
NBA 3-point Shooting Percentage by Conference, Playoff Status, and Playoffs by Conference

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MAT 324-01

Monday, December 9, 2019

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Contents

1. Introduction

In this era of basketball in the National Basketball Association, (NBA) the three-point jump shot is at the center of competition. With players such as Stephen Curry and Klay Thompson, winning and losing seemingly hinges upon a team's ability to make these three-point shots. In the NBA, there are two conferences, known as the Eastern and Western Conference, each with 15 teams. At the end of the regular season the playoffs start and the eight teams with the best regular season records from each conference battle each other in a series of a maximum 7 games (first to 4 wins) in their respective conferences to represent their conference in the NBA Finals. The winner of the NBA finals is crowned NBA Champion. My goal in this project is to understand the differences in three-point shooting during the 2018-2019 regular season in three phases: By conference (eastern vs. western), playoff status (teams that would go on to make the playoffs that year vs non-playoff), and playoff teams by Conference. The order of the teams was followed by the website used to collect the data and is used for the entire project. **The order is as follows:** Golden State Warriors, San Antonio Spurs, Milwaukee Bucks, Indiana Pacers, Toronto Raptors, New Orleans Pelicans, Philadelphia 76ers, Los Angeles Clippers, Los Angeles Lakers, Washington Wizards, Utah Jazz, Portland Trailblazers, Denver Nuggets, Boston Celtics, Sacramento Kings, Phoenix Suns, Minnesota Timberwolves, Orlando Magic, Oklahoma City Thunder, Chicago Bulls, Atlanta Hawks, Miami Heat, Memphis Grizzlies, Brooklyn Nets, Houston Rockets, Charlotte Hornets, Dallas Mavericks, Cleveland Cavaliers, Detroit Pistons, New York Knicks. **The order of the Eastern Conference is as follows**: Milwaukee Bucks, Indiana Pacers, Toronto Raptors, Philadelphia 76ers, Washington Wizards, Boston Celtics, Orlando Magic, Chicago Bulls, Atlanta Hawks, Miami Heat, Brooklyn Nets, Charlotte Hornets, Cleveland Cavaliers, Detroit Pistons, New York Knicks. **The order of the Western Conference is as follows**: Golden State Warriors, San Antonio Spurs, New Orleans Pelicans, Los Angeles Clippers, Los Angeles Lakers, Utah Jazz, Portland Trailblazers, Denver Nuggets, Sacramento Kings, Phoenix Suns, Minnesota Timberwolves, Oklahoma City Thunder, Memphis Grizzlies, Houston Rockets, Dallas Mavericks. **The order of Playoff Teams is as follows:** Golden State Warriors, San Antonio Spurs, Milwaukee Bucks, Indiana Pacers, Toronto Raptors, Philadelphia 76ers, Los Angeles Clippers, Utah Jazz, Portland Trailblazers, Denver Nuggets, Boston Celtics, Orlando Magic, Oklahoma City Thunder, Brooklyn Nets, Houston Rockets, Detroit Pistons. **The order of non-playoff teams is as follows:** New Orleans Pelicans, Los Angeles Lakers, Washington Wizards, Sacramento Kings, Phoenix Suns, Minnesota Timberwolves, Chicago Bulls, Atlanta Hawks, Miami Heat, Memphis Grizzlies, Charlotte Hornets, Dallas Mavericks, Cleveland Cavaliers, New York Knicks. **The order of Eastern Conference Playoff Teams is as follows:** Milwaukee Bucks, Indiana Pacers, Toronto Raptors, Philadelphia 76ers, Boston Celtics, Orlando Magic, Brooklyn Nets, Detroit Pistons. **The order of Western Conference Playoff**

Teams is as follows: Golden State Warriors, San Antonio Spurs, Los Angeles Clippers, Utah Jazz, Portland Trailblazers, Denver Nuggets, Oklahoma City Thunder, Houston Rockets.

