Scoring in the Finnish ice hockey Liiga during the 2023–2024 regular season

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ORIGINAL ARTICLE

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CORRIGENDUM

A corrected version of this article (Version 2) was published on 23 October 2026.

Description of the correction

The original version of this article, published on 10 June 2025, contained an error in Section 3.2 (“Scoring method”). The percentage of goals scored from rebounds was incorrectly reported as 6%. The correct value is 8%. This error has been corrected in Version 2.

This correction does not affect the scientific conclusions of the study.

A record of the changes and the archived original version (Version 1) are available through the article's version history.

ABSTRACT

The purpose of this study was to investigate the types of situations from which goals are scored in the ice hockey games. The focus of the study was on all regular season games (n = 450) played by teams in Finland's top league (Liiga) during the 2023–2024 season. The data consisted of 2,454 goals. The goals were analyzed post-event from the video by notational game analysis system, using systematic observation as the method.

Goal situations were classified based on the defensive, neutral, and offensive zones, as well as the number of players on the ice. According to the results, the majority of goals were scored at even strength, during 5 vs. 5 play (63%). The proportion of goals scored during 5 vs. 4 power play (21%) was also significant.

In 5 vs. 5 plays, scoring was emphasized through offensive zone board play (n = 484) and goals resulting from turnovers (n = 372). Most goals from the defensive zone were scored from fast breakouts (n = 207) and counterattacks (n = 201). In 5 vs. 4 power play, the majority of goals were scored from offensive zone board play (n = 384).

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According to the study, board play in the offensive zone, is a crucial tactical aspect of scoring goals, both during even strength and power play situations. Another key factor for scoring is being active and recovering the puck as close to the opponent's goal as possible. Additionally, quick transitions are essential for scoring. When teams use fast attacks and counterattacks, the opponent doesn't have time to organize their defense, making it easier to score goals.

Keywords

ice hockey, goal scoring, game analysis, tactics, offensive strategy, even strength, power play

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1 Introduction

Ice hockey is a fast-paced team sport watched by millions of spectators annually around the world. For example, the Finnish ice hockey Liiga had 2,055,781 spectators present in arenas during the 2023–2024 season (Liiga, 2024). During the same season, the NHL drew 22,560,634 spectators to the games in the regular season (National Hockey League, 2024).

Some fans are attracted by the tactical aspects of the game, while others are drawn to elements like physical hits or the players' various skills. However, a lot of attention is given to scoring goals and winning games. Scoring goals and preventing goals are for example part of Finland's ice hockey strategy for 2022–2026 (Leijonat, 2023).

In recent years, published studies have shown that ice hockey has been relatively understudied in terms of goal scoring and tactics (Lignell et al., 2020; Tian & Xu, 2024). Previous studies have provided insights into aspects like players' physical performance. Research has examined players' strength (Hoff et al., 2005; C. Johansson et al., 1989; Kierot et al., 2024), speed (Mascaro et al., 1992; Stastny et al., 2023), and endurance characteristics (Montgomery, 2006; Montgomery et al., 1990; Vigh-Larsen & Mohr, 2022). Other research areas have included the history of the sport (Hardy, 2007; Mason, 1998) and players' anthropometry (Quinney et al., 2008; Triplett et al., 2018).

If scientific databases like Google Scholar, PubMed, or ResearchGate are searched using terms such as "game analysis," "game efficiency," "tactics," or "goal scoring" in English or Finnish, only a few results related to ice hockey will be found. When compared to a sport like soccer, the number of studies is significantly higher. For instance, Pratas et al. (2018) aimed to review goal scoring in men's soccer. They found 610 related studies from two databases, eventually conducting an analysis on nineteen studies that met all the researchers' criteria.

Previous studies from other team sports have demonstrated that various tactical and contextual parameters influence goal scoring (González-Rodenas et al., 2019; Mitrotasios & Armatas, 2014; Sarmento et al., 2016; Sunderland et al., 2006; Tenga et al., 2010). For example, these studies found that factors like the time elapsed since gaining possession (González-Rodenas et al., 2019), attack style (Tenga et al., 2010), and shooting area (Sunderland et al., 2006) affected the

probability of scoring or maintaining possession near the goal. Some findings also apply to ice hockey. For example, shots taken close to the goal are more likely to result in goals than those taken from farther away. Similarly, shots taken in the second or third period are more likely to result in goals than those in the first period (Lignell et al., 2020; Tian & Xu, 2024). Lignell et al. (2020) noted that, across multiple sports, fast and counterattacks are the most effective for goal scoring. However, they did not find such a connection in their study. Other studies have found that in ice hockey, the effectiveness of organized slow attacks is around 10-15%, fast attacks about 40%, and counterattacks about 80% (Rautakorpi, 1993; Westerlund, 1991). In these studies, effectiveness referred to finishing an attack with a shot on goal.

In different sports and studies, offensive strategies - slow, fast, and counterattacks - may be defined slightly differently. For example, in basketball, fast break situations can be 1 vs. 0, 1 vs. 1, 2 vs. 1, 2 vs. 2, 3 vs. 2, or 3 vs. 3 attacks (Evangelos et al., 2005). In ice hockey, a slow attack means that the defending team has time to organize four or five players into defense. In a fast attack, the defending team has one to three players available, but at least as many as the attacking team. However, the attacking team may be at a numerical disadvantage. In counterattacks, the attacking team has more players available than the defending team (Westerlund, 1991).

The rules of the sport define the objective of the game: the team that scores the most goals wins the game. Ice hockey games are played in rinks that vary in size, ranging from 56–60 x 26–30 meters (International Ice Hockey Federation, 2023). In North America, a smaller rink has traditionally been used compared to Europe. The blue and center lines divide the rink into defensive, neutral, and offensive zones (International Ice Hockey Federation, 2023).

In North America, the playing style of teams in the 20th century often emphasized rough physical play and fighting. In contrast, in Europe, the focus was on strong skating skills and gameplay ability (Valkonen, 1997). However, the encounter between the two hockey cultures (Europe vs. North America) in various tournaments has led to the mutual adoption of influences (Kivinen et al., 2000). The migration of players abroad has also had an imdump pact on the matter. For example, Finland's Liiga has no restrictions on foreign players: In the 2024–2025 season, approximately one in four players is foreign (Yleisradio, 2024).

