

## The Impact of NBA New Rules on Games

[SJ thesportjournal.org/article/the-impact-of-nba-new-rules-on-games/](https://thesportjournal.org/article/the-impact-of-nba-new-rules-on-games/)

U.S. Sports Academy

January 15, 2021

**Authors:** Mahmoud M. Nourayi<sup>1</sup>, Meghna Singhvi<sup>2</sup>

<sup>1</sup>Department of Accounting, Loyola Marymount University, CA, USA

<sup>2</sup> Department of Accounting, Finance, Economics, and Law, California State University, Dominguez Hills, CA, USA



### Corresponding Author:

Meghna Singhvi, PhD., CPA(inactive),MBA, MACC  
1000 E. Victoria Street  
Carson, CA 90747  
[msinghvi@csudh.edu](mailto:msinghvi@csudh.edu)  
310-243-3696

Dr. Mahmoud Nourayi, PhD, CPA, CMA, CFM is the Paul Grosch Professor of Accounting at Loyola Marymount University. He earned this distinct honor by dedicating more than 25 years to LMU teaching various accounting courses at the undergraduate and graduate level. He was named Outstanding Accounting Educator by the California Society of Certified Public Accountants. He regularly presents at U.S. and international academic conferences and has served at various times as Accounting Department Chair, Associate Dean of the College of Business Administration, and as facilitator for the LMU Accounting Society.

Dr. Meghna Singhvi, PhD, is an Associate Professor of Accounting at California State University, Dominguez Hills and her research focuses on corporate governance, gender diversity in the board room and CEO Power. She is a CPA (inactive) and she earned her MBA from Ohio University in 2002 and her Masters in Accountancy from NKU in 2004. She is passionate about inspiring students and has recently established the “THRIVE” mentorship program at CSUDH along with two other faculty members to bridge the gap between industry experts and her students at CSUDH.

### ABSTRACT

The purpose of this study is to examine the impact of rule changes by the National Basketball Association on pace, scoring, physicality, and shot selection in professional basketball games. Method: We use regression analysis to examine the trend of various game indicators about the speed and flow, physical plays, shooting accuracy, and shot selection over time. Results: Our findings showed an upward trend in the number of possessions, Points, and Field Goal

Attempts in line with the expectation of the NBA league administrators. We also observed a downward trend in the number of Personal Foul calls, Free Throws Attempts, and Free Throws Made after the rule changes and our findings further indicated an increase in relative number of 3-point shots as well as increased shooting precision in 2-point shots. Based on our hypothetical scoring of the games and analysis, about 10.3% of the wins and 6.5% of losses were attributable to 3-point shots. Conclusion: Our analyses indicate that the 2-point shooting percentage (2P%), on average, improved more than that for 3-point shots over time, and the number of personal foul calls, free throw attempts and free throws made declined under new rules over time. Application in Sports: While 3-point shots did not seem to impact the game outcome for most games, it appears that the involvement of the more skilled and agile players has made the game faster. However, shot selection decision by the teams must be based on game conditions and managed by coaches on a game by game basis, perhaps even quarter by quarter, and player by player.

**Key words:** Analytics, OR in Sports, New NBA rules, Speed and flow, Scoring, Style of the Game, 3-point Shooting, Trends

## INTRODUCTION

After much scrutiny from sports media and fans alike, the NBA appointed the Select Committee on Playing Rules to analyze and revise the rules of the game beginning in the 2001-02 season and made further adjustments to the rules beginning in the 2004-05 season. The NBA had a declining attendance and television viewership, and rule changes were necessary to restore viewer satisfaction and support (Ibanez, Rubio, Gomez, Espinosa 2018). The committee agreed that any rule changes must work to make the game faster, supply more freedom to offenses, and most importantly make the smaller “shooter” players more likely to succeed (3).

Major rule changes by the Select Committee included the elimination of the illegal defense, effectively allowing the zone defense instead of man-to-man defense. Additionally, the defensive 3-second rule, disallowing the big men camping in the painted area, opened up that area. Teams were allowed 8 seconds to cross the midcourt, down from 10 seconds thereby increasing the speed of the game. At the beginning of 2004-05 season, the league introduced penalties for hand/body checks to further curb excessive physical plays and protect the offensive players.

Jerry Colangelo, the owner of Phoenix Suns who had led the Select Committee on rule changes, had intended to make the game more free flowing and fast paced; data show the committee accomplished the goals of the league. Three-second defensive rule has forced the big centers and shot blockers out of the lane. Elimination of illegal defense together with the combined effect of other rule changes resulted in open lane to the basket. This in turn created opportunities for quick guards and forwards to run through the lane for a layup or dunk. Hand check rules made fouling the 3-point shooter a costly option for the defense, thereby creating opportunities for sharpshooters to score early in the shot clock.

