# MAT 243 Project Two Summary Report

Armon Wilson

Armon.wilson@snhu.edu

Southern New Hampshire University

## Introduction: Problem Statement

This project uses historical NBA team performance data to check different statements about team performance. It looks at two teams: the Chicago Bulls from 1996 to 1998 and the Knicks from 2013 to 2015. The data includes scores, skill levels, and game details. By using statistical tests like t-tests and z-tests, this project aims to confirm or dismiss claims about average skills, points scored, and how teams compare during different periods. The goal is to provide evidence to help make decisions about improving team strategies.

## Introduction: Your Team and the Assigned Team

Table 1. Information on the Teams

|  | **Name of Team** | **Years Picked** |
| --- | --- | --- |
| 1. Yours | Knicks | 2013 - 2015 |
| 2. Assigned | Bulls | 1996- 1998 |

## Hypothesis Test for the Population Mean (I)

Hypothesis testing evaluates claims about a population parameter, such as a mean, based on sample data. In this case, the team management hypothesized that the average relative skill level of your team is greater than 1340. To test this claim, a one-sample t-test was performed using a 5% level of significance, assuming an unknown population standard deviation.

Null Hypothesis:

* Notation: H\_0: u <= 1340
* The average relative skill level (u) of the Knicks is less than or equal to 1340.

Alternate Hypothese:

* Notation: H\_1: u > 1340
* The average relative skill level (u) of the Knicks is greater than 1340.

Level of Significance:

* 5%

Table 2: Hypothesis Test for the Population Mean (I)

| **Statistic** | **Value** |
| --- | --- |
| Null Hypothesis | The average relative skill level (u) of the Knicks is ≤ 1340 |
| Alternate Hypothesis | The average relative skill level (u) of the Knicks is > 1340 |
| Test Statistic | 18.58 |
| P-value | 0.0 |
| Alpha Threshhold | 5% |
| Decision | Reject |
| Conclusion | The test showed that the Knicks’ skill level, between 2013 and 2015, exceeded the mark of 1340 significantly. This suggests they consistently performed better than many others during this period. It implies they might have an edge over those falling below this skill level. This could guide the Knicks’ strategy to focusing on strengths or aiming to maintain this higher skill level. |

The low P-value indicates strong evidence against the null hypothesis. Since the P-value is less than the chosen significance level of 5%, there is strong evidence against the null hypothesis, so we reject it. The statistical evidence supports that the average relative skill level of the Knicks is greater than 1340.

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## Hypothesis Test for the Population Mean (II)

Null Hypothesis:

* Notation: H\_0: u >= 106
* The average number of points scored (u) is greater than or equal to 106.

Alternative Hypothesis:

* Notation: H\_1: u < 106
* The average number of points scored (u) is less than 106.

Level of significance:

* 1%

Table 3: Hypothesis Test for the Population Mean (II)

| **Statistic** | **Value** |
| --- | --- |
| Null Hypothesis | The average number of points scored (u) is ≥ 106. |
| Alternate Hypothesis | The average number of points scored (u) is < 106 |
| Test Statistic | -12.84 |
| P-value | 0.0 |
| Alpha Threshhold | 1% |
| Decision | Reject |
| Conclusion | The evidence suggests that the Knicks’ scored significantly fewer points on average compared to the hypothesis of 106 points. With the ELO statistics indicating strong performance, this suggests a strong defense and a weaker offence. A focus on improving offense may increase their overall performance. |

With the P-value of 0.0 being smaller than the significance level of 1%, there is strong evidence against the null hypothesis, so we reject it. There is significant evidence to support the claim that the average number of points scored by the Knicks’ is less than 106.

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## Hypothesis Test for the Population Proportion

Hypothesis testing for a population proportion involves evaluating claims about the proportion of successes in a population based on sample data. In this case, the management claimed that the proportion of games your team wins when scoring 102 or more points is 0.90. This was tested using a 5% level of significance.