An ice hockey game lasts 60 minutes, divided into three 20-minute periods of effective playing time, meaning the clock stops during breaks in play. Two teams face off, each with five players and a goaltender on the ice at a time, known as even strength or full strength play (5 vs. 5). If a player breaks the rules, they may be penalized, giving the opposing team a power play (e.g., 5 vs. 4; International Ice Hockey Federation, 2023; National Hockey League, 2024).

Teams can change players on the ice as needed, either during stoppages or while play is ongoing. The rules also allow for the removal of the goaltender, giving the team an extra player (6 vs. 5). If the game is tied after 60 minutes, teams play overtime with three players each (3 vs. 3). If no goals are scored in overtime, the winner is determined by a shootout (International Ice Hockey Federation, 2023).

Game analysis in ice hockey can be described using the so-called fixed-sum theory, meaning game events are distributed based on the relative strengths of the teams. The total number of game events cannot be increased, but the distribution of events between teams can be influenced. For example, when two evenly matched teams play against each other, each team has about 160–200 offensive and defensive situations. Of these, 80–100 occur in the defensive zone, 35–45 in the neutral zone, and 25–35 in the offensive zone (International Ice Hockey Centre of Excellence, 2008; Luimula, 2013; Thusberg & Mikkola, 1985; Westerlund, 1997).

In team sports, tactics are often discussed. Tactics refer to the plan by which a team intends to play. Team tactics are composed of game systems for different areas of the field (Luimula, 2013). In everyday language, tactics are often used synonymously with game systems and playing style. The game systems used in ice

hockey include breakouts, neutral zone offense, and finishing the attack in offense, as well as defensive zone, neutral zone, and offensive zone defense in defense (Westerlund, 1997).

Previous research has described and analyzed some of the tactics used by teams in the Turin Olympics. In the defensive zone, teams used so-called pressure breakouts when the opponent played an active forechecking game. If the opponent played more passively, teams used slow, organized breakouts. In defense, teams employed zone, man-to-man, or hybrid defense in their own defensive zone. The attacking team then aimed to score by offensive board play. In the neutral and offensive zones, teams most often used a 1-2-2 defensive system (Luimula, 2013).

The best offensive efficiency — defined as ending an attack with a shot on goal from the scoring sectors 1 to 3 — is achieved from the offensive zone. In terms of goal scoring, offensive zone defensive play is especially important, as attacks originating from the offensive zone have significantly higher scoring efficiency compared to those from the defensive zone and nearly significant compared to the neutral zone (Luimula, 2013).

In some cases, the goal of an attack may simply be to avoid losing the puck by deliberately giving it up through a controlled chip-out or clearance. When teams successfully exit their defensive zone with possession of the puck, they may aim for a direct attack. A direct attack involves carrying the puck into the offensive zone and concluding the play with a shot on goal once they reach the offensive zone. If a direct entry is not feasible, many teams adopt a dump-and-chase tactic, in which the puck is intentionally played from the neutral zone into the offensive zone, and the attacking team attempts to regain possession through aggressive forechecking. However, attacking is generally more effective when the team carries the puck into the offensive zone rather than relying on the dump-and-chase tactic (Tulsky et al., 2013).

In the offensive zone, the attacking team aims to find the best possible shooting position. Coaches and analysts often divide the offensive zone into different sectors on shot maps to determine where shots are taken. In this study, the offensive zone is divided into four sectors (see Figure 1). The same shot map has also been used in previous studies (International Ice Hockey Centre of Excellence, 2008; Luimula, 2013).

Sectors 1–2 form what is known as the high-scoring area. The importance of play near the net is evident from the typical shot volumes and their effectiveness in the offensive zone. On average, five shots are taken from the first sector, with 30% resulting in goals. In contrast, 20 shots from the least favorable sector produce goals at only a 3% rate (Westerlund, 1991). Typically, a team requires about ten shots to score one goal. Lignell et al. (2020) found in their research that 13.2% of scoring opportunities resulted in a goal.

Modern technology and artificial intelligence have introduced additional possibilities for game analysis across various sports. In ice hockey, however, these opportunities have been used quite sparingly. Schulte et al. (2017) employed a Markov game formalism to develop a contextual approach to evaluating player actions, positions, and team performance. This model demonstrated that the overall value of a team's actions and states are strong predictors of team success, as measured by the team's average goal differential.

Recent technological advancements have also been leveraged, for example, by Heikkilä (2024), who studied the speed of puck carriers during scoring opportunities using data transmitted by smart pucks, and by Nurmi (2024), who examined puck possession and team compactness in attacking play based on smart puck data when entering the offensive zone.

U. Johansson et al. (2022) state that traditionally, ice hockey analyses have focused on the +/- statistic, which offers a very limited assessment of a player's performance based on whether they were on the ice when their team scored or conceded a goal. In the 21st century, game analysis has evolved significantly. The terms Corsi and expected goals (xG) are important metrics for game analysis. Corsi is based on shot attempts and has been used to describe a team's performance in a game. Expected goals (xG) also rely on shot attempts, but in addition to quantity and loca-

tion, they take shot quality into account. The NHL has published Corsi statistics since the 2010–2011 season. When comparing teams' Corsi values in the regular season, the Stanley Cup winner's Corsi value was one of the best in the league up until 2016. However, since then, expected goals (xG) have gained importance as a metric for evaluating team performance and success. By the 2019–2020 season, xG had surpassed Corsi in predicting team success (U. Johansson et al., 2022).

If a coach wants to improve their team's performance, it is important for them to know not only their Corsi rating but also the types of situations from which shots are generated. The purpose of this study is to investigate the types of situations that lead to goals. The research examines scoring from various types of attacks across different areas of the ice. The results will provide coaches with insights into which aspects of the game they should focus on in both offensive and defensive play.

2 Methods

2.1 Material

The data analyzed in this study was collected from regular season games (n = 450) between 15 teams during the 2023–2024 season. A total of 2,454 goals were scored in these games. The matches were from Finland's top-tier league, Liiga.

2.2 Data collection

A game analysis suitable for different game situations in ice hockey was created for goal analysis. The game analysis was based on situations related to scoring that had been studied previously (Luimula, 2013; Rautakorpi, 1993; Westerlund, 1991). Additionally, some of the variables for the analysis were derived from the rules of ice hockey (International Ice Hockey Federation, 2023).

The goals were analyzed post-event from goal highlights available on the official Liiga website (Liiga, 2024). The method used was the notational game analysis and systematic observation, which have been widely used in sports research (Hughes & Franks, 2004; McGarry & Franks, 2005).