2. Hypothesis

Phase 1: Three-point shooting percentage by conference

Null Hypothesis: There is no difference in mean three-point shooting percentage between the eastern and western conferences.

Alternative Hypothesis: There is a difference in mean three-point shooting percentage between the eastern and western conferences.

My Hypothesis: There is no difference in mean three-point shooting percentage between the eastern and western conferences.

Phase 2: Three-point shooting percentage by playoff status

Null Hypothesis: There is no difference in mean three-point shooting percentage between playoff and non-playoff teams.

Alternative Hypothesis: The mean three-point shooting percentage of playoff teams is greater than that of non-playoff teams.

My Hypothesis: The mean three-point shooting percentage of playoff teams is greater than that of non-playoff teams.

Phase 3: Three-point shooting percentage of playoff teams by conference

Null Hypothesis: There is no difference in mean three-point shooting percentage of playoff teams between the eastern and western conferences.

Alternative Hypothesis: There is a difference in mean three-point shooting percentage of playoff teams between the eastern and western conferences.

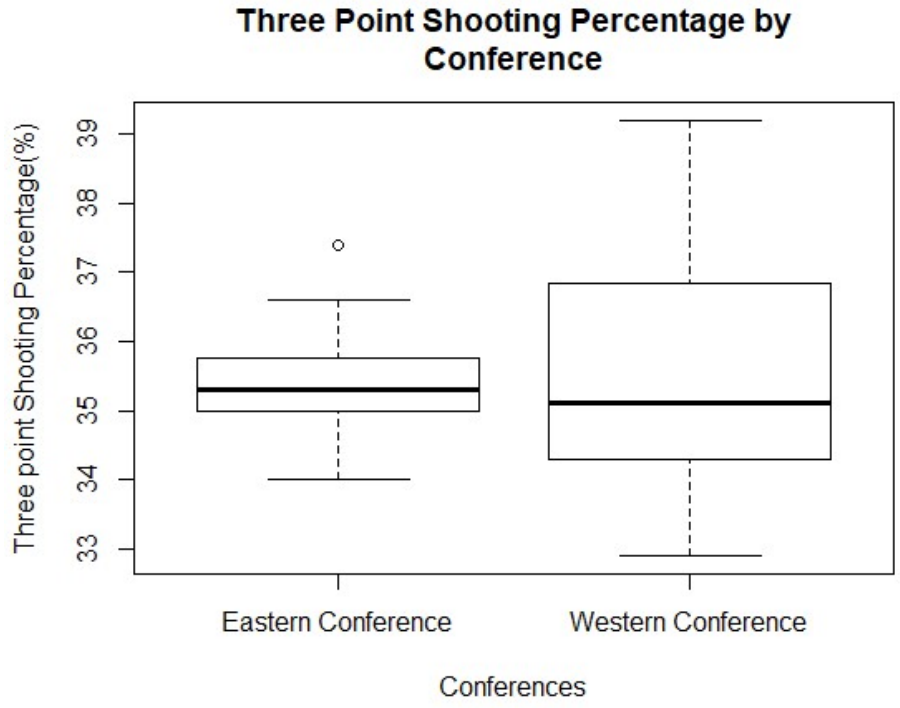
My Hypothesis: There is no difference in mean three-point shooting percentage of playoff teams between the eastern and western conferences.