The NBA has continuously modified the rules to increase the game's pace and scoring. Arguably, the move to a more offensively oriented league started in 1954 with the institution of the 24-second shot clock. After the introduction of the shot clock, scoring quickly jumped from 79.5 points per game per team in 1954, to 93.1 points per game per team the following year (6). The one-on-one isolation offense, post-up plays, emphasis on defense and physical plays, and hard fouls had all slowed the game down to a mere 78 field goal attempts per team, from 100 plus attempts per game in late 1960s (17).

The league expected that the introduction of the 3-point shot in 1979, established the line at 23 feet, nine inches (22 feet in the corners), measured from the center of the basketball hoop, which is 15 inches from the surface of the backboard, together with other rule adjustments, would increase the numbers of shot attempts in games. The evolution of the 3-point shot in basketball has been decades in the making. The American Basketball League (ABL) introduced the 25-foot line for 3-point shots in professional basketball in 1961, upon formation of the league. However, ABL was short lived and the league folded during its second season in 1962. Three-point shots from a 21-foot line had been tested for the first time in 1945 in one college game, and the experiment was repeated with a 23-foot line once again in 1958 in a college game.

The Continental Basketball Association (CBA), a men's professional basketball minor league in the United States (also known as the Eastern Pennsylvania Basketball League, the Eastern Professional Basketball League, and the Eastern Basketball Association) from 1946 to 2009, adopted the shot during the 1963-64 season. In 1967 the legendary George Mikan, "Mr. Basketball" himself, one of the organizers and the first commissioner of the American Basketball Association (ABA), reintroduced the 25-foot 3-point shot. Mikan's illustrious career, as the first dominant center in professional basketball, served as a role model for other great centers who followed him decades after his retirement. He had won several scoring titles and seven championships in 8 seasons of pro basketball, including the two championships as he played in the National Basketball League (NBL), through his dominance of the painted area and pounding the ball inside. While traditional coaches did not favor the 3-point shot, Mikan was a strong proponent of the 3-point shot and opening up the game of basketball for guards and smaller players.

NBA league had assumed that the 3-point shot served as an important factor in increasing both scoring and speed in games. As scoring continued decline, the league shortened the 3-point line to 22 feet starting in the 1994-95 regular season. The league also made it more costly for the defense to commit a foul against a 3-point shooter; the penalty for such a foul increased from two to three attempts at the free throw line. Over the next three regular seasons, with the shortened 3-point line, the number of 3-point attempts and 3-point percentage increased by 50 percent and 3 percent, respectively. However, the inside power-game by big men in the middle, and isolation play by super stars and guards, drove the average score further down to their lowest level (91.6 points) during the 1998-99 regular season, since the introduction of the 24-second clock.

Arguably, the NBA rules and officiating were more favorable for the less agile bigger men on the team compared to smaller players. This in turn, had affected the fluidity and pace of the game. The league decided to move the 3-point line back to its original distance after 1996-97 season. Currently, the NBA has a 22-foot 3-point line in the corners and a 23-foot, 9-inch line elsewhere. The WNBA and the international game plays with a 20-foot, 6-inch line. The NCAA men's game has a 20-foot, 9-inch line while the NCAA women and high schools have a 19-foot, 9-inch line.

The goal of this article is to demonstrate the impact of NBA rule changes on game statistics over the past 20 years. We examined Game indicators influenced by the speed and flow of the game such as Pace (estimated number of possessions), number of Points, and Field Goal Attempts (FGA). The new rules favor offensive players and discourage physical defensive moves. Therefore, the league intended to curtail physical plays and number of personal fouls. We examined the number of free throws attempted (FTA) and free throws made (FTM), relative to the FGA. We also examined shot selection and shooting accuracy. We also report the results of our hypothetical scoring of the playoff games, over the past 5 playoff series, in determining the impact of 3-point shot on the outcome of games.

## **DISCUSSION**

According to Stu Jackson, the former Senior VP of Basketball Operations, the new rules discourage the bigger players from staying in the middle of the lane and preventing passing, player movement, and therefore, improving shooting percentage close to the basket. The rules also speed up the ball movement to the frontcourt and bring about full court press, as well as reduce disruption by touch foul calls (14). The NBA intended to produce a higher scoring, and a more aesthetically pleasing brand of basketball.

Since 2001-02, the numbers of possessions have been increasing gradually from 91 possessions to 100 possessions per 48 minutes in current season. Field Goal Attempts (FGA) have shown a pronounced upward trend from 81 to 89 attempts over 20 seasons. "We want to make it a more free-flowing, fluid, wide-open game," said Rod Thorn, the former NBA's vice president of basketball operations. The rule changes were intended to increase scoring and cut down on physical play (21). "Rather than impede the game, zone defense arguably has helped foster the offensive renaissance by giving teams more incentive to score on fast breaks" (2). The rules have stretched to limit the defense and reward the offense with fast break and 3-point shooting opportunities by eliminating defensive contacts (19). Portland Coach Terry Stotts said. "They wanted to bring freedom of movement and skill and opening up the court and moving it from the side of the court to the middle of the court." (4). Number of points scored per game by a team on average have increased by 16 points over the 20-year period, from 95 points to 111 points.