The notational game analysis is shown in Table 1. The goals in the study were classified into three main categories based on different zones of the rink: defensive, neutral, and offensive zones. Each main category was further divided into smaller subcategories according to the type of attack. These included, for the defensive and neutral zones: a) slow attack, b) fast attack, and c) counterattack.

In the offensive zone, the goals were divided into goals from board play, turnovers, and face-off wins in the offensive zone. For turnovers and face-off wins, a goal was scored within five seconds of gaining possession. If the time exceeded this, the goal was classified as part of board play. Attacks that started in the defensive or neutral zone were also classified as board play if they did not result in a shot from a direct attack. In these cases, the puck carrier may have, for example, skated from the defensive zone to behind the opponent's net or ended up in the corner of the offensive zone, where the play continued as part of board play.

Each goal was coded into subcategories according to the number of players on the ice. However, there were two exceptions: 1) If a team had been playing on a power play and the opposing player returned from the penalty box but did not reach the defensive zone before the goal was scored, the goal was coded as a power play rather than even strength. This same approach was applied to other situations where players were switching but did not reach the defensive zone in time to assist. 2) The subcategory "Unclear situations" (n = 15) included goals that could not be classified into any other subcategories. Since the purpose of this study was to determine the types of situations from which goals are scored, unclear goals were removed from the final dataset. As a result, the number of goals analyzed in the study decreased from the 2,454 goals scored during the season to 2,439 goals. Overall, the results are based on 99.4% of the goals scored during the 2023–2024 regular season.

Table 1
Definition of Game Analysis and the Variables

1. Type of attack	**Defensive zone** *Slow attack*: Puck possession in the defensive zone, leading to a direct attack into the offensive zone. The defending team has 4–5 players in the defensive zone when the attacking team carries the puck into the offensive zone. *Fast attack*: Puck possession in the defensive zone, leading to a direct attack into the offensive zone. The defending team has 1–3 players in the defensive zone when the attacking team carries the puck into the offensive zone. The defending team has at least as many players as the attacking team (1 vs. 1, 2 vs. 2, 3 vs. 3). The attacking team may also have fewer players than the defending team. *Counterattack*: Puck possession in the defensive zone, leading to a direct attack into the offensive zone. The attacking team has more players than the defending team when carrying the puck into the offensive zone (1 vs. 0, 2 vs. 1, 3 vs. 2). The defending team has no more than two players. **Neutral zone** *Slow attack*: Puck possession in the neutral zone, leading to a direct attack into the offensive zone. The defending team has 4–5 players in the defensive zone when the attacking team carries the puck into the offensive zone. *Fast attack*: Puck possession in the neutral zone, leading to a direct attack into the offensive zone. The defending team has 1–3 players in the defensive zone when the attacking team carries the puck into the offensive zone. The defending team has at least as many players as the attacking team (1 vs. 1, 2 vs. 2, 3 vs. 3). The attacking team may also have fewer players than the defending team. *Counterattack*: Puck possession in the neutral zone, leading to a direct attack into the offensive zone. The attacking team has more players than the defending team when carrying the puck into the offensive zone (1 vs. 0, 2 vs. 1, 3 vs. 2). The defending team has no more than two players. **Offensive zone** *Turnover*: The defending team gains puck possession from the opponent in the offensive zone. A goal is scored within 5 seconds of gaining possession. *Face-off win*: The team wins a face-off in the offensive zone. A goal is scored within 5 seconds of gaining possession. *Board play*: The puck is held in the offensive zone for more than 5 seconds before scoring. Attacks originating in the defensive or neutral zone are also marked as board play if they do not lead to a direct shot (e.g., the puck is carried behind the net or into the corner). Similarly, the dump-and-chase strategy is marked here if the puck has not been lost to the opponent.
2. Game situation	Goals are analyzed based on the type of attack and game situation. Exceptions include a delayed penalty or penalty expiration, in which case the goal is analyzed according to the situation in effect before the player returns to the defensive zone (e.g., if a penalty ends 1 second before a goal, the goal is counted as a power play goal, not an even strength goal). 5 vs. 5: Even strength 5 vs. 4: One-player power play 4 vs. 5: One-player penalty kill 5 vs. 3: Two-player power play

	3 vs. 5: Two-player penalty kill 6 vs. 4: One-player power play, with goalie pulled 4 vs. 6: One-player penalty kill, with the opponent's goalie pulled 4 vs. 4: Both teams missing one player 4 vs. 3: One-player power play 3 vs. 3: Overtime Penalty shot Shootout
3. Type of goal	*Direct shot:* Goal from a shot or deke. *Off a pass:* One-timer or a goal when the goalie is still moving. *Deflection:* A player positions themselves between the shooter and goalie and scores by deflecting the puck. Also includes deflections off a skate or other object. Rebound: Goal scored after a shot is saved by the goalie. *Empty net:* Goal scored when the opposing goalie has been pulled.
4. Location of shot	Sectors 1 – 4

Note. Adapted from (International Ice Hockey Federation, 2023; Luimula, 2013; Westerlund, 1991).

To determine the locations of goal-scoring opportunities, the shot maps from the Liiga's online results service were utilized (Liiga, 2024). The Liiga's shot map is based on Wisehockey analytics, developed by Bitwise, which uses a smart puck equipped with Bluetooth tracking (Bitwise, 2024). Goals scored during the games were extracted from the shot map, and the sector from which each goal was scored was recorded (Figure 1).

