Division II Basketball Home Court Advantage

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Abstract: This study investigates the persistence and determinants of the home court advantage in NCAA Division II basketball, with a specific focus on the Lone Star Conference across three seasons, including one affected by Covid-19 disruptions. While previous research has attributed home court advantage to factors such as travel distance, crowd dynamics, and season length, this study aims to reassess these variables in the context of pandemic-altered conditions. Using a combination of win-loss records, advanced game statistics, and the Pythagorean Expectation model, we analyzed data from 17 men's and 17 women's basketball teams over the 2018–19, 2019–20, and 2020–21 seasons. Despite the significant disruptions to crowd attendance, travel patterns, and schedule length due to Covid-19 protocols, the home court advantage remained statistically significant. Logistic regression revealed that home location was the only variable with a consistent positive effect on win probability, while ANOVA testing showed no significant influence from travel distance, crowd size, or season length. The findings indicate that playing at home continues to confer a meaningful advantage regardless of external disruptions. This resilience suggests that psychological familiarity, comfort with the playing environment, and routine consistency may play larger roles in home court performance than previously understood. These insights not only validate the continued importance of game location in strategic planning but also call for deeper investigation into the psychological and contextual elements of home court advantage in Division II athletics. By incorporating both traditional metrics and advanced analytics, this study offers a comprehensive assessment that contributes to sport management, performance strategy, and future research on collegiate basketball.

Keywords: Sports, Home Court, Division II

1. INTRODUCTION

The concept of the home court advantage has long been a focal point of interest in sports analytics and psychology, encapsulating the inherent advantage that teams often experience when playing in their home arena. This advantage is commonly attributed to various factors, including the influence of the home crowd, familiarity with the playing environment, and reduced travel fatigue *(1)*. Sports psychologists have delved into these determinants, seeking to understand their individual and collective impacts on team performance. Factors such as season length, crowd effect, and travel distance have all been scrutinized in attempts to quantify and explain the home advantage phenomenon *(2)*. However, the Covid-19 pandemic allowed researchers to study the unique set of challenges to the sporting world. The change of safety protocols and precautions to game environments and fan participation causes the need to reassess the nature and extent of the home advantage *(3)*. Examining the home court advantage in Division II basketball presents unique insights distinct from those observed in Major Division I or NBA contexts *(4)*. Division II basketball operates within a different competitive landscape characterized by varying levels of resources, talent pools, and institutional priorities compared to its higher-tier counterparts. Consequently, factors influencing the home court advantage, such as crowd dynamics, travel distance, and season length, manifest differently in Division II settings. Additionally, Division II basketball often features smaller arenas, tighter-knit communities, and less media exposure, which can impact the intensity of home court support and the psychological dynamics of players. By studying the home court advantage in Division II basketball, researchers gain a nuanced understanding of how environmental factors intersect with competitive dynamics in a distinct collegiate sports ecosystem. Moreover, insights derived from Division II basketball can inform broader discussions on athletic performance, coaching strategies, and fan engagement across diverse sports contexts. Therefore, exploring the

home court advantage in Division II basketball offers valuable perspectives that enrich our understanding of athletic competition and inform practices across all levels of the sport.

Home Court Advantage

The home court advantage is a fundamental concept in sports, characterized by Carron et al *(5)* as the phenomenon where home teams tend to win over 50% of games under balanced home and away schedules. This definition underscores the statistical prevalence of the home advantage across various sports, serving as the foundation for further inquiry into its underlying mechanisms and implications. To quantify this advantage, researchers commonly compare a team's win-loss record at home with their performance on the road. This straightforward method allows for an assessment of how playing in familiar surroundings influences competitive outcomes. Jeremy P. Jamieson's *(6)* meta-analysis serves as a prime example of this approach, showcasing its utilization across diverse sports contexts and providing valuable insights into the consistency and magnitude of the home advantage phenomenon. Through systematic analysis and exploration, researchers aim to deepen our understanding of the factors contributing to the home court advantage and its significance in athletic competition.