The effectiveness and utilization of the 3-point shot varies by the league, as indicated by prior research, and is dependent on the style of the game, the rules and officiating. Additionally, improved players' shooting accuracy and team defense by the opponents has evolved over time, influencing the outcome of games (6,15,16).

As Fichman and O'Brien (6) suggested, the variance of the probability of 3-point shots success has remained higher than that of 2-point shots over three decades, although it has decreased over this period. Their observation indicates that although the expected points from 3-point shots is higher than the expected points from the 2-point shots, the 3-point shots as a percentage of FGA have not reached 100 percent by the NBA teams, because of the variability of the success in 3-point shots from team to team and game to game.

Furthermore, the new restrictive defense rules and changing style of NBA basketball games appear to have reduced physicality in the games, as indicated by the number of fouls called, free throws attempted (FTA), and free throws made (FTM). Defensive rule changes, such as defensive 3-second, hand checking, zone defense, etc., have opened up the area under the basket. This has potentially improved the shooting percentage of 2-point shots (2P%) under and around the basket and resulted in fewer fouls committed on 3-point shot attempts (3PA) due to larger penalties for the defensive players. As discussed earlier, opening of the painted area allowed quick guards and forwards to slash through the lane for layups and dunks at more efficient rates, thereby improving the 2P% at a steeper rate than the long distance shot rate.

Generally, when teams attempt fewer 3-point shots, and/or are less successful in those attempts during a game, they end up with underwhelming performances. Lowe (13) reports that according to Kiki Vandeweghe, the league's senior vice-president for basketball operations, "Everyone wants to dribble and shoot jumpers. But at the same time, NBA coaches have looked at the numbers and found that 3-pointers are efficient, the pick-and-roll is efficient, that it's more efficient to shoot early in the shot clock." NBA regular season games have slowly turned into athletic performance showcases resulting in fast paced, 3 point and slam-dunk heavy games (5).

Eight of the last 10 NBA championship teams have finished top 10 in regular season 3-point field goal percentage, and 5 of the last 10 have finished top 3 in regular season 3-point field goal percentage (3P%). Additionally, the renowned 3-point specialist, Steph Curry received the NBA Most Valuable Player (MVP) award for the 2015 and 2016 season (6). Stephen Curry also happens to be one of the team captains of the Golden State Warriors who have won three of the last five NBA championships and have finished first, third, and first in the regular season 3-point field goal percentage during those championship seasons.

Prior studies have documented the significance of shooting accuracy in success of basketball games in various leagues. The proportion of 3-point shot attempts by teams in basketball leagues across the world are steadily increasing. In the Copa Del Rey, a Spanish basketball tournament, the 3-point line was moved farther back in reaction to the dramatic increase of 3-point shot attempts. Even after moving the 3-point line back, the efficacy levels of the shot did not decline (10). It is quite common for players in today's game to specialize in the 3-point shot. Coaches across many leagues are keen on the importance of 3-point shot precision and agree that 3-point shots are one of the most important indicators of victory in the Asociación de Clubs de Baloncesto (ACB) league for the last 10 seasons (Ibanez, et al., 2018).

Many studies have shown a high correlation between field goal percentage (FG%) and winning in basketball games at the college and professional levels, by both women’s and men’s teams (7,8;12;20). The results of the 2004-2016 Olympic study emphasized that strong shooting proficiency (particularly long-distance shots for women), and specific defensive activities, were critical in predicting the likelihood of victory for both men and women’s games (11).

## METHODS

We began with the average game statistics for the regular season over the past two decades for our trend analysis. The data was publicly available from Basketballreference.com and NBA.com. We used regression analysis to examine the trend of various game indicators about the speed and flow, physical plays, shooting accuracy, and shot selection over time. We specified linear and quadratic polynomial models for our analyses in order to discern the impact NBA rule changes on the style of the game over the past two decades.

We also examined the impact of shot selection in playoff games. The data and game statistics for 410 playoff games over five recent NBA playoffs (2015-19), 81 (2015), 86 (2016), 79 (2017), 82 (2018), and 82 (2019), were collected. We choose 2015-2019 playoff games for this study to analyze the most competitive games in professional basketball under new NBA rules. Using most recent playoff games to study the impact of shot selection as teams, coaches, and players have made necessary adjustments, modifying practices, training, game tactics, and game strategy, to the more restrictive defense rules (6).