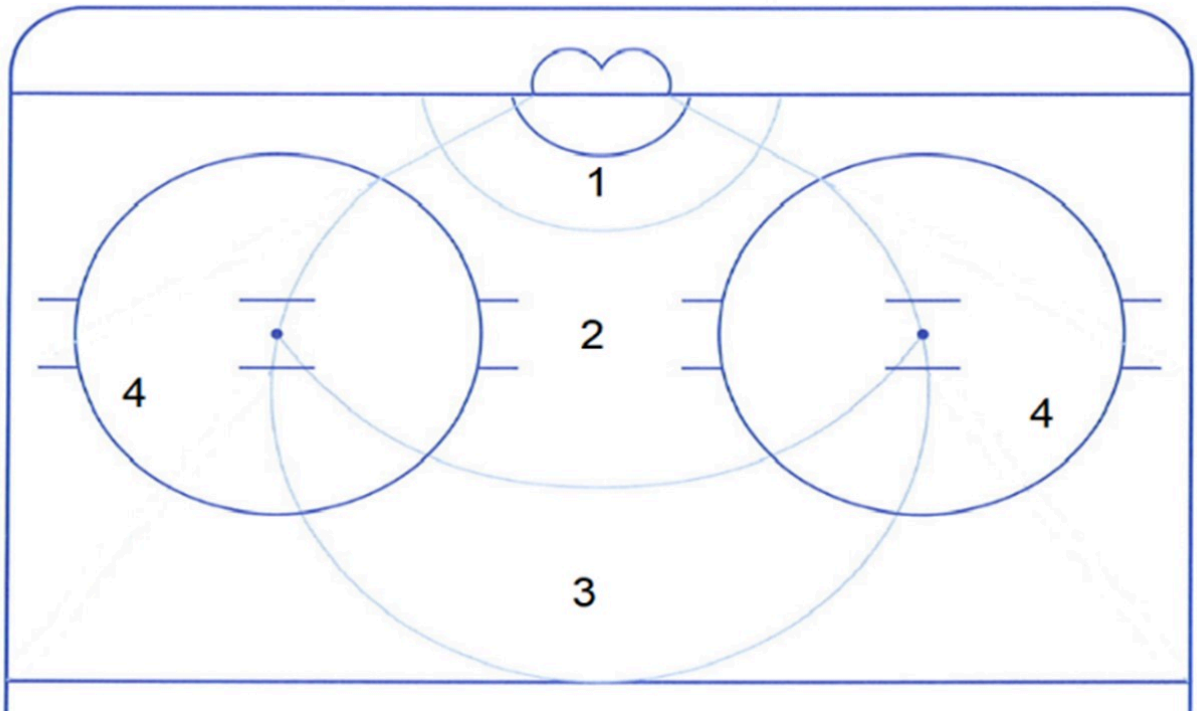


Figure 1 Shot Map Used in the Study

Note. Adapted from (International Ice Hockey Centre of Excellence, 2008; Luimula, 2013)

The analysis of goal situations was conducted using goal highlights freely available online (Liiga, 2024). The researcher watched the goal highlights on an iPad tablet. Next to it was an Asus R541U laptop, where the researcher simultaneously recorded observations into Microsoft Excel. The same observer analyzed all the goals in the study. The goal highlights of the games allowed individual goals to be reviewed multiple times if necessary.

The reliability of the analysis method used in the study can be evaluated, for example, by comparing measurements made by two different researchers or by having the same researcher repeat the measurement (Alkula et al., 1994; Siedentop & Tannehill, 2000)(Alkula et al., 1994; Siedentop & Tannehill, 2000). In this study, reliability was tested by having the researcher first analyze ten games and then repeat the analysis later. The re-measurement showed that the results were 94% identical. After this, reliability was further tested by observations made by another researcher in three matches – including 20 goals. The agreement between the two different observers was 92.5%.

2.3 Statistical analysis

In the first phase, the total number of goals from all categories was calculated using Excel. Next, the proportions of goals from each subcategory and main category were calculated out of the total number of goals. This helped to demonstrate how much of the game's goals came from each situation.

According to the results, 63% of the goals were scored during 5 vs. 5 play. 21% of the goals were scored during 5 vs. 4 power plays, and the remaining 16% occurred in other game situations.

3 Results

Table 2 shows the abbreviations used in the figures presented in the results.

Table 2
Abbreviations Used in Figures 2–4.

OZ board play	offensive zone board play
OZ turnover	offensive zone turnover
OZ face-off	offensive zone face-off
NZ slow	neutral zone slow attack
NZ fast	neutral zone fast attack
NZ counter	neutral zone counterattack
DZ slow	defensive zone slow attack
DZ fast	defensive zone fast attack
DZ counter	defensive zone counterattack
PS	penalty shot
SO	shootout

3.1 Goals by game situation

3.1.1 Even strength 5 vs. 5

A total of 1,547 goals were scored during even strength play in the regular season (Figure 2). Of the 5 vs. 5 goals, 61% (*n* = 942) were scored from the offensive zone, 31% (*n* = 477) from the defensive zone, and 8% (*n* = 128) from the neutral zone.

Most of the goals were created from board play in the offensive zone (*n* = 484), turnovers in the offensive zone (*n* = 372), fast attacks from the defensive zone (*n* = 207), and counterattacks (*n* = 201). Significantly fewer goals were scored from the neutral zone.

3.1.2 Power play 5 vs. 4

The total number of 5 vs. 4 power play goals was 512 (see Figure 3). Of these, 89% (*n* = 456) were scored from the offensive zone, 9% (*n* = 47) from the defensive zone, and 2% (*n* = 9) from the neutral zone.

The most significant contributor was board game (*n* = 384). Far fewer goals were scored from other situations, such as turnovers and face-off wins in the offensive zone, which accounted for only 36 goals.

Although the majority of goals were scored from the offensive zone, teams occasionally succeeded in scoring through direct attacks from the defensive zone (*n* = 28).

3.1.3 Other situations

A total of 380 goals were scored in other situations (see Figure 4). Most of these occurred when one team had pulled their goalie. In 6 vs. 5 plays, teams successfully scored 40 goals, while opponents managed to score 115 goals into an empty net during 5 vs. 6 plays.

Goals were also scored during 3 vs. 3 overtime play (*n* = 44), with 64% (*n* = 28) coming from the defensive zone. Of these, 15 were from fast attacks and 13 from counterattacks. The offensive zone accounted for 23% of the goals (*n* = 10), four of which were scored after turnovers and six during play from board game. The neutral zone contributed 14% of the goals (*n* = 6), with four from fast attacks and two from counterattacks.

Additionally, goals were scored in shootouts (*n* = 49), in 4 vs. 5 shorthanded situations (*n* = 46), in 5 vs. 3 power plays (*n* = 31), in 4 vs. 3 power plays (*n* = 15), in penalty shots (*n* = 14), in 4 vs. 4 even strength (*n* = 11), in 6 vs. 4 power plays (*n* = 8), and in 4 vs. 6 shorthanded situations (*n* = 7).

3.2 Goal scoring methods

Nearly half of the goals, or 47%, were scored with a direct shot. The remaining goals were distributed as follows: 30% from a pass, 15% from deflections, and 8% from rebounds.