3. Data Gathering and Output

I started by copying the list of all 32 teams from the website that I used into a vector named "teams". I then created a vector named "threept" to hold the three-point shooting percentages of those same teams. I then calculated the mean three-point shooting percentage, which turned out to be 35.55%. Next, I made the vector of the three-point shooting percentage(3p%) of Eastern Conference teams and then Western Conference teams. I tested the normality of both and concluded that both were normally distributed because the p-value of the Eastern Conference vector is .5191 and the p-value of the Western Conference vector is .1481. Both are greater than the standard alpha (.05) that we use to test against our calculated p-value, so we fail to reject the null hypothesis that the data is normally distributed. I then combined the Eastern Conference and Western Conference vectors into a single vector, named "byconference." I then created a vector called conference that has 15 letters a's and 15 letter b's to match the "byconference" vector. I then created a boxplot that showed the 3p% of each conference. I then performed a t test to see if whether or not the mean 3p% of the two conferences are the same. Because the p-value that I calculated turned out to be .6518, I fail to reject the null hypothesis that the mean 3p% of the 2 conferences are the same. There is no difference. I then performed essentially the same process for the mean 3p% of playoff teams vs non-playoff teams. However, there were a few differences. There are 16 playoff teams (8 from each conference) which leaves 14 total playoff teams. Also, when I performed a shapiro-wich test, the distribution of 3p% of playoff teams was not normal. This was because the p-value that I calculated (.0152) is less than .05, so we reject the null hypothesis that the data is normally distributed. Although the distribution of the 3p% of non-playoff teams turns out to be normal, (.0894 is greater than .05) this doesn't matter because the distribution of the 3p% of playoff teams isn't normal. So, I performed a wilcox test and my guess was that the 3p% of playoff teams would be better than non-playoff teams because they are better. Lastly, this process was repeated for Eastern Conference teams vs western conference teams that made the playoffs. While the distribution of Eastern Conference playoff teams was normal, (.8708 is greater than .05) the distribution of Western Conference playoff teams is not. (0477 is smaller than .05) Because of this, I had to use the wilcox test once again. The result was that we fail to reject the null hypothesis that the man 3p% of Eastern and Western Conference playoff teams is the same.

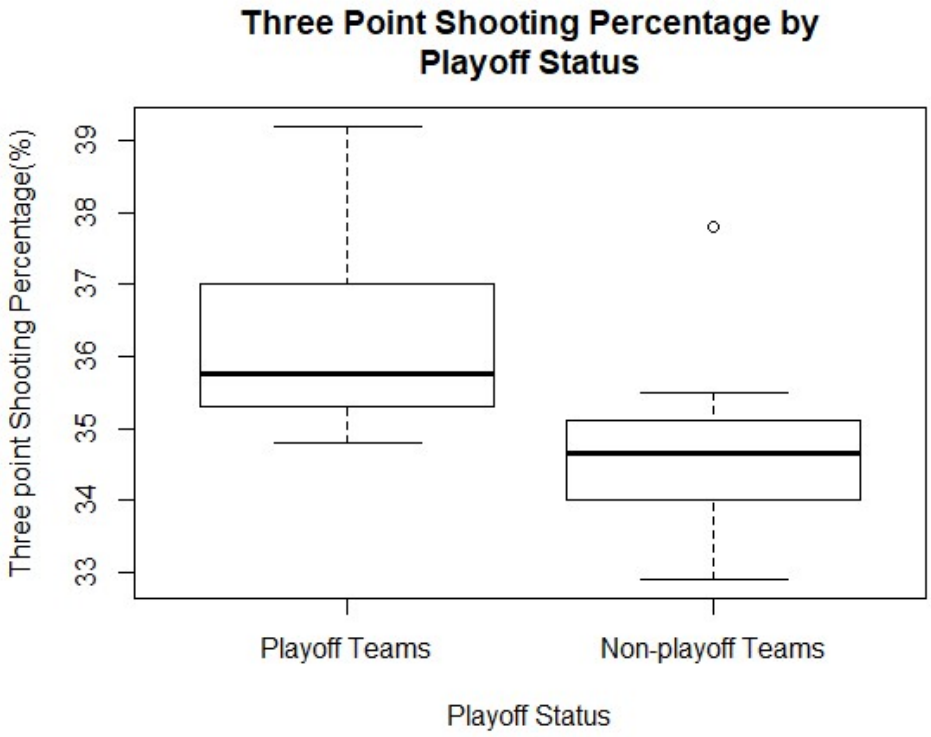
Output:

```
> teams=c("gsw,sas,mil,ind,tor,nop,phi,lac,lal,was,uta,por,den,bos,sac
,
+        phx,min,orl,okc,chi,atl,mia,mem,bkn,hou,cha,dal,cle,det,nyk")
> threept=c(38.5,39.2,35.3,37.4,36.6,34.4,35.9,38.8,33.3,34.1,35.6,35.
9,
+           35.1,36.5,37.8,32.9,35.1,35.6,34.8,35.1,35.2,34.9,34.2,35.
3,
+           35.6,35.1,34.0,35.5,34.8,34.0)
> mean(threept)
[1] 35.55
> #east vs west 3 point %
> easternconference=c(35.3,37.4,36.6,35.9,34.1,36.5,35.6,35.1,35.2,34.
9,
+                     35.3,35.1,35.5,34.8,34.0)
> westernconference=c(38.5,39.2,34.4,38.8,33.3,35.6,35.9,35.1,37.8,32.
9,
+                     35.1,34.8,34.2,35.6,34.0)
> shapiro.test(easternconference)#normally distributed bc .5191>.05

        Shapiro-Wilk normality test

data:  easternconference
W = 0.94966, p-value = 0.5191

> shapiro.test(westernconference)#normally distributed bc .1481>.05

        Shapiro-Wilk normality test

data:  westernconference
W = 0.91254, p-value = 0.1481

> #both datasets are normally distributed so we will use a t-test
> byconference=c(easternconference,westernconference)
> conference=factor(rep(letters[1:2], each = 15))
> boxplot(byconference~conference,xlab="Conferences",
+ ylab="Three point Shooting Percentage(%)",names=c("Eastern Conferenc
e",
+ "Western Conference"),main="Three Point Shooting Percentage by
+ Conference")
```



