Sharpshooters, Aggressors, Controllers: Quantifying NHL Team Styles

A five-season statistical analysis of NHL team strategies using clustering and key performance metrics.

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Background:

All NHL teams have a distinct playing style that shapes their performance on the ice. Some teams emphasize efficient shooting and puck control, while others focus on defensive stability. Understanding these differences provides valuable insight into team strengths and weaknesses. This project explores team trends over five seasons to classify each into a broader archetype: aggressive, balanced, or efficiency-focused. Quantifying variables such as shooting percentage, hits, blocks, and turnover ratios allows for analysis to distinguish measurable patterns between and within archetypes.

As professional teams increasingly embrace advanced analytics for decision-making, this type of analysis has become more relevant than ever. Modern hockey strategy depends not only on individual player talent, but the team dynamics that impact player performance. While previous studies focused on classifying individual player styles, this study aims to shift the focus to team-level behavior. Classifying teams by playing style helps analysts and coaches better understand team synergy, assess their own competitive advantages, and anticipate how their opponents will approach the game. Even as hockey analytics evolve, the need for interpretable measures of team performance in the NHL remains.

Research Objective:

The objective of this project is to classify NHL teams into distinct strategic archetypes using quantitative performance metrics. Through analyzing team-level data from the 2018-2019 to 2022-2023 seasons, the study aims to examine how shooting efficiency, aggressiveness, and puck management shape overall team style. The primary goal of this study is to compare cluster means to reveal meaningful performance differences among groups.

Hypothesis: Teams will partition into clusters that represent statistically distinct styles. These groups are expected to differ significantly in shooting percentage, hits, blocks, and turnover ratio, which reflects the unique playing styles of each team.

Data Collection:

Data was obtained from publicly available NHL player stats for the 2018-2019 and 2022-2023 seasons on Moneypuck.com. Each observation represents a single skater-season, excluding goalkeepers. Observations include key variables such as goals, shots, hits, blocks, and turnover-related metrics. These variables were aggregated by team and summarised into totals for all teams. Shooting percentage, turnover ratio, average hits, and average blocks were created as metrics of team performance for analysis. Some teams did not have five complete seasons of data and were removed from the analysis. After preprocessing, team-level data across five seasons provided a consistent foundation for comparative analysis with 31 teams and four metrics.

Methodology:

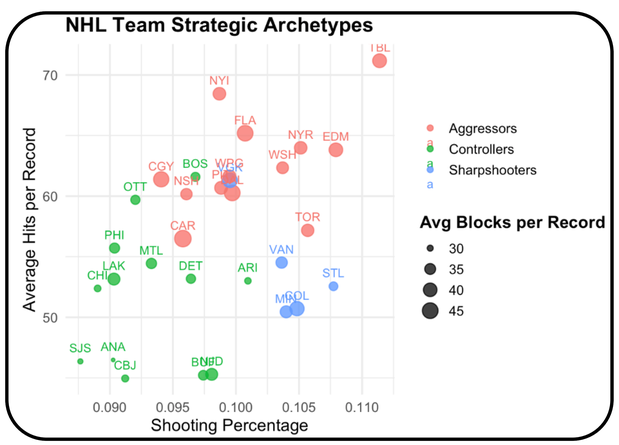
The K-means clustering algorithm was used because of its ability to identify patterns in quantitative data. K-means minimizes within-group variation while maximizing differences between groups, making it ideal for discovering distinct team archetypes. An elbow chart was used to determine the optimal number of clusters (K), which was three. Data was normalized by record count to control for team size and seasonal variation

Multiple tests were conducted to compare cluster means and assess the statistical significance of differences in playing style. ANOVA was first used to determine if there were statistically significant differences among the cluster means. Because ANOVA cannot identify which specific clusters differ, the Tukey's HSD test was then applied. This test performs pairwise comparisons between all cluster combinations while controlling for the overall type I error rate. Assumptions for parametric tests were checked for all metrics: Shapiro–Wilk tests confirmed approximate normality within clusters, and Levene's tests indicated homogeneity of variance. These checks support the use of ANOVA and Tukey HSD, even though cluster sizes differ.