However, while win-loss differentials offer a broad overview of team performance, a more comprehensive understanding of the home court advantage necessitates a nuanced examination of game-specific statistics. By analyzing factors such as scoring efficiency, defensive prowess, and player dynamics in both home and away settings, researchers can elucidate the nature of the home advantage and its impact on game outcomes. This approach acknowledges the intricate interplay between environmental factors, team dynamics, and individual performance, thereby facilitating the home court advantage phenomenon.

While win-loss differentials provide a broad overview of team performance, understanding the home court advantage requires understanding the link between travel distance, season length, and crowd dynamics as determinants on win-loss *(7,8)*.

Travel Distance

Travel distance is a significant factor that can influence a team's performance and contribute to variations in the home court advantage. The inherent stressors associated with travel, including time constraints, physical fatigue, and psychological strain, can impact a team's readiness and efficacy on the court. Indeed, studies have shown that increased travel demands correlate with decreased shooting percentages, diminished offensive rebounds, and overall fluctuations in performance metrics. *(6)*. Also, the effects of travel are exacerbated when teams traverse multiple time zones, disrupting athletes' circadian rhythms and further compromising their physical and cognitive functions. The phenomenon of jet lag, characterized by fatigue, disorientation, and sleep disturbances, poses a formidable challenge for athletes as they strive to maintain peak performance levels amidst the rigors of competitive travel schedules *(9)*. A compelling illustration of the relationship between travel and the home court advantage emerged during the NBA's restart bubble in 2020, as investigated by McHill et al. *(10)*. With teams confined to a centralized location and the absence of traditional travel requirements, the study documented a notable reduction in the aforementioned stressors and their associated effects on performance. Consequently, the diminished impact of travel during the bubble period led to a leveling of the playing field, attenuating the home court advantage overall. The role of travel distance in shaping athletic performance and influencing the dynamics of the home court advantage underscores the need for comprehensive strategies to mitigate the adverse effects of travel on athletes. *(11)*.

Season Length

Season length is a pivotal determinant that can influence the magnitude of the home court advantage observed in various sports leagues. Research conducted by Jamieson *(6)* has elucidated this relationship, revealing that sports with longer seasons, such as baseball, tend to exhibit a lesser home advantage compared to those with shorter seasons, such as football. The rationale underlying this phenomenon lies in the cumulative nature of performance metrics over an extended period, which can attenuate the relative impact of home field/court advantage across a larger sample size of games. However, the pandemic introduced disruptions to sports schedules, leading to the cancellation or postponement of numerous games during the 2020 and 2021 seasons across different collegiate and

professional leagues. These shortened seasons not only altered the competitive landscape but also provided a unique opportunity to assess the influence of season length on the home court advantage in a controlled setting *(12)*. In the context of D2 college basketball, the abbreviated seasons resulting from pandemic-related disruptions offer a valuable opportunity to examine the significance of season length on the home court advantage that normal scheduling doesn't allow. By comparing statistical trends and performance metrics between previous seasons with normal durations and those affected by Covid-19-induced alterations, researchers can discern any discernible shifts. The investigation into the interplay between season length and the home court advantage in D2 college basketball holds broader implications for sports analytics and management. Insights gleaned from this analysis can inform strategic decision-making processes, such as scheduling optimizations and resource allocation, to maximize competitive parity and enhance the overall integrity of collegiate athletics.

Crowd Dynamic

The influence of crowd dynamics on athletic performance is a well-documented phenomenon, with the presence and behavior of spectators exerting significant effects on team morale, motivation, and even officiating decisions *(13)*. As articulated by Watkins *(14)*, the quality and quantity of a team's supporters can impact their on-court performance, a phenomenon commonly referred to as the crowd effect. This effect encompasses a wide range of factors, from the vocal encouragement of fans to the psychological pressure exerted on opposing teams and match officials. The role of fans as a source of motivation and morale boost for the home team cannot be overstated. The energy and enthusiasm generated by a supportive home crowd can galvanize players, imbuing them with a heightened sense of confidence and determination *(15)*. The influence of spectators extends beyond mere emotional support, as evidenced by their potential to sway officiating decisions through vocal expressions of approval or disapproval.