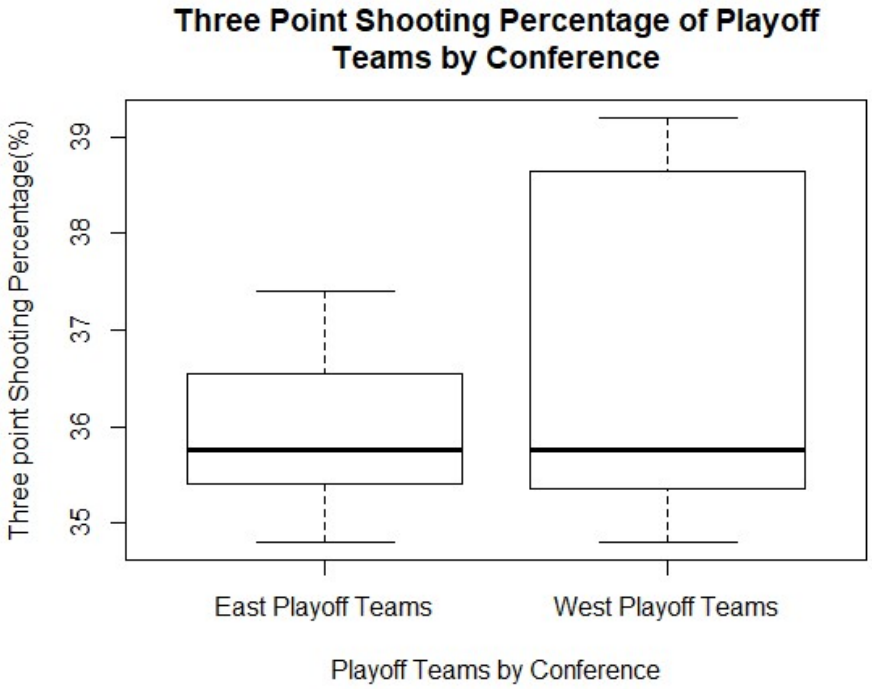

```
> t.test(byconference~conference)#.6518>.05 fail to reject null

        Welch Two Sample t-test

data:  byconference by conference
t = -0.45837, df = 19.481, p-value = 0.6518
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -1.4452479  0.9252479
sample estimates:
mean in group a mean in group b
          35.42           35.68

> #hypothesis so the means of both datsets are not significantly diffe
rent
> #playoff teams vs non-playoff teams 3 point %
> playoff=c(38.5,39.2,35.3,37.4,36.6,35.9,38.8,35.6,35.9,35.1,36.5,35.
6,
+           34.8,35.3,35.6,34.8)
> nonplayoff=c(34.4,33.3,34.1,37.8,32.9,35.1,35.2,34.9,34.2,35.1,35.1,
+              34.0,35.5,34.0)
> shapiro.test(playoff)#not normally distributed bc .0152<.05

        Shapiro-Wilk normality test

data:  playoff
W = 0.85321, p-value = 0.0152

> shapiro.test(nonplayoff)#normally distributed bc .0894>.05

        Shapiro-Wilk normality test

data:  nonplayoff
W = 0.89303, p-value = 0.0894
```

```
> byplayoff=c(playoff,nonplayoff)
> #16 playoff teams and 14 non playoff teams
> playoffs=c("a","a","a","a","a","a","a","a","a","a","a","a","a","a","a",
+            "a","a")
> nonplayoffs=c("b","b","b","b","b","b","b","b","b","b","b","b","b","b",
+               "b")
> allofnba=c(playoffs,nonplayoffs)
> boxplot(byplayoff~allofnba,xlab="Playoff Status",ylab=
+ "Three point Shooting Percentage(%)",names=c("Playoff Teams",
+ "Non-playoff Teams"),main="Three Point Shooting Percentage by
+ Playoff Status")
```




```
> wilcox.test(byplayoff~allofnba,alternative="greater")#.0003705<.05

        Wilcoxon rank sum test with continuity correction

data:  byplayoff by allofnba
W = 193.5, p-value = 0.0003705
alternative hypothesis: true location shift is greater than 0

Warning message:
In wilcox.test.default(x = c(38.5, 39.2, 35.3, 37.4, 36.6, 35.9,  :
  cannot compute exact p-value with ties
> #so reject null hypothesis, which means playoff teams have a higher
> #3pt%
> #east vs west playoff teams
> eastplayoff=c(35.3,37.4,36.6,35.9,36.5,35.6,35.5,34.8)
> westplayoff=c(38.5,39.2,38.8,35.6,35.9,35.1,34.8,35.6)
> shapiro.test(eastplayoff)#normally distributed bc .8708>.05

        Shapiro-Wilk normality test

data:  eastplayoff
W = 0.96668, p-value = 0.8708
```