## RESULTS

More than two decades since major rule changes and continuous adjustments to the rules, FGAs have increased in a more free-flowing game, with fewer fouls and stoppages, and shorter possession time in the faster games. Sport analysts and coaches seem to agree that the new rules have increased the speed and pace of NBA games. We examined the trends of game statistics relevant to the flow and speed, physicality of in the games, and shot selection and shot accuracy of the game since 2001-02 season using regression analyses for the past twenty years.

To examine changes that impacted the speed and flow of the games, we regressed the pace, number of points, and FGA over time. These variables appear to behave in quadratic polynomial form as shown in Table 1. After an initial decline, all three variables show upward trends consistence with the Select Committee’s expectations. That is, the pace, points and FGA have been increasing in faster and more free-flowing games. All coefficients are significant at conventional level with significant explanatory power of these trends as indicated by the R-squared and F-statistic, The R-squared for Pace and FGA are over 93 percent and for number of Points at approximately 83 percent. These results are presented in Table 1 below.

**TABLE 1:** Speed and Flow

Independent Variable(s)	Coef.	Std. Err.	t	P> t	Adjusted R2	Prob > F
<b>PACE</b>						

<b>Trend</b>	-2.25194	0.38249	-5.89	0.000	0.9313	0.0000
<b>Trend^2</b>	0.04289	0.00605	7.09	0.000		
<b>_cons</b>	120.2620	5.88789	20.43	0.000		
<b>POINTS</b>						
<b>Trend</b>	-2.31257	0.99437	-2.33	0.033	0.8298	0.0000
<b>Trend^2</b>	0.04854	0.01573	3.09	0.007		
<b>_cons</b>	123.2763	15.30686	8.05	0.000		
<b>Field Goal Attempts (FGA)</b>						
<b>Trend</b>	-2.39443	0.31349	-7.64	0.000	0.9485	0.0000
<b>Trend^2</b>	0.04466	0.00496	9.01	0.000		
<b>_cons</b>	112.1680	4.82572	23.24	0.000		

Next, we examined the annual results of the regular season games to discern any changes in the games' indicators driven by the level of physicality in the game. We regressed the statistics for Personal Foul (PF), Free Throw Attempts (FTA) and Free Throws Made (FTM).

The data indicate that the number of PF, FTA, and FTM have declined by 2.0, 3.2, and 2.0, respectively. These measures have shown downward trends in a linear form with respect to time as presented in Table 2. All trend coefficients are significant at 0.001 level and regression R-squared for PF, FTA, and FTM were at 0.50, 0.45, .34, respectively. F-statistics are significant for all three models.

Oliver (18) included the free throw rate (FTA/FGA) as one of his four indicators of the game outcome. We extended our analysis of defensive aspect of the game in *relative* to FGA and number of points as the approximate drivers of the foul calls and free throws attempted and made. Then, we regressed the PF/FGA, FTA/FGA, FTM/FGA, and FTM/Points on time.

**TABLE 2:** Physical Play

<b>Independent Variable(s)</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>t</b>	<b>P&gt; t </b>	<b>Adjusted R2</b>	<b>Prob &gt; F</b>
<b>Personal Foul (PF)</b>						
<b>Trend</b>	-0.11654	0.02593	-4.50	0.000	0.5027	0.0003
<b>_cons</b>	24.66105	0.83026	29.70	0.000		
<b>Free Throw Attempts (FTA)</b>						
<b>Trend</b>	-0.15308	0.03752	-4.08	0.001	0.4516	0.0000

<b>_cons</b>	28.80210	1.20143	23.97	0.000		
<b>Free Throw Made (FTM)</b>						
<b>Trend</b>	-0.09654	0.02969	-3.25	0.004	0.3351	0.0044
<b>_cons</b>	21.20105	0.95071	22.30	0.000		
<b>Personal Foul (PF) / Field Goal Attempts (FGA)</b>						
<b>Trend</b>	-0.00267	0.00034	-7.87	0.000	0.7625	0.0000
<b>_cons</b>	0.33904	0.01088	31.16	0.000		
<b>Free Throw Attempts (FTA) / Field Goal Attempts (FGA)</b>						
<b>Trend</b>	0.01180	0.00585	2.02	0.060	0.7326	0.0000
<b>Trend^2</b>	-0.00024	0.00009	-2.58	0.019		
<b>_cons</b>	0.16494	0.09009	1.83	0.085		
<b>Free Throw Made (FTM) / Field Goal Attempts (FGA)</b>						
<b>Trend</b>	0.00852	0.00458	1.86	0.080	0.6788	0.0000
<b>Trend^2</b>	-0.00017	0.00007	-2.36	0.031		
<b>_cons</b>	0.12747	0.07047	1.81	0.088		
<b>Free Throw Made (FTM) / Points</b>						
<b>Trend</b>	0.00515	0.00256	2.01	0.060	0.8679	0.0000
<b>Trend^2</b>	-0.00012	0.00004	-2.91	0.010		
<b>_cons</b>	0.14022	0.03941	3.56	0.002		

