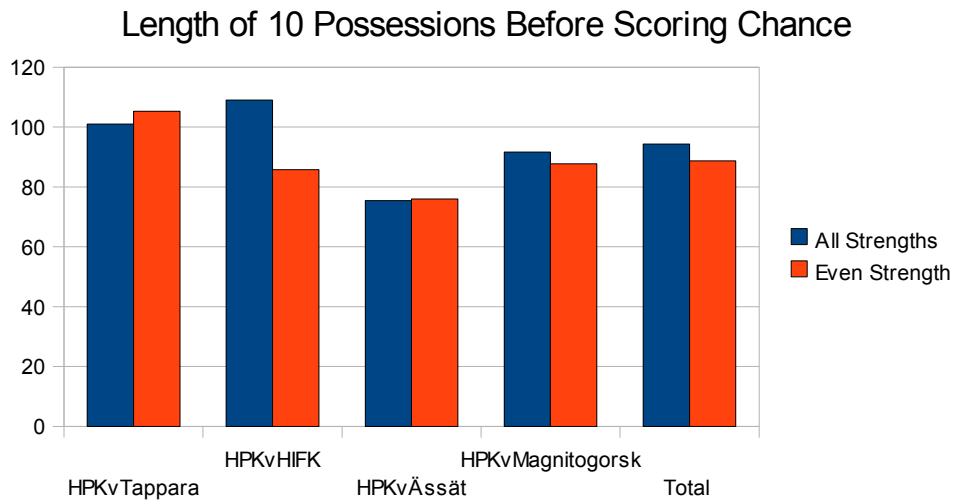


Figure 6. Length of 10 possessions before scoring chance, in seconds

The average length of those 10 possessions before the scoring chance was 94.3 seconds at all strengths and 88.7 seconds at even strength. Note, however, that in two of the games, the average 10 possessions before even strength scoring chances were actually longer than the average 10 possessions before All Strength scoring chances.

The most striking numbers (and the ones with the greatest implications for coaches) concern the percentage of possession prior to scoring chances. As earlier figures in this study have demonstrated, overall possession percentages do not relate directly to quantity of scoring chances. A team may possess the puck, over the course of an entire game, up to 15% more time than its opponent, and still get fewer scoring chances. However, as the following figure 7 demonstrates, in the 10 possessions prior to a scoring chance, on average, the attacking team has the puck more than 50% of the total time. This is true regardless of whether the measurement was made for scoring chances at All Strengths, Even Strength, or only for Even Strength Counter-Attack chances.

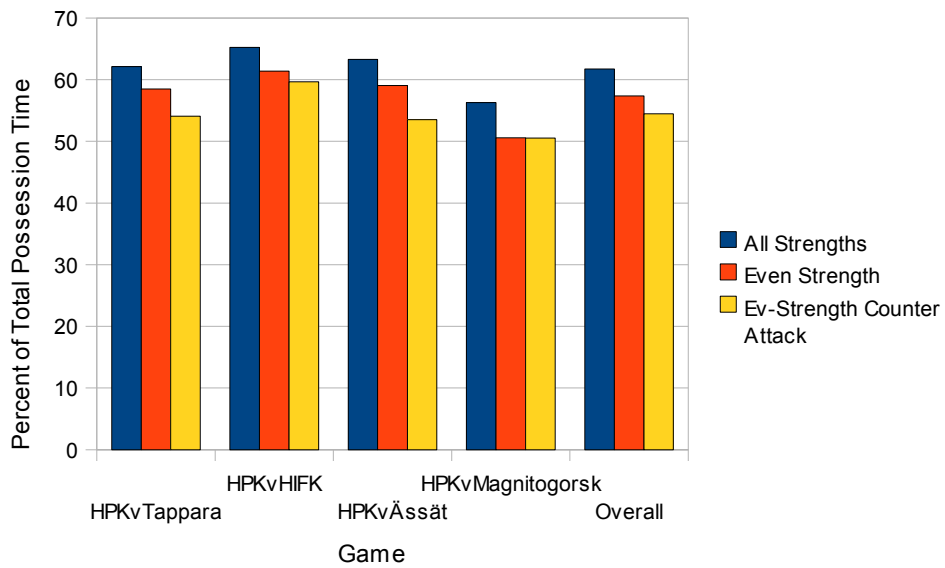


Figure 7. Percent of total possession time in 10 possessions prior to scoring chance by attacking team

These numbers show conclusively that scoring chances are not based solely on creating quick counter-attacks, but on possessing the puck in the in the minutes *before* the quick counter-attack. In every game and overall, scoring chances occur at a time when the attacking team has possessed the puck over 50% of the time in the prior 10 possessions.