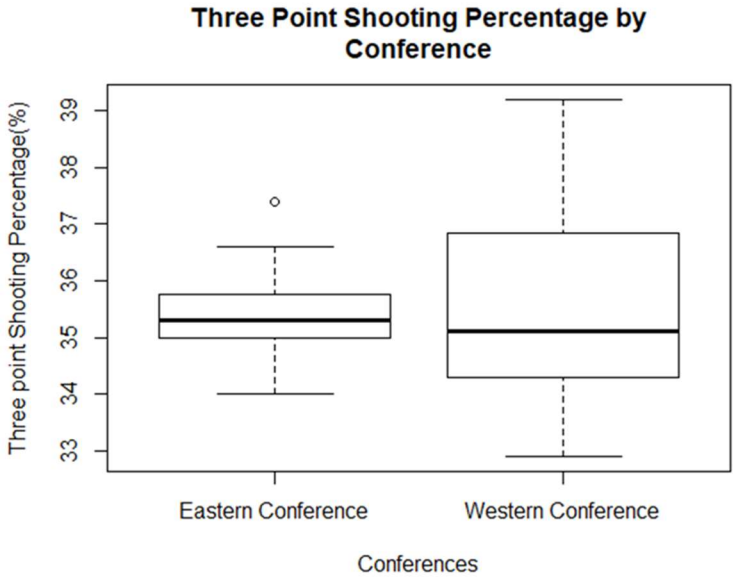
```
> shapiro.test(westplayoff)#not normally distributed bc .0477<.05

        Shapiro-Wilk normality test

data:  westplayoff
W = 0.82091, p-value = 0.0477

> eastwest=c(eastplayoff,westplayoff)
> westeast=factor(rep(letters[1:2], each = 8))
> boxplot(eastwest~westeast,xlab="Playoff Teams by Conference",
+ ylab="Three point Shooting Percentage(%)",names=c("East Playoff Team
s",
+ "West Playoff Teams"),main="Three Point Shooting Percentage of Playo
ff
+ Teams by Conference")
```




```
> wilcox.test(eastwest~westeast)#.635>.05 so fail to reject null

        Wilcoxon rank sum test with continuity correction

data:  eastwest by westeast
W = 27, p-value = 0.635
alternative hypothesis: true location shift is not equal to 0

Warning message:
In wilcox.test.default(x = c(35.3, 37.4, 36.6, 35.9, 36.5, 35.6,  :
  cannot compute exact p-value with ties
> #hypothesis, so the 3pt% of east and west playoff teams are not
> #significantly different

>
```