Our results in Table 2 indicate the PFs remain linear and significantly downward sloping over the examination period. Furthermore, FTAs and FTMs as percentages of FGA appear to behave in an inverted U Shapes with initial increases then downward sloping functions over time. These results suggest that the violations and physicality have been declining as the league had intended. The results also suggest that FTMs are smaller percentages of total points in recent years, declining from approximately 20 percent in 2001-02 regular season to 16 percent in 2019-20 (per COVID-19) season. FTAs as a percentage of FGAs has also been on a downward trend, declining from about 30 percent to 25 percent, over the same period as the number of three-point shots (3PA/FGA) have increased from 17 percent of field goal attempts to 38 percent.

The increase in number of points over the past 20 seasons is the results of faster pace and more free-flowing games but increase in shooting accuracy could have contributed to higher scoring. We examined the trend of shooting percentages for 2-point and 3-point shots over study period. The results, as shown in Table 3, indicated that 3-point shooting percentage (3P%) has essentially remained constant with an insignificant U-shape changes, however, the 2-point shooting percentage (2P%) show a significant linear upward trend. The increase in 2-point shooting percentage may be attributable to the 3-second defensive rule and the opening of the painted area allowing the offensive players to get closer to the basket and score with more accuracy.

**TABLE 3:** Shooting Accuracy and Efficiency

Independent Variable(s)	Coef.	Std. Err.	t	P> t	Adjusted R2	Prob > F
<b>2-point Shot Percentage (2P%)</b>						
<b>Trend</b>	0.00271	0.00030	8.99	0.000	0.8078	0.0000
<b>_cons</b>	0.39979	0.00967	41.35	0.000		
<b>3-point Shot Percentage (3P%)</b>						
<b>Trend</b>	0.00360	0.00256	1.41	0.177	0.0654	0.2187
<b>Trend^2</b>	-0.00005	0.00004	-1.31	0.207		
<b>_cons</b>	0.29674	0.03933	7.54	0.000		
<b>Effective Field Goal Percentage (eFG%)</b>						
<b>Trend</b>	0.00253	0.00028	9.18	0.000	0.8141	0.0000
<b>_cons</b>	0.41657	0.00883	47.15	0.000		
<b>Effective Field Goal Percentage (eFG%) / 2-point Shot Percentage (2P%)</b>						
<b>Trend</b>	0.00513	0.00181	2.84	0.011	0.4940	0.0012
<b>Trend^2</b>	-0.00009	0.00003	-3.12	0.006		
<b>_cons</b>	0.95254	0.02781	34.25	0.000		
<b>3-point Shot Percentage (3P%) / 2-point Shot Percentage (2P%)</b>						
<b>Trend</b>	0.00968	0.00438	2.21	0.041	0.8454	0.0000
<b>Trend^2</b>	-0.00021	0.00007	-3.02	0.008		
<b>_cons</b>	0.64366	0.06742	9.55	0.000		

The efficacy of 3-point shots is merely dependent on two factors. The accuracy of both 2-point and 3-point shots and the relationship between these two measures. In other words, as long as the expected ratio of  $3P\%/2P\%$  is *larger* than  $2/3$  or 66.7%, the 3-point shot is a more efficient choice.

Oliver (18) suggests eFG% is one of 4 variables that influence the outcome of basketball games. Shooting accuracy positively affects the Effective Field Goal Percentage (eFG%). That is,  $\{eFG\% = [(Total\ Points - FTM)/2]/FGA\}$  or  $[eFG\% = (FGM + 0.5 * 3PM)/FGA]$ . The data indicate that eFG% has increased linearly over the study period as shown in Table 3. This upward slope of eFG% is the result of improvement in shooting accuracy over the past two decades. The question becomes which type of shot yields more points for the team. If 3-point shooting is the more efficient choice, eFG% is higher than 2P%, i.e., the expected points from a 3-point shot is larger than the number of points than that of a 2-point shot. The 3-Point Attempts (3PA) as a percentage of FGAs have increased from 16.7% in 2001-02 to 38.2% in 2019-20 (per COVID-19) regular season.