The pandemic advanced a shift in spectator attendance, as evidenced by the absence of fans from sporting events worldwide. Nauright et al. *(16),* conducted a comprehensive analysis of the European soccer season 2020-2021, which unfolded amidst stringent crowd restrictions and matches held in empty stadiums. The findings of this study revealed a notable departure from established trends, with home teams experiencing a higher incidence of upsets and unexpected outcomes, contrary to the customary advantage conferred by home field/court support. The implications of these findings are reflective, underscoring the pivotal role of crowd dynamics in shaping athletic performance and influencing competitive outcomes. The circumstances precipitated by the pandemic underscore the need for a nuanced understanding of the interplay between environmental factors and sporting success.

Sport Analytics

Sport analytics serves as a crucial tool for researchers seeking to unravel the intricate dynamics underlying athletic performance and the home court advantage phenomenon. Defined by Sarlis & Tjortis *(17)* as a scientific field dedicated to the collection and analysis of past and current sports data, sports analytics enables researchers to glean valuable insights into the factors shaping team success and competitive outcomes. Traditionally, researchers have focused on conventional metrics such as wins and losses to assess team performance. However, a deeper understanding of the home court advantage necessitates a more nuanced examination of specific statistics that are uniquely affected by playing on one's home court. Variables such as shooting percentage, field goal percentage, assists, blocks, and other offensive and defensive metrics can all be influenced by the environmental factors inherent to home court advantage.

By scrutinizing trends in offensive and defensive statistics across home and away games, researchers can gain insights into the mechanisms driving the home advantage and discern any shifts or anomalies. The disruptions to sporting schedules and spectator attendance have necessitated a reevaluation of traditional analytical frameworks, prompting researchers to adopt a more flexible and adaptive approach to sports analytics. One method used in sports analytics is the Pythagorean expectation. The formula was originally created by Bill James in order to predict the win-loss percentage that a baseball team "should" win based on runs scored and allowed *(18)*. The Pythagorean expectation has been applied to various sports over the years. When using the Pythagorean expectation in basketball, the formula can be expressed as:

$$Points\ For^{Exponent} \div (Points\ For^{Exponent} + Points\ Against^{Exponent})$$

Pythagorean Expectation

The Pythagorean Expectation, initially formulated by Bill James *(19)* as a predictive tool for baseball, has since been adapted and applied to various sports, including basketball. This statistical model aims to estimate the win-loss percentage that a team "should" achieve based on the number of points scored and allowed over a given period, providing valuable insights into a team's underlying performance irrespective of actual win-loss records. Daryl Rogers *(20)*, a pioneering statistician, was among the first to extend the Pythagorean Expectation framework to basketball, adapting the methodology to suit the nuances of the sport. Rogers introduced an exponent of 13.91 to the formula, reflecting the unique scoring dynamics and statistical patterns characteristic of basketball competitions. While alternate exponents have been proposed by other statisticians, the utilization of a consistent exponent is paramount for ensuring the reliability and comparability of results across different analyses and contexts.

By employing the Pythagorean Expectation model with a standardized exponent of 13.91, this study aims to provide a robust framework for evaluating team performance and assessing the impact of environmental factors such as the home court advantage on competitive outcomes.

The purpose of this research focused on how the consequences of Covid-19 have altered the influence of the home court advantage as well as examined the role of each of the determinants (crowd dynamics, season length, and travel distance) of the home court advantage in men's and women's Division II collegiate basketball.