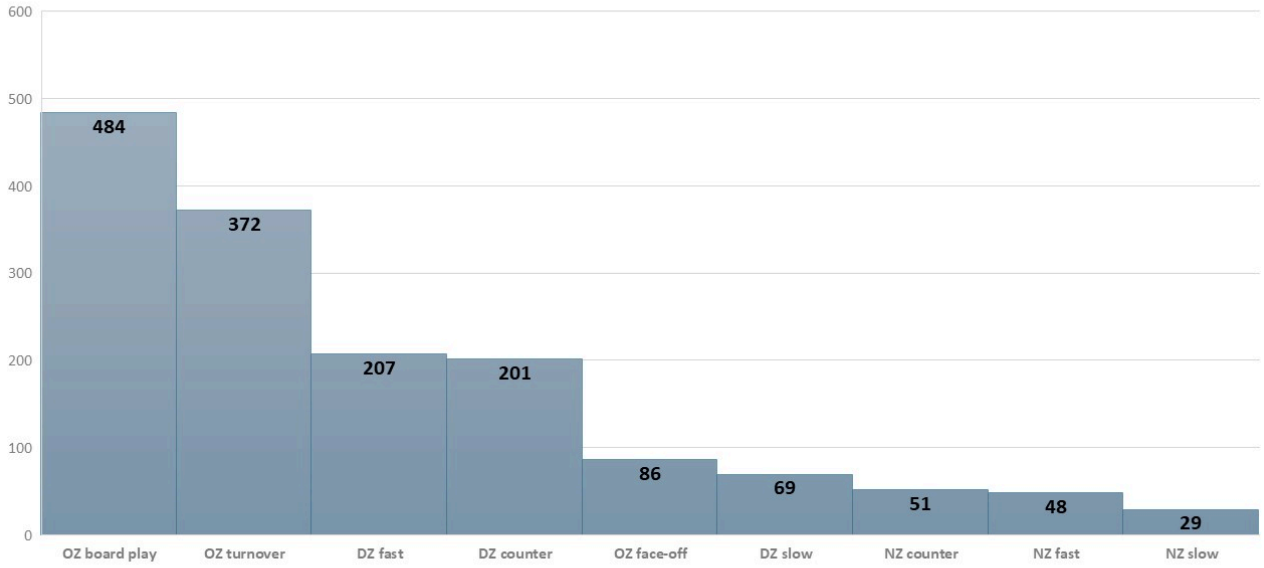


Figure 2 Number of Goals Scored at Even Strength 5 vs. 5.

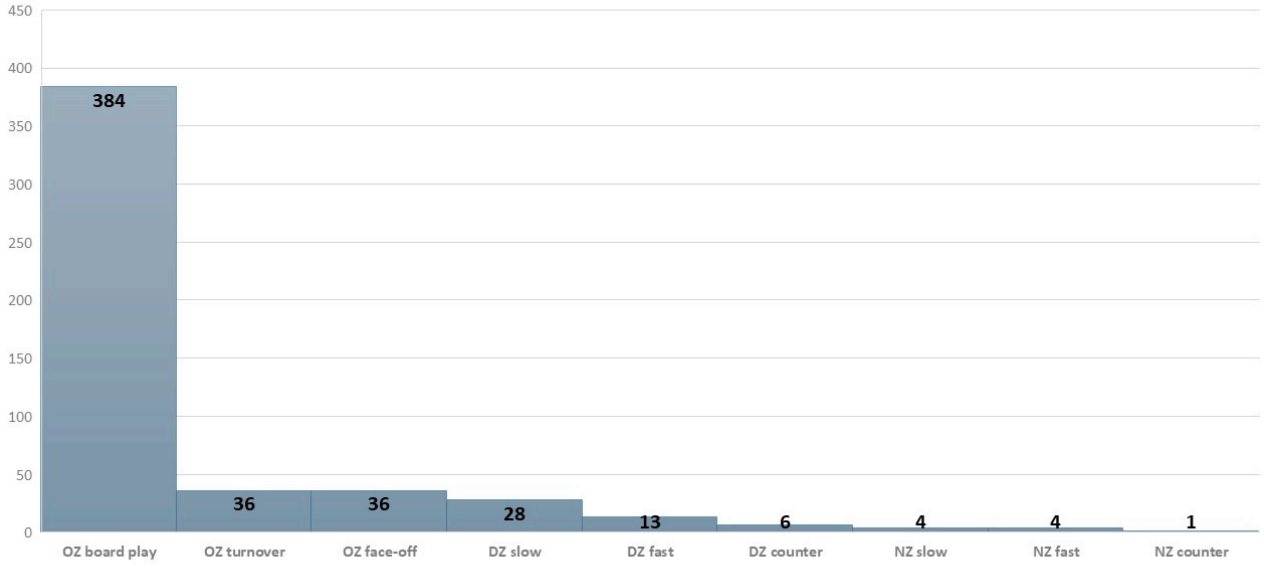


Figure 3 Number of Goals Scored in 5 vs. 4 Power Play.

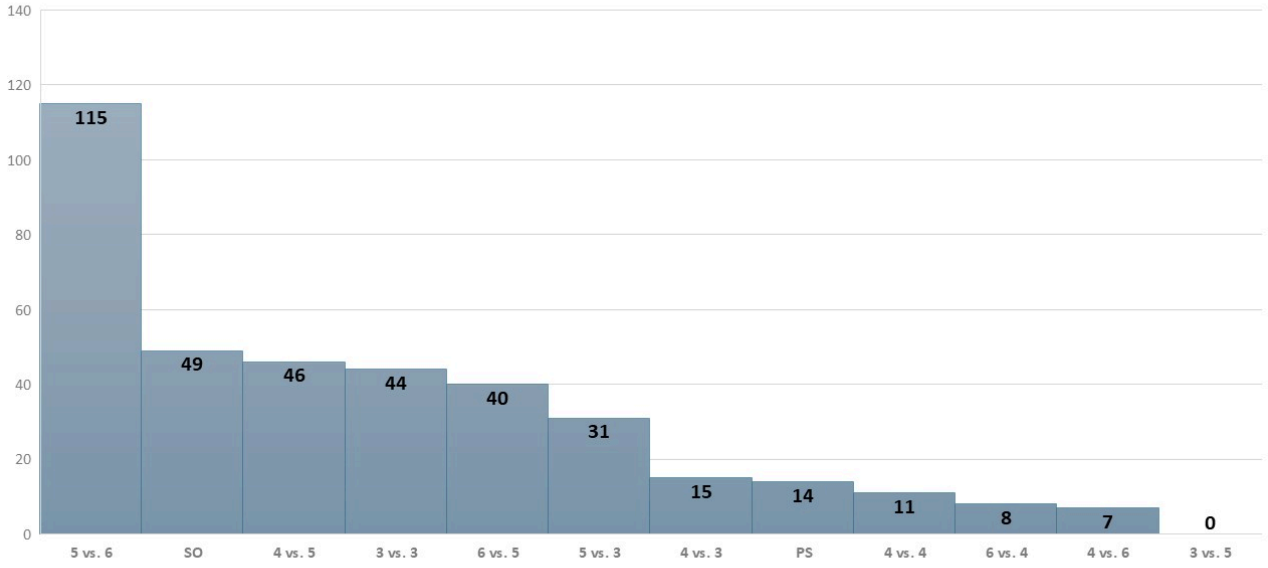


Figure 4 Number of Goals From Other Situations

Additionally, 5% of all goals were scored into an empty net.

