Background Information:

Many fans and sports analysts debate on how different aspects and decisions can affect an NBA player's scoring efficiency and address if some common assertions are true. A common argument in the NBA is that certain players do not try as hard in the regular season and save their best performances for the playoffs, also known as the post season. If this were true, then players would average more points in the post season than in the regular season. This gives way to a secondary issue known as load management. Load management is when an NBA player intentionally plays less minutes than normal or sits out for a game entirely in order to prepare for more important games in the future. While it may seem obvious that if a player plays longer, they will score more points, this is not always the case. This is because it is not guaranteed that if a player plays more minutes, they will score more points. It is common for even the best players to score a low number of points despite playing almost an entire game. The opposite is also true, it is possible for an NBA player to score a lot of points early and stay out the rest of the game when victory is almost certain. This forms the basis for load management as players do not want unnecessary injury risks by playing longer. The final assertion is that some players do better because of the position they play. While it is true that some positions have more opportunities to score, there are efficient players at every position. This study will address whether these assertions carry any weight. In this section, two population mean t-testing, chi-square testing, and ANOVA testing will be performed with an assumed significance level of 5% for all tests.

1. T-Test with Unequal Variances:

T-tests are conducted to compare the means of two groups for a continuous variable. In the context of NBA statistics, it is applied to test for a significant difference between the average points scored by players in the regular season compared to the average points scored in the post season.

H0: $\mu_{regular} = \mu_{post}$

HA: $\mu_{regular} \neq \mu_{post}$

Assumption:

This t-test is assumed to have unequal variances due to the difference in sample size.

Decision Ruling:

P-value decision where the if found to be below the alpha will reject the null hypothesis in favor of the alternative hypothesis. If the P-value is greater than the alpha, it will fail to reject the null hypothesis.

Testing and Results:

Regular vs Post Season Scoring	Regular Season	Post Season
Mean	10.39979564	10.34552239
Variance	38.39842585	57.70279547
Observations	2936	1340
Hypothesized Mean Difference	0	
Df	2184	
t Stat	0.229059652	
P(T<=t) one-tail	0.409422	
t Critical one-tail	1.645551621	
P(T<=t) two-tail	0.818844	
t Critical two-tail	1.961050781	

Analysis and Conclusion:

With a P-value of 0.409422, we are unable to reject the null hypothesis since it is above the alpha of 0.05. This means that we cannot conclude that the average points scored by NBA in the regular season differs from the average points scored by NBA players in the post season. As a result, this study can expel the notion that NBA players do not try as hard in the regular season as they do in the post season. If this were true, then there would be a significant difference in the average points scored between the two types of season, which this study shows is not true.

2. Chi-Square Testing:

Chi-square tests are conducted to detect if there is a difference in the expected population proportions based on a categorical variable. In the context of this study of NBA player statistics, it will be employed to test if there is a significant difference in average points scored by NBA players based on their position. The position a player plays will be the categorical variable and there are five positions on an NBA team. Since this test will detect if there are any significant differences in scoring, the proportion of points scored by position should be equal with each comprising of one-fifth or 20% of the total points scored.

Categorical Variable: NBA Player Positions with Abbreviations

Center (C)

Small Forward (SF)

Power Forward (PF)

Shooting Guard (SG)

Point Guard (PG)

H0: $p_C = p_{SF} = p_{PF} = p_{SG} = p_{PG} = 0.2$

HA: At least one population proportion is not equal to the rest.

Assumption:

Categorical variables are mutually exclusive.

Decision Ruling:

P-value decision where the if found to be below the alpha will reject the null hypothesis in favor of the alternative hypothesis. If the P-value is greater than the alpha, it will fail to reject the null hypothesis.

Testing and Results:

Position	Expected %	Expected Points	Observed %	Observed Points	Chi-Square
Center	20%	8879	16%	6994	400.15
Small Forward	20%	8879	22%	9691	74.14
Power Forward	20%	8879	21%	9196	11.27
Shooting Guard	20%	8879	21%	9328	22.66
Point Guard	20%	8879	21%	9188	10.74
Total	1	44397	1	44397	518.95
P-Value	0.000				

Analysis and Conclusion:

The chi-square test shows a p-value close to 0, which means the null hypothesis is rejected. This means that the average scoring proportion for each position is statistically significant. As a result, it can be concluded that different positions on an NBA team can lead to a player scoring more points. It does not mean that one position is more valuable than the rest as all five positions are important to how the team functions. What this does mean is that certain positions have better scoring efficiency. Every position except for center shows an observed percentage of scoring above the expected values. This makes sense since centers are typically the least athletic and are normally play more defensively, which reduces the opportunity to score.

3. Single Factor ANOVA Testing:

ANOVA is short for analysis of variance and can perform the same analysis as a t-test. The major difference is that a t-test is limited to two population means while ANOVA testing can work with more than two population means. An NBA game is 48 minutes long and each quarter of the game is 12 minutes, and it is unlikely for an NBA player to play the entire game. However, the longer they are not on the court, the less opportunities they get to score points. An issue in the NBA is load management, which is when players will intentionally play less minutes to avoid possible injuries for more important games. To perform an ANOVA test, the scoring data for players will be grouped by their average playing time in quarters to see the effect of load management on NBA players’ average points.

Population Groups: Playing Time Ranges with Abbreviations

0 to 1 Quarters worth of time (Q1) = 0 to 12 minutes

1 to 2 Quarters worth of time (Q2) = 12 to 24 minutes

2 to 3 Quarters worth of time (Q3) = 24 to 36 minutes

3 to 4 Quarters worth of time (Q4) = 36 to 48 minutes

Assumptions:

Normal Distribution of Data

Equal Variances between Populations

Independence of Samples

H0: $\mu_{Q1} = \mu_{Q2} = \mu_{Q3} = \mu_{Q4}$

HA: At least one population mean does not equal the rest.

Decision Ruling:

P-value decision where the if found to be below the alpha will reject the null hypothesis in favor of the alternative hypothesis. If the P-value is greater than the alpha, it will fail to reject the null hypothesis.

Testing and Results:

Groups	Count	Sum	Average	Variance
Q1	708	1703.2	2.406	2.122
Q2	1262	8163	6.468	5.078
Q3	1672	21594	12.915	16.250
Q4	634	12936.6	20.405	25.462

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	138791.438	3	46263.813	3862.046	0.0000	2.607
Within Groups	51174.696	4272	11.9790954			
Total	189966.133	4275				

Analysis and Conclusion:

The ANOVA test shows a small p-value close to 0, which means the null hypothesis is rejected. This means that there is a statistically significant difference between the playing time of NBA players and their scoring efficiency. What this ANOVA test shows is that load management does affect an NBA player's scoring efficiency. It should be noted that mid-game injuries can affect the data since a player is unable to play if they are injured. This is especially impactful if a player receives a season-ending injury. However, the sample size if large enough to account for this.