2. METHODS

This study examined the win-loss statistics of multiple men's and women's collegiate basketball teams. The study compared the pre-Covid-19 statistics with those performed under pandemic protocol conditions. There are 17 men's basketball teams and 17 women's basketball teams that were chosen for this study all from the Lone Star Conference. This conference was chosen due to its easily accessible game statistics. In addition to regular season win-loss records, the more detailed game statistics that were studied are field goal percentage, free throw percentage, three-point field goal percentage, assists, turnovers, and steals. The Pythagorean expectation was applied to each season to determine whether pandemic repercussions alter the accuracy of the predictions of win-loss records.

As these game-specific statistics were analyzed, the study evaluated how the statistics align with the previously listed determinants. Travel distances for each team were taken into account and compared with the win-loss record as well as statistics such as shooting percentage to observe how travel affects a team. The role of season length on the home advantage was determined by comparing the number of games per season with the percentage of home wins. Where information is available, crowd size was recorded and analyzed along with the overall home advantage and statistics such as the number of steals, field goal percentage, etc.

Data Collection

For the data collection process, a comprehensive spreadsheet was created to systematically compile information for each men's and women's basketball team within the Lone Star Conference. This spreadsheet served as the central repository for all relevant data points, facilitating organized and efficient analysis. The collected data encompassed a wide array of variables essential for evaluating team performance and contextualizing the impact of environmental factors on game outcomes.

Each entry in the spreadsheet included pertinent details such as box scores, win-loss records, shooting percentages (including field goal percentage, three-point field goal percentage, and free throw percentage), blocks, assists, steals, crowd size, and distance traveled for each game. By capturing these diverse metrics, the dataset enabled researchers to conduct a comprehensive analysis of team performance across multiple dimensions, shedding light on the nuanced interplay between various factors influencing game outcomes.

To ensure consistency and ease of analysis, variables were meticulously compiled and recoded as necessary. This involved standardizing data formats, categorizing variables into relevant subgroups, and resolving any discrepancies or inconsistencies in the dataset. By streamlining the data preparation process, researchers were able to minimize

errors and facilitate smoother analytical workflows, thereby enhancing the reliability and validity of the study findings.

In total, the data collection effort involved in putting a substantial volume of information, with approximately 45,072 data points entered into the spreadsheet. Each data point was meticulously recorded to capture the nuances of team performance and environmental conditions across different games, seasons, and teams within the Lone Star Conference.

By leveraging this rich dataset, researchers were poised to conduct rigorous statistical analyses, explore trends and patterns in team performance, and evaluate the impact of Covid-19 pandemic protocols on the home court advantage phenomenon. Through meticulous data collection and preparation, this study aimed to provide valuable insights into the dynamics of collegiate basketball competition and contribute to a deeper understanding of the factors shaping athletic performance in the face of unprecedented challenges.

3. RESULTS

The aim of this study was to find the extent to which the Covid-19 pandemic influenced the home court advantage in Division II basketball. Additionally, this study tested each research hypothesis to provide a better understanding of the contributing determinants of the home court advantage. The mean descriptives and frequencies of the men's and women's teams in the Lone Star Conference are listed in Table 1.

Table 1. Descriptives and Frequencies for the Lone Star Conference

	N	Pts For	Pts Ag.	FG%	3FG %	FT%	AST	TO	BLK	STL	Crowd Size	Dist.
2018-19												
Home	478	75.3	68.2	.44	.34	.71	14.5	15.0	3.4	7.7	542.9	
Away	422	68.3	73.3	.41	.32	.69	11.6	16.0	2.7	7.2	579.3	317.4
2019-20												
Home	455	73.2	67.8	.43	.34	.71	14.6	15.4	3.4	8.0	535.1	
Away	435	69.1	72.0	.41	.32	.70	12.2	16.4	2.8	7.6	416.8	286.7
2020-21												
Home	250	73.1	67.5	.44	.34	.72	14.0	15.2	3.0	8.2	278.4	
Away	237	67.6	72.4	.42	.32	.70	12.1	17.0	2.5	7.0	275.9	324.6