Null Hypothesis:

* Notation: H\_0: p = 0.9
* When the Knicks score 102 points or more, they win 90% of the time.

Alternate Hypothesis:

* Notation: H\_1: p != 0.90
* When the Knicks score 102 points or more, the statistics of the game win is not 90%.

Level of Significance:

* 5%

Table 4: Hypothesis Test for the Population Proportion

| **Statistic** | **Value** |
| --- | --- |
| Null Hypothesis | H\_0: p = 0.9, When the Knicks’ score 102 points or more, they win 90% of the time |
| Alternative Hypothesis | H\_1: p != 0.90, When the Knicks’ score 102 points or more, the statistics of the game win is not 90%. |
| Test Statistic | -2.75 |
| P-value | 0.006 |
| Alpha threshold | 5% |
| Decision | Reject |
| Conclusion | The findings indicate that the claimed proportion of winning games when scoring over 102 points might not be accurate. This implies that the team’s success rate might differ from the clamed proportion. The results of this test could inspire a reassessment of strategies or predictions regarding game outcomes when the team reaches a specific scoring threshold. This might initiate changes in game plans or performance expectations |

With a P-value of 0.006 (less than the significance level of 0.05) there is evidence against the null hypothesis, so we reject it. There is enough statistical evidence to suggest that the actual proportion of game wins when scoring 102 or more points is different from 0.90.

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## Hypothesis Test for the Difference Between Two Population Means

Hypothesis testing for the difference between two population means aims to determine whether there's a significant difference in the means of two separate populations. This comparison can reveal if there's evidence to support the claim that the means are different or if they're equal.

Null Hypothesis:

* Notation: H\_0: u\_1 = u\_2
* The average skill level of the Knicks (u\_1) is equal to the average skill level of the Bulls (u\_2).

Alternative Hypothesis:

* Notation: H\_1: u\_1 != u\_2
* The average skill level of the Knicks (u\_1) is not equal to the average skill level of the Bulls (u\_2).

Level of Significance:

* 1%

Table 5: Hypothesis Test for the Difference Between Two Population Means

| **Statistic** | **Value** |
| --- | --- |
| Null Hypothesis | The average skill level of the Knicks (u\_1) is equal to the average skill level of the Bulls (u\_2). H\_0: u\_1 = u\_2 |
| Alternative Hypothesis | The average skill level of the Knicks (u\_1) is not equal to the average skill level of the Bulls (u\_2). H\_1: u\_1 != u\_2 |
| Test Statistic | 34.45 |
| P-value | 0.0 |
| Alpha threshold | 1% |
| Decision | Reject |
| Conclusion | These results show clear differences in skill levels between the two teams in their respective eras. This could affect decisions about team strategies, player choices, and coaching methods. These distinct skill gaps could shape future planning and competitive approaches, as well as assisting in the forecasting of outcomes for future games. |

With the P-value less than the significance level, there is evidence to reject the null hypothesis. There is statistical evidence to suggest that the average skill of the Knicks’ diggers from the average skill of the Bulls.

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## Conclusion

The Knicks' skill level significantly surpassed the hypothesized 1340, indicating consistent superiority over many teams during the stated period. This underscores their potential advantage over opponents, suggesting a need to capitalize on strengths or maintain this higher skill level.

Despite skill level, the evidence strongly suggests that the Knicks scored notably fewer points on average compared to the hypothesized 106. This indicates a formidable defense but a weaker offense, suggesting a need for improvement in offensive strategies.

The statistical evidence challenges the claim of a 90% win rate when scoring over 102 points, implying a potential discrepancy in the team's success rate. This prompts a reevaluation of strategies or outcome predictions when achieving specific scoring thresholds.

The analyses highlight a significant difference in skill levels between the Knicks from 2013 to 2015 and the Bulls from 1996 to 1998. These gaps in skill could significantly influence strategic decisions, player selections, coaching methods, and the prediction of future game outcomes.