



The Improvement in NCAA Division 1 Basketball Free Throw Accuracy Since 1987, and the Counter-Productive Increased Reliance on Three-Point Shots

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Abstract

We examine two diametrically opposite levels of action on a basketball court to address incorrect concepts about both. When a free throw is taken, all action stops. The fouled player steps unopposed to the free throw line to shoot at the open basket. Individual players may have flaws in their techniques, therefore consistent overall improvement across many games for many players may be perceived as unlikely. A plot of yearly free throw shooting accuracy from 1987 through 2022 tells a different story. At the opposite end of the basketball activity spectrum is the three-point shot. Since 1987, when the top division of US college basketball created the opportunity to score three points for shots taken outside of an arc, we see much effort being taken to shoot an increasing number of three-point shots, given the obvious advantage of scoring three points instead of two. However, we will show that consistent increases in the fraction of three-point shots has been counterproductive, in that the increased reliance on three-point shots has been consistent with reduced team score. Instead, since the two-point shot and three-point shot earn the same 1 point per shot on average, both shots should be considered of equal importance, unless a team has especially good three-point shooters or it is late in the game and a team must catch up.

Keywords: basketball, free throws, three-point shots, tactics, skilful shooting, invasion sport, sports analytics

1 Introduction

There have been well-known cases in the past when sports technologists made dramatic improvements. Some examples include the Fosbury Flop technique that raised high jump clearance, the fibre glass pole that increased pole vault clearance by allowing a faster run-up, hinged clap skates that improved speed skating velocities and a rowing machine for out of water and bad weather training that led to velocity records in that sport (Stefani, 2017 and 2022). At first glance, free throw shooting seems to have little benefit from three of the four basic building blocks of sport: physiology (driven by nutrition and training), technology, and equipment, leaving the fourth building block, coaching (Stefani, 2017 and 2022) as the most likely source of change. For example, it has been frequently demonstrated that working with individual free-throw shooters under variable practice conditions provides greater improvement for an individual than practicing with the same routine each time (Shoenfelt et al., 2022), but can improvement be more widespread than for a subset of all NCAA basketball athletes? Let us look carefully at free throw accuracy over several years to see if that measure of accuracy has been improved.

As we watch top-flight basketball being played around the world, we see a concerted effort to pass the ball around the three-point arc in search of what seems to be the proverbial gold at the end of the rainbow: the three-point shot. There are situations where a team should give the three-point shot significant consideration; for example, when a team has excellent three-point shooters or when a team is behind late in a game. On the other hand, does a typical team benefit from focusing strongly on that three-point shot? To objectively examine trade-offs regarding the relative use of two-point shots and three-point shots, a meaningful database is needed.

2 NCAA Data Base

There is an excellent book of yearly average basketball statistics compiled by the US college sport governing agency, the NCAA, for Division 1, the top US level of competition, covering the 1948 through 2022 seasons (NCAA, 2022). Each yearly data set shows the number of teams, as well as average overall statistics for games played, points scored, field goals attempted, two-point shots attempted and made, three-point shots attempted and made, and free-throws attempted and made.

Since we will examine three-point shooting that began with the 1987 season, free throw shooting accuracy will be examined beginning with the same 1987 season.

3 Free-Throw Shooting

Free throw shooting accuracy from 1987 through 2022 is plotted in Figure 1. Free throw accuracy dropped consistently from 69.1% in 1987, the year that the three-point shot began, to 67.1% in 1994, coincident with the increased use of the three-point shot in competition. After that 1994 low of 67.1%, accuracy rose steadily through 2022 when it reached 71.6%, with nearly 5000 games being used to obtain each yearly average per team per game.

The consistency of the increases from 1994 through 2022 indicates the steady hand of coaching and perhaps improvements in physiology which could have created a somewhat more fit basketball player who would be just a bit steadier and more relaxed at the line. The continued improvement in free-throw accuracy is exemplified by the fact that accuracy exceeded 70% for each of the last six seasons, whereas accuracy had never exceeded 70% previously.

