How has the Game of Hockey Changed Over the Past 20 Years?

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Introduction

The game of hockey has undoubtedly changed over the years from its inception, in terms of rules, speed, equipment, new teams, and even a hard salary cap introduced in the 05-06 season. Equipment in the modern game is lighter and more durable than it was decades before, allowing players to move faster, and more robustly. Even goalie equipment is bigger and lighter so they can stop more shots. In 2001, the graphite-composite hockey stick was introduced into the NHL, which is lighter and more flexible allowing for more whip and velocity on shots, still used today, it left wooden and aluminum sticks in the past. The first recorded 100 mph slap shot was recorded in the 1992 Season All-Star competition, where now the average speed of a slap shot in the NHL is close to 100 mph. Along with equipment development, hockey has expanded to Europe, and training has also evolved where players are stronger and faster, flooding the NHL with an abundance of talent. The culture of hockey has changed as fighting and 4th line goons are becoming less common since the game revolves now more than ever around skill and speed.

The evolution of the game coupled with rule changes has put the focus on offensive production as it creates a more exciting show for fans. So how has the NHL, if it has, changed over the past 20 years?

Method

The datasets analyzed contained statistics for all current NHL teams in the 2001-02 and 2021-22 seasons. The information collected and analyzed for each team was Goals for, Shots for, Wins, Number of Games, Penalty Minutes per Game (PIM/G), Power Play Conversion Percentage (PP%), and Goalie Save Percentage (SV%).

Sources

1. https://records.nhl.com/history/historical-rule-changes
2. https://bleacherreport.com/articles/2679131-ranking-the-10-hardest-slap-shots-in-nhl-history

Results

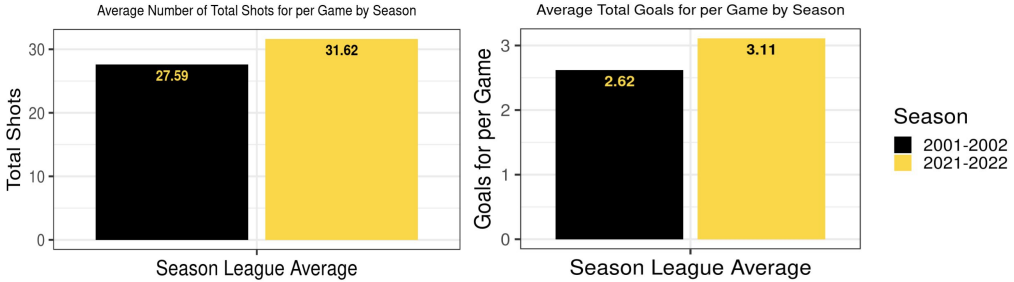

Figure 1: The 2001-02 season league average number of total shots for per game compared to the 2021-22 season league average number of total shots for per game

Figure 2: The 2001-02 season league average number of goals for per game compared to the 2021-22 season league average number of goals for per game

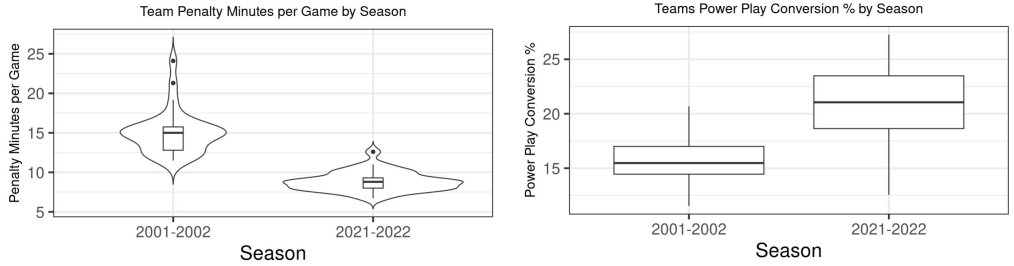

Figure 3: Side-by-side violin plots of the distribution of penalty minutes per game for each team for the 2001-02 and 2021-22 seasons

Figure 4: Side-by-side box plots of team power play conversion % by team, which measures the rate at which teams scored while on a power play

Competitive Balance Measure by Season

Season	Actual	Idealized	Noll-Scully
2001-2002	15.02	9.77	1.54
2021-2022	20.28	9.77	2.08

Table 1: Noll-Scully is a competitive balance metric that compares the actual standard deviation of teams win % across a league to an idealized standard deviation (maximum degree of competitive balance) given a league's schedule length. By calculating the standard deviation of standing win points for each season (NHL uses a point system) we calculate how competitive each season was based on the idealized st. dev where all teams are equal in competition and playing strength. A value closer to 1 means greater competitive balance within the league.

$$\frac{Actual\ St.\ Dev}{Idealized\ St.\ Dev} = Noll\text{-}Scully$$

Save Percentages by Season

Season	Min	Q1	Median	Q3	Max	Mean	SD	n
2001-2002	0.896	0.900	0.902	0.911	0.922	0.905	0.007	30
2021-2022	0.880	0.896	0.903	0.907	0.919	0.902	0.009	32

Table 2: Summary statistics for the save percentages of teams for each respective season (2001-2002 season and 2021-2022 season).

Discussion

- Figure 1: The 2021-22 season had, on average, 4 more shots for per game than the 2001-02 season, with an average of 31.62 and 27.59 shots for per game, respectively
- Figure 2: The 2021-22 season had 0.5 more goals scored per game, on average, compared to the 2001-02 season, with an average of 3.11 and 2.62 goals for per game, respectively
- Figure 3: Penalty minutes per game (PIM/G) decreased significantly between the two seasons. In 2002, the average PIM/G was 15 minutes per game. In the 2022 season that number was 9 minutes per game. The max PIM/G of the 2022 season, 12.6, is drastically less than the 2002 average, 24.1
- Figure 4: The 2021-22 season average power play conversion was 20.5% compared to the 2001-02 season with a lesser average of 15.8%. The standard deviations for the 2021 and 2001 season were 3.97% and 2.24%, respectively, with max values of 27.27% and 20.68%, respectively
- Table 1: 2001-02 season Noll-Scully metric of 1.54 indicates a more competitively balanced NHL season than the 2021-22 season at 2.08
- Table 2: Similar summary statistics are shown for goalie save percentages when comparing the two seasons of interest. The only major difference is that there were two more teams in the league during the 2021-2022 season compared to the 2001-2002 season.

Conclusion

Based on our findings, which show mixed results, the NHL has changed over 20 years, just not to the extent we initially thought. Penalty minutes per game, power play conversion, and the Noll-Scully metric provide evidence that the game has evolved with substantially less penalties minutes but much higher conversion percentages on power plays, and a wider range in team success now more than 20 years ago.The offensive statistics hint that the game has evolved to more offensive production, but the statistical comparison of a 4 shot and 0.5 goal difference per game isn't a large difference in hockey. Meanwhile, the save percentage statistics by team indicate that goalie performance has not changed over 20 years.