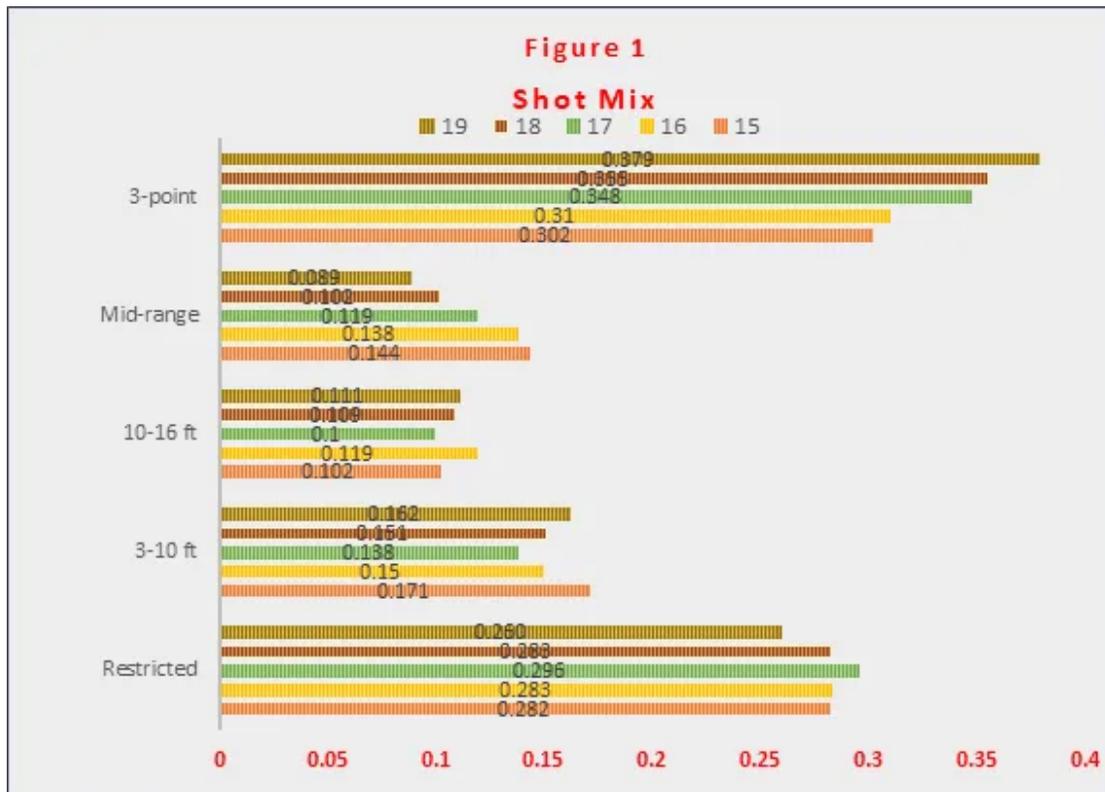
To determine the efficiency of attempted shots we examined the relationship between the eFG% and 2P% as well as the ratio of 3P% to 2P% over the past 2 decades. Our results, Table 3, indicated that while the 3P% has slightly increased, the 2P% appear to have improved at a steeper rate. The eFG% / 2P% measure continues to be larger than one. However, the difference between eFG% and 2P% has been shrinking, i.e., approaching the optimal mix of 2- and 3-point shots.

A big reason NBA teams use the 3-point shot more in their repertoire is increasing shooting accuracy of players. The positive difference between eFG% and 2P% explains the upward trend of 3-point shots in NBA. The 3PAs increased from 30 percent of total attempts (FGA) on average, in 2015 playoff games, to 38 percent in 2019 playoffs as shown in Figure 1. As such, the results show that 3P% as a percentage of 2P% has started to decline after initial increase over the past 20 years, thereby reducing the expected benefit of 3-point shots in games. In fact, if 2P% exceeds eFG%, the expected points from a 3-point shot is less than a 2-point shot.