3.3 Scoring zones

Most of the goals were scored from close to the net (see Figure 5). Zone 1. accounted for 30%, zone 2. for 35%, zone 3. for 25%, and zone 4. for 11% of the goals. Goals from shootouts and penalty shots were excluded from this analysis to focus solely on goals scored during regular play situations.

Discussion

Sports considered major globally, such as soccer, basketball, and baseball, have been studied much more extensively than ice hockey. Numerous studies on these sports exist, including research on tactics, offensive strategies, and goal analysis. This study offers new results from the perspective of ice hockey.

The results of this study showed that offensive and defensive play in the offensive zone played a significant role in scoring. Most goals were scored in even strength situations from offensive zone board play (*n* = 484) and from turnovers in the offensive zone after defensive play (*n* = 372). Fast (*n* = 207) and counter-attacks (*n* = 201) from the defensive zone were also important, producing significantly more goals than slow attacks (*n* = 69). Regarding attacks starting from the defensive zone and goals scored from them, the results of this study were in line with previous studies, which also found that fast and counterattacks are crucial for scoring (Rautakorpi, 1993; Westerlund, 1991).

A power play offers a significant advantage to the attacking team in terms of scoring. According to the results, offensive zone board play during a 5 vs. 4 power play (*n* = 384) accounted for the second-highest number of goals in the comparison between individual categories. In this study, 5 vs. 4 power play goals made up 21% of all goals. If all types of power plays (e.g., 6 vs. 4, 5 vs. 4, 5 vs. 3) are included, the share rises to 23%. In a previous study, it was found that special situations accounted for 33% of the goals at the 2006 Turin Olympics (Luimula, 2013).

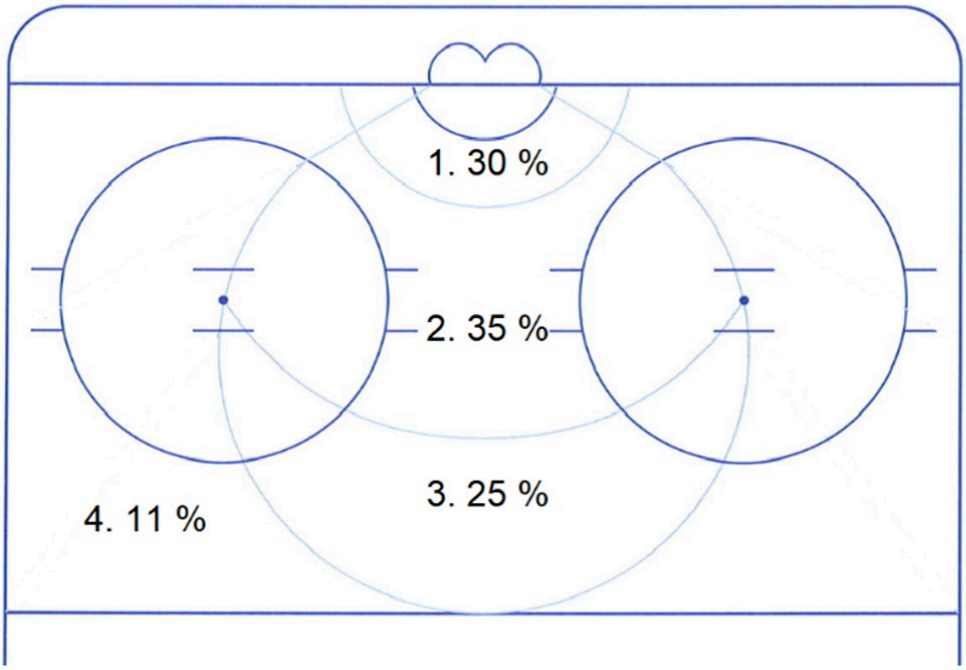


Figure 5 Goal Distribution by Zone

Of the goals analyzed in this study, 84% were scored during 5 vs. 5 play or 5 vs. 4 power plays. The remaining 16% were distributed across several subcategories. Notable among these were goals scored in shootouts (n = 49) and during 3 vs. 3 plays in overtime (n = 40). In the 2023–2024 season, 111 games, or 24.6% of the regular season games, ended in a tie after regulation. This means that in nearly one out of every four games, teams had a chance to earn additional points for potential playoff qualification by scoring a winning goal in overtime. The results of this study highlight differences between 5 vs. 5 and 3 vs. 3 play that should be considered when planning team tactics. In 5 vs. 5 play, 61% of goals were scored from the offensive zone category, while in 3 vs. 3 play, 64% of goals came from the defensive zone. In 5 vs. 5 plays, the defensive zone accounted for 31% of the goals.

In the regular season 2023–2024, 40,760 shots were taken (Liiga). Of these, 6% resulted in a goal. In terms of scoring methods in goals, a direct shot was the method for 47% of goals. The other scoring methods were: 30% from a pass, 15% from a deflection, and 6% from a rebound. In previous research, the results were very similar (International Ice Hockey Centre of Excellence, 2008).

Regarding shot locations, previous research found that 81% of goals were scored from the first two shooting sectors and 19% of goals were scored from sectors 3 and 4 (International Ice Hockey Centre of Excellence, 2008). In this study, the corresponding percentages were 65% and 35%. According to the results, fewer goals were scored from close to the net compared to previous findings. This may be explained by teams' improved defensive play, making it harder to reach areas close to the net.

The results of this study can be considered reliable. The researcher had prior experience with game analysis, both as a researcher and as a coach. The reliability of the analysis method used in the study can be evaluated through re-measurements or the measurement made by another researcher (Alkula et al., 1994). In this study, the agreement between two different observers was 92,5%. The re-measurement showed a 94% correspondence. Reliability is further enhanced

by the fact that the same person systematically analyzed each game using game recordings. The method is widely used in sports research (Hughes & Franks, 2004; McGarry & Franks, 2005).