Metric	Comparison	Mean Difference	P Value
Shooting Percentage	Controllers-Aggressors	-0.0080	0.0003
Shooting Percentage	Sharpshooters-Controllers	0.0106	0.0003
Avg Hits per Record	Controllers-Aggressors	-10.8671	0.0000
Avg Hits per Record	Sharpshooters-Aggressors	-8.6082	0.0060
Avg Blocks per Record	Controllers-Aggressors	-10.9099	0.0000
Avg Blocks per Record	Sharpshooters-Controllers	5.1061	0.0172
Turnover Ratio	Sharpshooters-Aggressors	0.0620	0.0071
Turnover Ratio	Sharpshooters-Controllers	0.0707	0.0022

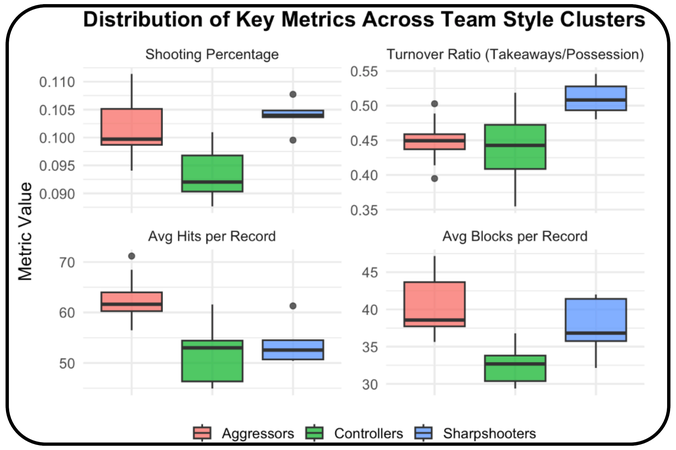
Results:

Three distinct archetypes were created by the clustering analysis. Sharpshooters were teams with the highest shooting percentage and strong puck control. Aggressors had significantly higher hits and blocks, emphasizing their physicality. The last group, Controllers, shows balanced performance, but lower physicality and shooting efficiency..



Sources:

All data was obtained from www.MoneyPuck.com.



Results:

The ANOVA results revealed statistically significant differences between clusters for all four variables ($p < 0.001$ each). Tukey HSD was used to confirm these inter-cluster differences. Between the three clusters, sharpshooters had a significantly higher average scoring percentage than Controllers ($p < 0.001$) and stronger puck management compared to both other clusters ($p < 0.001$). Aggressors led both the hit and block categories, with highly significant differences in mean compared to Controllers ($p < 0.001$). Visualizations, including scatterplots and boxplots, illustrate the clear distinctions between groups in terms of efficiency, physicality, and puck control. The separation of cluster means seen in both the tests and visualizations supports the hypothesis that NHL teams can be quantitatively grouped into strategic archetypes.

Interpretation:

The clustering results reveal that NHL teams naturally fall into three core playing styles. Sharpshooters' high average shooting percentage and turnover ratio suggest extra emphasis dedicated to offensive strategies, where they dominate in efficiency and puck control. Aggressors' superior average blocks and hits show that their focus lies on defensive strategies, prioritizing preventing the opposing team from advancing. Controllers balance both offense and defense, but do not excel at either. Tukey HSD results confirm statistically significant differences in shooting percentage, hits, blocks, and turnover ratio between team clusters. The median 5-year total goals by play-style types show aggressors and sharpshooters dominating with 1235 and 1193 goals, respectively, while controllers fell behind with a median of 984 goals. These findings suggest that teams leaning heavily toward offense or defense may achieve higher scoring success than teams using a balanced strategy. Specialization allows teams to become highly efficient in game-deciding moments, which could give aggressors and sharpshooters a competitive advantage.

Implications:

These findings provide a framework for evaluating team style using quantitative metrics. Understanding where a team falls within these three categories can lead to tactical adjustments that better align with team goals. Coaches could use team style classification to inform pairing decisions, benchmark team metrics against others in the same category, and build rosters that reinforce their strategic approach. Analysts can use team style classifications to predict outcomes, identify key matches, and monitor strategic trends over time. Although the results are most directly applicable to the NHL, the methodology can be used to analyze other professional hockey leagues and team sports. Variations in rules, player skill, and game structures may affect cluster composition and defined categories.

Limitations:

The analysis is limited by the number of NHL teams (n = 31), which constrains the team-level sample size. This limited sample size required using only four key metrics in the clustering algorithm to avoid overfitting. This approach assumes that these metrics sufficiently capture team style, although other important metrics were excluded. Despite this restriction, including all teams except Seattle means the findings reflect nearly the entire league and provide a comprehensive view of team playing styles.

Future Research:

Future research could incorporate other professional hockey leagues for a holistic analysis of team styles. This addition would allow for more variables to be used in analysis, potentially increasing the model's predictive and explanatory power. Additionally, data from previous NHL years would help account for variation due to coaching or roster changes. This study could be refined to analyze cluster-specific performances in competition levels, in-game situations, and player contributions.