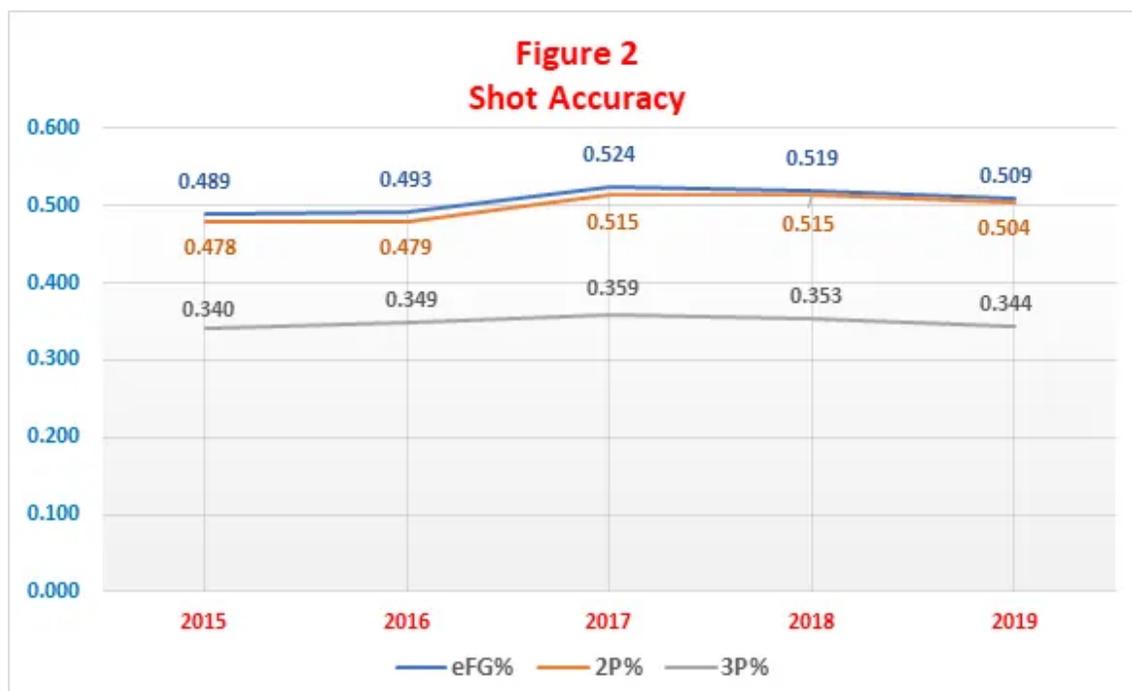
For example, we analyzed the game statistics for 2019-20 regular season (pre COVID-19) for the top 21 players with highest Field Goal Percentages (FG%). For every player in this group, the difference between eFG% and 2P% is either zero, because the player did not attempt any 3-point shot, or negative, i.e., 2P% exceeds eFG%. This means the yield of 2-point shots was higher than that of 3-point shots for each of those players.

We extended our analysis of shot selection and shooting accuracy by examining NBA's five most recent playoff results. Over the recent 5 playoff seasons 410 games was played, i.e., 410 wins and 410 losses. We analyzed 820 games' statistics and scores. Our data indicate that the ratio of 3P% to 2P% in our sample of playoff games remained over  $2/3$  threshold during the five recent playoff seasons. However, the ratio has declined from 71.2% to 68.2%, approaching the point of inflection of 3-point shots efficiency.

Each season, top NBA teams compete in playoff games, and due to the intensely competitive nature of these games. More and more NBA players in elite teams can play multiple positions and are able to switch positions as the game conditions on the court dictates. As players shooting accuracy has improved noticeably over the past two decades, Field Goal Percentage (FG%) has increased for both long distance shots and the shots around the basket. Our playoff data suggest that teams shot selection may be the reason for improved shot accuracy. That is, more shots are taken in the restricted area than any other area on the court except for the shots beyond the 3-point line as shown in Figure 1 below.



The data in Figure 2 show that the *difference* between eFG% and 2P% has declined from 1.1% in 2015 to 0.5% in 2019, on average, approaching zero. This evidence raises the question about shot selection of individual teams and the impact of 3-point shots on the outcome of the playoff games.



We examined the impact of 3-point shooting on the outcome of each playoff game over the five playoffs 2015-19 by computing a hypothetical game score for each team by assuming all 3PA were made inside the 3-point line at 2P% rate. To examine the impact of 3-point shooting on the results of the games, one should consider both the number of attempts and shooting percentage together. Therefore, we computed the impact of 3-point shooting on win/loss, by first measuring the “Impact Points,” i.e. a hypothetical number of points a team would have earned if 2-point shots had been attempted instead of the 3-point shots, as follows:

$$IP = 2 \times (2P\% \times 3PA) - 3 \times 3PM$$

Next, we computed each team’s hypothetical total points, adjusting the actual score by the Impact Points (IP) as computed above. The IP is positive if the ratio of 3P% to 2P% is smaller than 0.67 (or 2/3) in a game, and negative if this ratio is greater than 0.67. We then determined the “as if” result of each game. We compared the hypothetical Win/Loss results with the *actual* outcome of the game. Year-by-year breakdown of these analyses appear in Table 4.

**TABLE 4:** 3-point Impact on the Game Results

Year	NO 3-point Impact Teams				Total %	3-point Impact Teams				Total %	TOTAL Team/ Game
	WIN	%	LOSS	%		WIN	%	LOSS	%		
<b>2015</b>	64	39.5%	69	42.6%	82.1%	17	10.5%	12	7.4%	17.9%	162
<b>2016</b>	65	37.8%	75	43.6%	81.4%	21	12.2%	11	6.4%	18.6%	172
<b>2017</b>	67	42.4%	73	46.2%	88.6%	12	7.6%	6	3.8%	11.4%	158
<b>2018</b>	66	40.2%	71	43.3%	83.5%	16	9.8%	11	6.7%	16.5%	164

<b>2019</b>	63	38.4%	69	42.1%	80.5%	19	11.6%	13	7.9%	19.5%	164
<b>Total</b>	<b>325</b>		<b>357</b>			<b>85</b>		<b>53</b>			<b>820</b>

The “as if” scores indicate that the outcome of the games would have not changed for 325 teams with actual wins, and 357 teams with actual losses because of shot selection, i.e., selection of 2PA versus 3PA. Our results indicated that long distance shots impacted 138 scores of 820 teams (winners and losers) in 410 games. Eighty-five winning teams’ success may be attributable to 3-point shooting which would have lost the game without the long-distance shots. On the other hand, 53 losses would have been wins by shooting 2-point shots instead of 3-pointers.