Since the observation was conducted using goal highlights, the researcher had the opportunity to review individual goals multiple times. However, the reliability of the results is somewhat limited by the fact that the researcher could not control the camera angles used in the goal highlights. Some of the situations leading to goals were challenging to analyze. In future studies, it would be beneficial to film games from multiple camera angles around the rink, allowing for more detailed analysis of the situations. The use of modern technology, such as GPS tracking, could also improve the accuracy of goal situation analysis. New methods could also provide fresh perspectives and possibilities for research. Further studies could also explore, for example, where and how often shots are taken during hockey games. The research could also analyze potential differences between home and away teams.

This study provided comprehensive information on how goals are scored at the highest level in ice hockey. The results can help coaches focus on those areas of team tactics that enable more efficient offensive and defensive play. This may be reflected in training, for example, by coaches regularly planning related aspects with their team. The results can also help coaches focus on these areas of the game when analyzing the opponent's playing style before matches.

Although the aim of the study was to determine the situations from which goals were scored, it is important to also consider the events that occurred before the goal. For example, quick attacks from the defensive zone produced more goals than slow, organized attacks. However, a slow attack could enable the team to bring the puck out of their defensive zone in a planned manner. Similarly, turnovers and transitions in the neutral zone allowed the game to shift into the offensive zone.

The study showed that certain situations occur frequently in matches and lead to numerous goal-scoring opportunities. According to the results, the most important situations for scoring goals in ice hockey games are: 1) offensive zone board play and scoring from turnovers, 2) fast and counterattacks from the defensive zone, and 3) power plays.

These should also be considered in reverse, as ways to prevent goals. In offensive situations in the defensive zone, it is important to avoid losing the puck to prevent the opponent from scoring after regaining possession near the net. In defensive play in the defensive zone, special attention should be paid to controlling the area in front of the goal. Team tactics should also take into account how to prevent the opponent's fast and counterattacks.

Analyzing games is important for the team. Impartial data allows the coach to obtain reliable and measurable information about performance. The data obtained can help further improve the team's performance.

References

Alkula, T., Pöntinen, S., & Ylöstalo, P. (1994). *Sosiaalitutkimuksen kvantitatiiviset menetelmät [Quantitative methods in social research]*. WSOY.

Bitwise. (2024). *Wisehockey*. https://bitwise.fi/referenssit/wisehockey.

Evangelos, T., Alexandros, K., & Nikolaos, A. (2005). Analysis of fast breaks in basketball. *International Journal of Performance Analysis in Sport*, *5*(2), 17–22. https://doi.org/10.1080/24748668.2005.11868324

González-Rodenas, J., Aranda-Malavés, R., Tudela-Desantes, A., Calabuig Moreno, F., Casal, C. A., & Aranda, R. (2019). Effect of match location, team ranking, match status and tactical dimensions on the offensive performance in spanish "la liga" soccer matches. *Frontiers in Psychology*, *10*, 2089. https://doi.org/10.3389/fpsyg.2019.02089

Hardy, S. (2007). Memory, performance, and history: The making of american ice hockey at st. Paul's school, 1860–1915. *The International Journal of the History of Sport*, *14*(1), 97–115. https://doi.org/10.1080/09523369708713967

Heikkilä, J. (2024). *Hyökkäysvauhdin vaikutus maalintekoon jääkiekon suorahyökkäyspelaamisessa tasakentällisin [Does high velocity have an impact on scoring in ice hockey rush situations at even strength]* [Master's thesis]. University of Jyväskylä; https://jyx.jyu.fi/handle/123456789/95513.

Hoff, J., Kemi, O., & Helgerud, J. (2005). Strength and endurance differences between elite and junior elite ice hockey players. The importance of allometric scaling. *International Journal of Sports Medicine*, *26*(07), 537–541. https://doi.org/10.1055/s-2004-821328

Hughes, M., & Franks, I. M. (2004). *Notational analysis of sport: Systems for better coaching and performance in sport*. Routledge.

International Ice Hockey Centre of Excellence. (2008). *Pelitilanteiden määrät jääkiekko-ottelussa. Analysoitu data kerätty Suomen A-maajoukkueen otteluista 1.9.2005-13.5.2007 [Number of game situations in a hockey match. Analyzed data collected from the matches of the Finnish A national team from 1 September 2005 to 13 May2007]*. International Ice Hockey Centre of Excellence.

International Ice Hockey Federation. (2023). *Official rulebook*. https://blob.iihf.com/iihf-media/iihfmvc/media/contentimages/4_sport/officiating/rule_book/230524_iihf_rulebook_gesamt_v_6_0_rz_v1.pdf

Johansson, C., Lorentzon, R., & Fugl-Meyer, A. R. (1989). Isokinetic muscular performance of the quadriceps in elite ice hockey players. *The American Journal of Sports Medicine*, *17*(1), 30–34.

Johansson, U., Wilderoth, E., & Sattari, A. (2022). How analytics is changing ice hockey. *Linköping Hockey Analytics Conference*, 49–59. https://doi.org/10.3384/ecp191006

Kierot, M., Stendahl, M., Warneke, K., Wirth, K., Konrad, A., Brauner, T., & Keiner, M. (2024). Maximum strength and power as determinants of on-ice sprint performance in elite U16 to adult ice hockey players. *Biology of Sport*, *41*(1), 245–252. https://doi.org/10.5114/biolsport.2024.129470

Kivinen, O., Mesikämmen, J., & Metsä-Tokila, T. (2000). *Kylmä kiekkosota: Kaksi mannerta, kaksi kulttuuria [Cold Hockey War – Two Continents, Two Cultures]*. Tammer-Paino Oy.

Leijonat. (2023). *Suomalaisen jääkiekon strategia 2022-2026 [Strategy for the Finnish ice hockey 2022-2026]*. https://www.leijonat.fi/files(mennpa/Leijonainfo_2023_1.pdf

Lignell, E., Rago, V., & Mohr, M. (2020). Analysis of goal scoring opportunities in elite male ice hockey in relation to tactical and contextual variables. *International Journal of Performance Analysis in Sport*, *20*(6), 1003–1017. https://doi.org/10.1080/24748668.2020.1823161

Liiga. (2024). *Liiga main page*. https://liiga.fi/.

