

ABOVE THE RIM

Exploring the effects of altitude on athletic performance in professional basketball

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EXPERIMENTAL PURPOSE:

The purpose of this project is to see if altitude affects some aspects of athletic performance related to fatigue in the National Basketball Association.

DRIVING QUESTION:

Does altitude affect some aspects of athletic performance related to fatigue in the N.B.A. (National Basketball Association)?

HYPOTHESIS:

I do believe that attitude effects some parts of athletic performance because when you are higher in the Earth's atmosphere, the air is thinner and contains less oxygen. That means an athlete's body has to work harder to maintain performance and get the oxygen it needs through its red blood cells. You need the red blood cells to breathe, and the harder the red blood cells have to work, the more tired you get, and the more tired you are, the more likely you are to make mistakes. When you are tired, you also have a harder time putting effort into the game.

SOURCE OF INFORMATION and RATIONALE:

I used the website Basketball Reference to collect all the data I wanted from past games: *www.basketball-reference.com*. I analyzed results from every game when the Oklahoma City Thunder went to Salt Lake City and Denver. I chose Oklahoma City because it is geographically close to the other two cities, is in the same time zone, and does not require as much air travel (reducing any jet lag and travel fatigue). I chose Salt Lake City and Denver because they are the two highest elevation areas in the NBA. So, when an Oklahoma City players have a game in Salt Lake City or Denver, they are playing at a much higher elevation than at any other time in their season.

PROCEDURE:

- I took three stats from the games: field goals (shots) attempted, turnovers per game, and free throw percentage. I decided on these three stats because I think they could all be impacted by fatigue. When you are tired, you are more likely to take quick shots on offense, you are more likely to make mistakes that cause turnovers, and you are more likely to lose the concentration necessary to make a free throw. Free throws also are completely dependent on yourself and involve no defense around you.

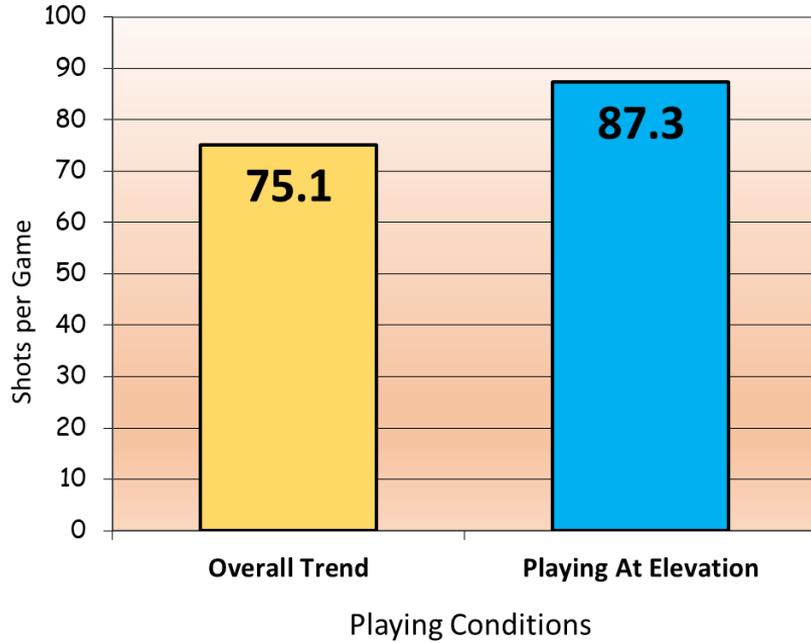
PROCEDURE (continued):

- I tracked these outcomes from 2008 (when the team moved into Oklahoma City) to 2025 (present). I ignored the 2020-21 season because it was impacted by COVID when all games were played in Florida.
- To see the impact of playing at a higher altitude, I compared the results from the altitude games to the average results of the team for the entire season for all seasons in that timeframe.

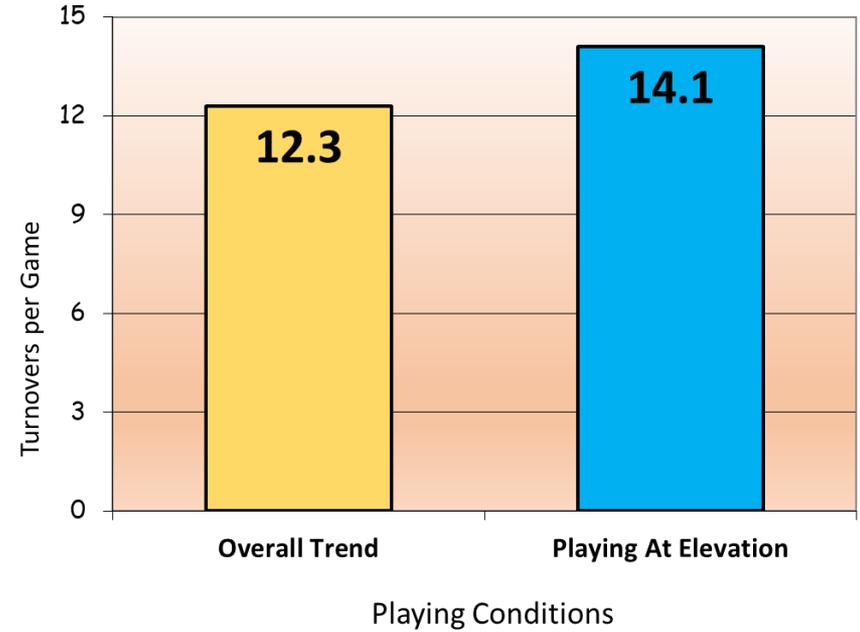
Totals for the Oklahoma City Thunder Team for the Three Statistical Categories Under Analysis

Conditions of Analysis	Thunder Shots per Game	Thunder Turnovers	Thunder Free Throw %
Per Game Averages Over All Seasons	75.1	12.3	74%
Per Game Averages When Playing at Altitude	87.3	14.1	75%

Average Number of Shots Per Game



Average Number of Turnovers Per Game



RESULTS:

Two of the three statistical areas under analysis were affected when playing at a high altitude: number of shots and turnovers (free throw percentage was not affected). Players performed less effectively in these two areas when playing at altitude compared to the rest of the time.

CONCLUSION:

My hypothesis is partially correct. I found that playing in an elevated arena did produce more turnovers from the team than what was usual. It also led to more shots. However, free throw percentage was not affected. Overall, this project shows that altitude does affect athletic performance in some aspects for teams that are not used to it. That could be a significant advantage if you play at a high altitude frequently, provided the team has talent. I think this is why the Denver team has been so good recently, winning a championship in 2023.

REFERENCES:

Sources utilized when collecting background information to understand the air conditions at high altitude:

- *wildsafe.org/resources/ask-the-experts/altitude-safety-101/oxygen-levels/*
- *www.earthdata.nasa.gov/topics/atmosphere/air-mass-density*
- *scied.ucar.edu/learning-zone/air-quality/whats-in-the-air*
- *publications.aiha.org/202203-common-properties-air*
- *www.physio-pedia.com/Altitude_and_Sport*