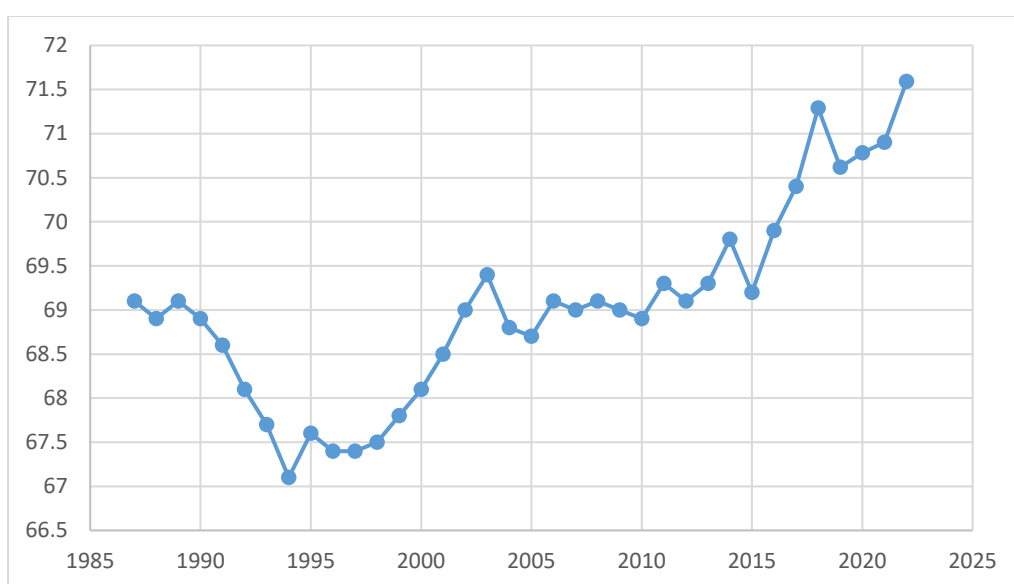


Figure 1: Seasonal average team free throw accuracy from 1987 through 2022, taken from the 2022-23 Division 1 Men's Basketball Records published by the National Collegiate Athletic Association, USA

4 Three-Point Shooting

The NCAA table of statistics (NCAA, 2022) reveals that shooting accuracy was remarkably constant for the 36 seasons including 1987 through 2022. The seasonal points per shot for two-point attempts only varied from 0.95 to 1.01, with a mean of 0.97 and a standard deviation of 0.02. For three-point shots, points per shot only varied from 1.00 to 1.10 with a mean of 1.05 and a standard deviation of 0.03. That is, the two-point shot and the three-point shot were never more than 0.1 points per shot removed from 1 point per shot. The three-point shot was simply one of two equal shooting options, and not necessarily a preferred option, unless a team has particularly adept three-point shooters or needs that shot to win late in a game.

To understand what occurred in conjunction with the increased use of three-point shots, relevant scoring statistics were plotted. A team score consists of scoring from field goals and scoring from free throws. The number of free throws attempted is a measure of a team's physical contact, more of which induces fouls and therefore free throw attempts, while fewer free throws imply less contact. Three-point shot activity can be expressed as the fraction of shots that were taken for three points. Accordingly, Figure 2 displays four curves created from the 36 seasons in the NCAA data tables (NCAA, 2022). From top to bottom, we have plots of seasonal averages for total points per game per team, field goal attempts (shots), the percent of shots that were for three points, and the number of free throw attempts.