4. Data Analysis

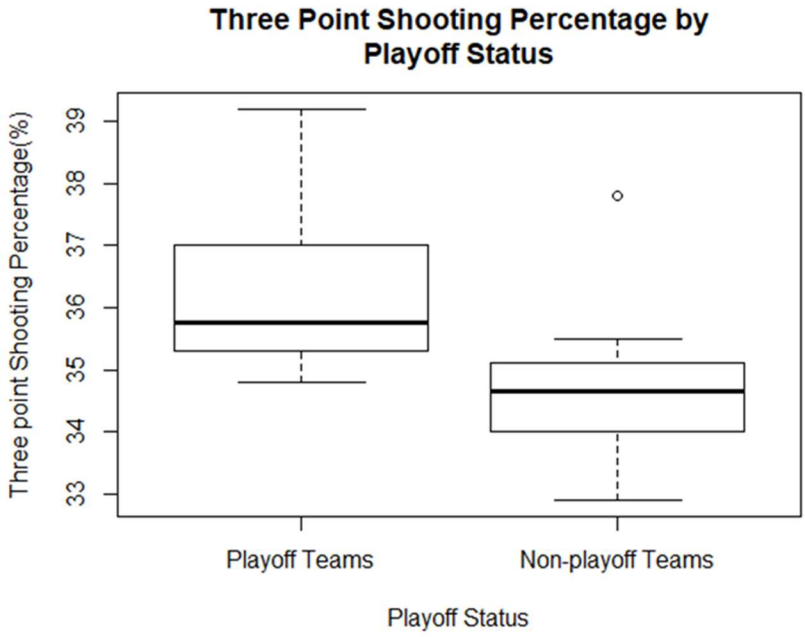
The shapiro-wich test told us that the distribution of Eastern Conference teams is normal because the p-value (.5191) is greater than .05. The distribution of Western Conference teams is also normal because the p-value that we calculated (.1481) is greater than .05. Because the distributions of both datasets are normally distributed, we use a t test to see if the mean 3p% of Eastern and Western Conference teams is significantly different. Our t test tells us that the p-value is .6518. Because this value is much greater than .05, we fail to reject the null hypothesis that the mean 3p% of Eastern and Western Conference teams is the same. So, we can conclude that the mean 3p% of Eastern and Western Conference teams is the same, which is was also my personal hypothesis.



Our boxplot supports this conclusion. Although the range of the 3p% of Western Conference teams is much greater than that of Eastern Conference, the means are very close.