## 6. Discussion

The information collected in this study reveals that although previous studies of scoring chances have been *correct*, they have not necessarily given a complete picture of scoring chances and the circumstances that precipitate them. While it has become common knowledge over the years that most even-strength scoring chances come from fast counter-attacks in the Offensive and Neutral Zones, the research has left many with the mistaken impression that such events are standalone occurrences. Thus, many coaches have trained their players to move the puck *forward, quickly*, in the hope of producing a scoring chance within the 'key', fast-attack window. Examples of this adherence to 'common knowledge' are plentiful in coaching literature. According to Perron, "The key ingredients of a counter-attack are surprise and quickness" (Perron, 161). When a defensive player gains the puck from attackers, he should, according to this philosophy, attempt to advance the puck as quickly as possible:

This quick forward pass will most likely create a numerical advantage. The defenseman could have chosen to pass laterally; this would not have produced a quick transition...you don't want to give the opposition time to recover their ideal defensive alignment (Perron, 161).

Ryan Walter, Head Coach of Canada's National Women's Team, and former NHL coach agrees. "It is important to practice counters with speed. When a team counters, the intent is to catch the opponent moving toward the offensive zone and then quickly pass the puck up to the forwards and hopefully get an odd-man rush" (Walter 18).

Knowing, however, that creating the right environment for a good counter attack (one that results in a scoring chance) requires your team to have the puck more than 50% of the time on the final 10 possessions might change some coaches' philosophies on when to keep the puck, and when to relinquish, or dump it.

Antti Pennanen, Head Coach of the Hämeenlinna Pallo Kerho A-Juniors has a different philosophy on dumping the puck from his North American counterparts. To Pennanen, the puck should only be dumped when his team has maneuvered itself into a good position to immediately win it back. That is to say, to Pennanen, dumping is not a defensive 'safe' action, but one that is

the culmination of longer possessions aimed at disorganizing and disrupting the opposition's defense.

This philosophy could prove to be a boon to Finnish hockey at the international level. For too long, Finland has been trying to beat Canada and the US at their own game. Finland has tried to play with fast transitions, dumping the puck into the opponent's zone, then forechecking to win the puck back. The problem, however, is that North Americans are, on average, bigger, stronger and faster than their Finnish counterparts. Furthermore, North American junior coaches focus on playing a physical brand of hockey (full-ice, hard pressure and body checking) that is not familiar in Finland. Canada and the US have players who are fast, strong and hit well. Why, then, does Finland attempt to play in a way that makes it easy for those teams to do the very things, and exploit the very strengths that make them so successful?

Advantage should be taken of this new information. If coaches embrace the facts, rather than blindly follow conventional wisdom, they will develop new tactical approaches to hockey. These new approaches will accept and build on the idea that the most effective attacks – counter-attacks – are produced by previous lengthy possessions.

The Game's underdogs can succeed against bigger, stronger opponents – but only if they choose to flout the conventional wisdom and play a different style of hockey. Possession Hockey.

## **6.1 Thesis Process**

This thesis project is but a beginning. To better analyze the nature of possessions, possession time, and scoring chances would require a quantity of research that cannot be accomplished by one person working alone. An interesting continuation to this research, then, might have the Degree Programme students in Vierumäki continue the research. They should develop new questions or premises, and examine an entire season's worth or tournament's worth of games to see if the results hold up.

This research is by no means flawless. The researcher is not much of a “numbers person” and, as such, struggled mightily to produce something useful from reams and reams of statistics. If there exists a person who would be more capable of analyzing the statistics collected, let him

or her step forward and have at.

The study initially involved information from 22 periods of play, but the results from 9 of those periods (3 full games) were discarded because of issues of accuracy. The games were not actually *filmed* by the researcher, but rather by volunteer staff who were, at times, less than reliable. The videographers would often, apparently, stop filming the games before the actual end of play, or would arrive back in the arena up to 5 minutes after the commencement of play. Thus, any results garnered from those incomplete videos were unusable. Without full video of a period, it is impossible to generalize any results taken from the available portion of that period. Thus, the decision was made to abandon the partial periods. Despite the loss of that information, important results and conclusions have still been garnered from the 189 scoring chances and 1479 possessions that remain.

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# Appendices

Appendix 1. Transition and puck possession in a single game