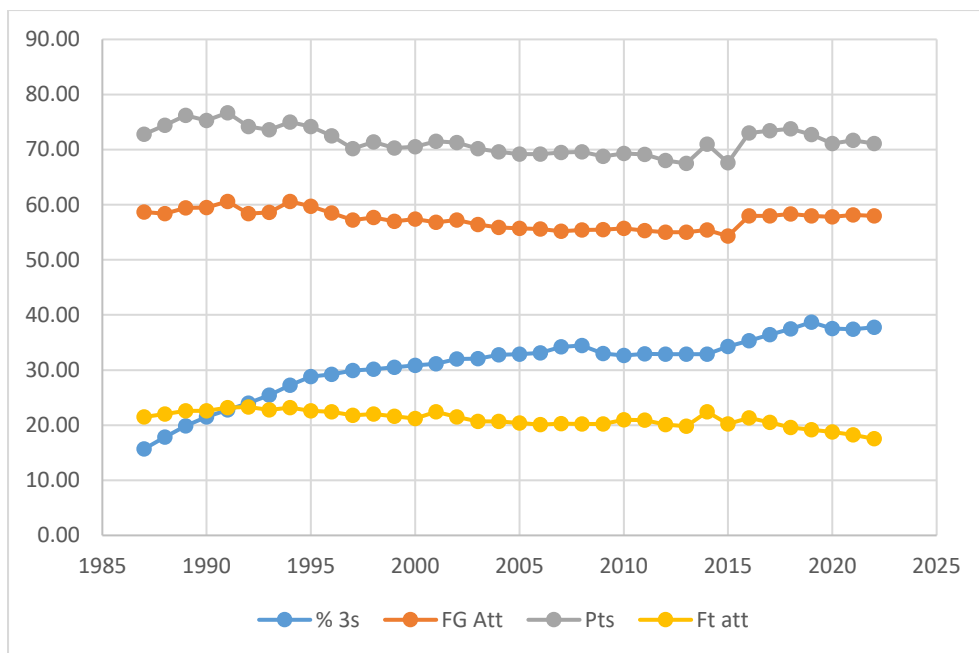


Figure 2: Seasonal average team points per game (top) followed below successively by field goal attempts (shots), percentage of three-point shots, and free throws attempted from 1987 through 2022, taken from the 2022-23 Division 1 Men's Basketball Records, published by the National Collegiate Athletic Association, USA.

In 1986, the season before the three-point shot was introduced, 69.4 points were scored per team per game. For the first five seasons (1987 through 1991) with the three-point shot as a new option to use, the three-point shot rose to 23% of shots taken, free throws increased slightly, total shots increased, and total points increased to 76.7, 7.3 more points than for the year before the three-point shot.

From 1991 through 2015, the percent of three-point shots steadily increased from 23% of shots taken to 34%, while free throws, the number of shots taken, and total score all declined. The total score in 2015 was 67.6, 1.8 points per game less than the year before the three-point shot was introduced and 9.1 points per game less than in 1991 when 23% of the shots were for three points. From 1991 through 2015, the same shot clock restriction was used with each possession, requiring a shot to be taken before that clock expired. Therefore, taking fewer shots as the fraction of three-point shots increased is consistent with a team taking more time per shot. Also, attempting fewer two-point shots reduces the amount of physical contact, which results in fewer free throws, yet another source of point loss as seen in Figure 2.

The shot clock was reduced from 35 seconds to 30 seconds for the 2016 season. Teams had to shoot more quickly, causing total shots and total points at 1 point per shot to move upward in 2016. From 2016 to 2022, under the shorter shot clock, the percent of three-point shots increased by 2% and then decreased by 1%, ending at 38% of shots taken in 2022. Shots taken therefore remained nearly constant, but total points, although continuing to gain one point per shot, decreased due to fewer free throws, which is consistent with less body contact due to the increase in three-point shots.

In 2022, after 36 years with three-point shots, the percentage of three-point shots rose to 38% and 71.09 points were scored per team per game, only 1.69 more points than for the year before the three-point shot was allowed in 1987 and 5.61 points per game less than when 23% of the shots were for three points in 1991. For each season of that 36-year period of the increasing (yet counterproductive) use of three-point shots, two-point shots and three-point shots each earned within 0.1 points per shot of 1 point per shot.

5 Conclusions

Free throw accuracy steadily improved from 2015 through 2022, exceeding 70% for the last six of those seasons, whereas accuracy had never exceeded 70% previously. Coaches have most likely played a major role in that improvement and their success encourages continuing their methodologies.

From 36 years of data, we learned that after the first six years of using the three-point shot, 23% of the shots were for three points and scoring went up by seven points per game; however, with increased emphasis on the three-point shot, by 2022, most of that gain had disappeared when 38% of the shots were for three points. For those years with the same shot-clock in place, taking fewer shots is consistent with taking more time per shot, and consistent with more selection time being needed to take more three-point shots. The one year when the shot clock time was reduced, shots and points moved upward. Another lesson was that the average two-point shooter and three-point shooter earned within 0.1 points per shot of the same average of 1 point per shot for each of the 36 seasons examined. Since the two-point shot and three-point shot are equally profitable in points per shot, if a team adopts a strategy of taking any good shot, whether for two points or three, selection time for a particular option is eliminated, less time is likely to be taken per shot, shots are likely to increase and, with about one point per shot, score is likely to increase. If more contact occurs due to more penetration for two-point shots, free throws attempted and made could also increase.

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