The shapiro-wich test told us that the distribution of playoff teams is not normal because the p-value that we calculated (.0152) is less than .05. On the other hand, the distribution of non-playoff teams Is normal. Because one of these distributions isn't normal, I decided to use a wilcox test to determine if the playoff and non-playoff datasets are the same(the wilcox test tests median instead of mean) My personal hypothesis was that playoff teams generally have a higher 3pt% because they are better teams overall. I was proven right because the p-value was .0003705, which is incredibly small. This means we reject the null hypothesis that the median 3p% of playoff teams is the same as non-playoff teams, which is

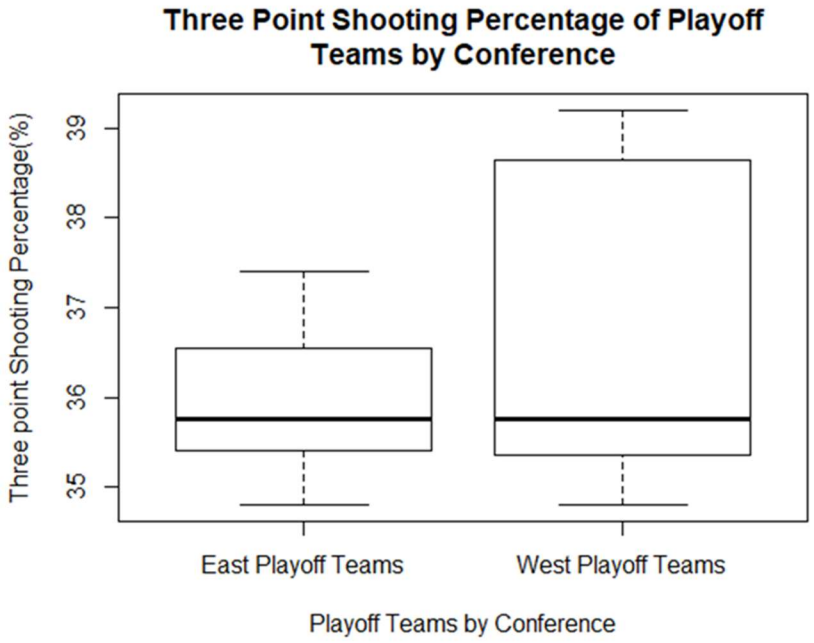
a good representation of the mean in this case.



The boxplot supports this conclusion because the distribution of playoff teams is much greater than that off non-playoff teams, with the first quartile of playoff teams being greater than the third quartile of non-playoff teams.

The shapiro-wich test tells us that the distribution of Eastern Conference Playoff teams is normal. This is because the p-value that we calculated is .8708, which is greater than .05. The distribution of Western Conference teams is not normal because .0477 is less than .05. Although this is very close to .05, I still decided to reject the null hypothesis that the distribution is normal because I wanted to be as professional as possible. Because of this, I used a wilcox test once again so that I could test the median, which is a good representation of the mean in this case. The results of the wilcox test was that (just like I hypothesized) the median 3p% of Eastern and Western Conference playoff teams is similar. This is the case because .635 is greater than .05, so we fail to reject the null hypothesis that the median

3p% of Eastern and Western Conference playoff teams is similar.



The boxplot supports this claim because although the range of the Western Conference playoff teams is greater than that if eastern Conference playoff teams, the medians are the exact same.

5. Summary

In this project, my goal was to understand the differences in three-point shooting during the 2018-2019 regular season in three phases: By conference (eastern vs. western), playoff status (teams that would go on to make the playoffs that year vs non-playoff), and playoff teams by Conference. Being an NBA fan, I did have an idea of what the results would be. As it turned out, my predictions were correct. While there was a similarity in the three-point shooting between the Eastern Conference and Western Conference teams as well as the three-point shooting between the Eastern Conference and Western Conference Playoff teams, there was a significant discrepancy in the three-point shooting between Playoff teams and non-playoff teams, just as I expected.

6. Citation

2018-19 NBA Team Shooting Stats. (n.d.). Retrieved November 27, 2019, from https://www.foxsports.com/nba/team-stats?season=2018&category=SHOOTING&group=1&time=0&pos=0&team=1&opp=0&page=1.