Luimula, S. (2013). *Jääkiekkotaktiikat 5 vastaan 5-pelissä Torinon vuoden 2006 olympialaisissa [Ice hockey tactics at even strength in the Turin Olympics 2006]*. [Licentiate thesis]. University of Jyväskylä. https://jyx.jyu.fi/handle/123456789/41199.

Mascaro, T., Seaver, B. L., & Swanson, L. (1992). Prediction of skating speed with off-ice testing in professional hockey players. *Journal of Orthopaedic & Sports Physical Therapy*, *15*(2), 92–98. https://www.jospt.org/doi/10.2519/jospt.1992.15.2.92

Mason, D. S. (1998). The international hockey league and the professionalization of ice hockey, 1904-1907. *Journal of Sport History*, *25*(1), 1–17.

McGarry, T., & Franks, I. M. (2005). The science of match analysis. In T. Reilly & A. M. Williams (Eds.), *Science and soccer* (pp. 273–283). Routledge.

Mitrotasios, M., & Armatas, V. (2014). Analysis of goal scoring patterns in the 2012 european football championship. *The Sport Journal*, *19*, 1–11.

Montgomery, D. (2006). Physiological profile of professional hockey players - a longitudinal comparison. *Applied Physiology, Nutrition, and Metabolism*, *31*(3), 181–185. https://doi.org/10.1139/h06-012

Montgomery, D., Turcotte, R., Gamble, E., & Ladouceur, G. (1990). Validation of a cycling test of anaerobic endurance for ice hockey players. *Sports Medicine, Training and Rehabilitation*, *2*(1), 11–22. https://doi.org/10.1080/15438629009511893

National Hockey League. (2024). *NHL landing page*. https://nhl.com

Nurmi, E. (2024). *5 vastaan 5 -hyökkäyspelin analysointi jääkiekon sijaintidatasta [5 versus 5 offensive game analysis on ice hockey positional data]* [Master´s thesis]. University of Tampere. https://trepo.uni.fi/handle/10024/154855

Pratas, J. M., Volossovitch, A., & Carita, A. I. (2018). *Goal scoring in elite male football: A systematic review*. *13*(1), 218–230. https://doi.org/10.14198/jhse.2018.131.19

Quinney, H., Dewart, R., Game, A., Snydmiller, G., Warburton, D., & Bell, G. (2008). A 26 year physiological description of a national hockey league team. *Applied Physiology, Nutrition, and Metabolism*, *33*(4), 753–760. https://doi.org/10.1139/H08-051

Rautakorpi, J. (1993). *Jääkiekon pelitehokkuuden arviointi MM-kisatasolla. [Assessment of game efficiency in ice hockey at World Championship level]* [Master's thesis]. University of Jyväskylä.

Sarmento, H., Bradley, P., Anguera, M. T., Polido, T., Resende, R., & Campaniço, J. (2016). Quantifying the offensive sequences that result in goals in elite futsal matches. *Journal of Sports Sciences*, *34*(7), 621–629. https://doi.org/10.1080/02640414.2015.1066024

Schulte, O., Khademi, M., Gholami, S., Zhao, Z., Javan, M., & Desaulniers, P. (2017). A markov game model for valuing actions, locations, and team performance in ice hockey. *Data Mining and Knowledge Discovery*, *31*, 1735–1757. https://doi.org/10.1007/s10618-017-0496-z

Siedentop, D., & Tannehill, D. (2000). *Developing teaching skills in physical education* (4.). McGraw-Hill.

Stastny, P., Musalek, M., Rozcniok, R., Cleather, D., Novak, D., & Vagner, M. (2023). Testing distance characteristics and reference values for ice-hockey straight sprint speed and acceleration. A systematic review and meta-analyses. *Biology of Sport*, *40*(3), 899–918. https://doi.org/10.5114/biolsport.2023.122479

Sunderland, C., Bussell, C., Atkinson, G., Alltree, R., & Kates, M. (2006). Patterns of play and goals scored in international standard women's field-hockey. *International Journal of Performance Analysis in Sport*, *6*(1), 13–29. https://doi.org/10.1080/24748668.2006.11868352

Tenga, A., Holme, I., Ronglan, L. T., & Bahr, R. (2010). Effect of playing tactics on goal scoring in norwegian professional soccer. *Journal of Sports Sciences*, *28*(3), 237–244. https://doi.org/10.1080/02640410903502774

Thusberg, J., & Mikkola, R. (1985). *20-vuotiaiden MM-kisojen analysointi [Analyzing the U20 World Championships]*. National Coaching Qualification of The Finnish Sports Federation.

Tian, N., & Xu, G. (2024). Determinants of fast attack performance on match outcome in the elite women's ice hockey. *Plos One*, *19*(7), e0306469. https://doi.org/10.1371/journal.pone.0306469

Triplett, A. N., Ebbing, A. C., Green, M. R., Connolly, C. P., Carrier, D. P., & Pivarnik, J. M. (2018). Changes in collegiate ice hockey player anthropometrics and aerobic fitness over 3 decades. *Applied Physiology, Nutrition, and Metabolism*, *43*(9), 950–955. https://doi.org/10.1139/apnm-2017-0789

Tulsky, E., Detweiler, G., Spencer, R., & Sznajder, C. (2013). *Zone entries*. https://hockeyanalytics.com/Research_files/Using%29Zone%20Entry%20%Data20To%20Seperate%20Offensive,%20Neutral,%20And%20Defensive%20Zone%20Performance.pdf

Valkonen, E. (1997). *Kuka kontrolloi peliä? [Who Controls the Game?]*. Karisto Oy.

Vigh-Larsen, J. F., & Mohr, M. (2022). The physiology of ice hockey performance: An update. *Scandinavian Journal of Medicine & Science in Sports*, *34*(1), e14284. https://doi.org/10.1111/sms.14284

Westerlund, E. (1991). *Pelianalyysi jääkiekon SM-liigasta [Game analysis of the ice hockey SM League]*. Seminar report, IIHF International Coaching Symposium, Turku, Finland.

Westerlund, E. (1997). Jääkiekko [Ice hockey]. In A. Mero (Ed.), *Nykyaikainen urheiluvalmennus* (pp. 527–544). Gummerus Kirjapaino Oy.

Yleisradio. (2024). *Ulkomaalaispelaajien määrä Liigassa kasvaa – se johtuu kiusallisesta ongelmasta [The number of foreign players in the Finnish Ice Hockey League is increasing – it stems from a troubling issue]*. https://yle.fi/a/74-20119885

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