## CONCLUSION

Some coaches and players disagreed with the rule changes and claimed that post-up and mid-range shot skills will be lost in favor of layups and 3-point shots, resulting in a less physical game (13). During playoff games, most field goal attempts (62 percent) were either 3-point shots or 2-pointers from the restricted area under the basket (Figure 1). According to Larry Bird, “Now, if you’re not firing up thirty 3’s, you’re just not playing basketball” (9). However, in recent years every team relies heavily on the long-distance shooters rather than a dominant center to succeed (4). Jason Kidd said, “There are maybe two handfuls of guys who can post up anymore”. Other coaches also expressed doubts about the rule changes. “The game is getting out of balance,” says George Karl, a coach whose emphasis was on defense and post-up coaching “But until we figure out a way to make the post-up more efficient, we’re not going back”. (13). “You just can’t win throwing the ball into the post 60 times per game.” Kidd says. “Sometimes it feels like we are making the game harder than it should be. The bottom line is this: The closer you get to the basket, the bigger a threat you are.” (13).

Our analyses indicate that the 2-point shooting percentage (2P%), on average, improved more than that for 3-point shots over time, and the number of personal foul calls, free throw attempts and free throws made declined under new rules over time. The findings of this study confirm that the rule changes by the Select Committee have achieved the strategic goals of the league in enhancing flow of the game, significantly increasing scoring, 2-point field goal percentage (2P%), relative and absolute number of 3PA and 2 and 3–point field goal made in most recent games.

## APPLICATIONS IN SPORT

NBA owners and players have financially benefited handsomely by the strategies bringing about larger viewership for the games on television and increased attendance in the arenas. Today’s professional basketball players are expected to use more of their offensive skills (than the strength in their defense) in an increasingly offense-oriented game, as the defense in NBA has been de-emphasized under new rules.



11. Leicht, Anthony S., M. A. Gomez & C. T. Woods (2017). Team Performance Indicators Explain Outcome during Women's Basketball Matches at the Olympic Games", *Sports* (5) 96 *MDPI*.
12. Lorenzo, A.; M.A.Gomez; E, Ortega; S.J. Ibanez & J. Sampaio (2010). Game related statistics which discriminate between winning and losing under-16 male basketball games. *Journal of Sports Sci. Med.*, 9: Pp. 664–668.
13. Lowe, Z. (2015). "Five Minutes With Bulls Coach Fred Hoiberg," (Accessed March 21, 2020) <http://www.horacegrant.com/blog/how-the-game-has-changed/>
14. NBA (2002). "Understanding the Rules Changes," NBA.com, November 21. (Accessed March 21, 2020) [http://archive.nba.com/features/jackson\\_rules\\_response.html](http://archive.nba.com/features/jackson_rules_response.html)
15. Nourayi, M., (2006). Profitability in Professional Sports & Benchmarking: The Case of NBA Franchises. *Benchmarking—An International Journal*, Vol. 13 (3): Pp. 252-271.
16. Nourayi, M. and G. Canarella, (2009). Non-financial Measures, Aggregation and Performance Evaluation, *The Journal of Business Inquiry*, Vol. 8 (1), 2009: Pp. 1-11.
17. Nourayi, M., (2019). Strategically Driven Rule Changes in NBA: Causes and Consequences, *The Sport Journal*, Pp.1-11.
18. Oliver, D., (2004). *Basketball on Paper: Rules and Tools for Performance Analysis*, Washington, DC: Potomac Books.
19. Scaletta, K., (2014). "How the NBA Turned into a Point Guard's League," Bleacher Report, December 4. (Accessed March 20, 2020) <https://bleacherreport.com/articles/2289867-how-the-nba-turned-into-a-point-guards-league>
20. Trninic, S.; D. Dizdar and E. Luksic (2002). Differences between winning and defeated top quality basketball teams in final tournaments of European club championship. *Coll. Antropol.*, 26: Pp. 521–531.
21. Wyche, S., (1999). "New NBA Rules Aim to Put Points on Board," Washington Post, September 25, 1999. (Accessed March 20, 2020) <https://www.washingtonpost.com/archive/sports/1999/09/25/new-nba-rules-aim-to-put-points-on-board/5c6698c6-c34e-4be8-8c02-f5a3953ff08c/>