Table 2. Total Home and Away Results for the Lone Star Conference 2018-19, 2019-20, 2020-21

		Away	Home	Total
Results	Losses	716	466	1182

	Wins	463	784	1247
Total		1179	1250	2429

A Chi-square test was performed in order to examine the presence of the home advantage. These results show that the Lonestar Conference as a whole won 784 of their 1250 home games and won 463 of their 1179 away games during all three seasons (2018-19 through 2020-21). This means that 62.72% of games played at home resulted in wins while only 39.27% of games played on the road resulted in wins. Chi-Square = 133.55 (1,2429), p <.001. In addition, there is a significant difference in the number of points scored [F (1, 2427)= 595.07, p < .001] and given up [F (1, 2427) = 846.08, p<.001] between home and away matches, see table 2. To determine the effect that crowd size and distance traveled on overall winning percentage, an ANOVA was run [F (2, 2427) = .125, p=.793] and no significant difference was found.

Table 3. Covid-19 and Season Length and the Home Advantage in the Lone Star Conference

	2018-19	2019-20	2020-21
Losses	473	458	251
Wins	504	482	264
Winning Percentage	50.3	49.5	49.5

In order to further test our research hypothesis, we compared data from all three seasons (2018-19, 2019-20, 2020-21). These results show the effect of Covid-19 and season length on the home advantage as it includes results from a pre-Covid-19 season (2018-19), a season where Covid-19 first began to affect the U.S.(2019-20), and a shortened season due to Covid-19 protocol (2020-21). As shown in Table 3, after controlling for the difference in the number of games per season, there was no significant difference between seasons on the winning percentages at home, p=.997.

Table 4. TAMUC Women's Results

	2018-19	2019-20	2020-21
Loss	11	3	4
Wins	20	28	14

Table 5. TAMUC Men's Results

	2018-19	2019-20	2020-21
Loss	7	12	7
Wins	24	15	7

TAMUC Women's basketball team had higher winning percentages in the later seasons compared to the 2018-19 season. While the TAMUC Men's basketball teams had two consistently lower winning percentages in the 2019-20

and 2020-21 seasons compared to the 2018-19 season. There was no significant difference between Women and Men during the seasons looked at, p=.663.

Additionally, the Pythagorean expectation was calculated and compared to the actual winning percentage for TAMUC teams. Appendix A shows the Pythagorean expectation results. The Pythagorean expectation was not significantly more or less accurate for TAMUC teams when comparing pre-Covid-19 and Covid-19 seasons.

A logistic regression was run to determine the impact that home and away had on wins and losses over the prior three seasons. The analysis revealed that playing at home had a significant positive effect on the likelihood of securing a win: ($p<.0001$) , $B=.956$, $R^2 = .072$. *Equation: Predicted Win/Loss = .647 + 2.6(H/A)*

Specifically, the logistic regression model indicated that the odds of winning a game were significantly higher when playing at home compared to playing away, with a predicted win/loss equation of Predicted Win/Loss = .647 + 2.6(H/A), where H/A represents the binary variable indicating game location (home = 1, away = 0). The model accounted for approximately 7.2% of the variance in win-loss outcomes.

4. DISCUSSION

The findings of this study confirm the presence of a significant home court advantage for teams within the Lone Star Conference across the three seasons examined. Despite the disruptions caused by the Covid-19 pandemic, the home court advantage remained robust and unaffected, underscoring its enduring influence on team performance in collegiate basketball. Despite including a comprehensive set of variables such as points for, points against, shooting percentages (FG%, 3FG%, FT%), assists, turnovers, blocks, steals, crowd size, season length, and distance traveled, playing at home emerged as the only significant factor influencing win-loss outcomes. This finding highlights the predominant role of game location, particularly the home court advantage, in shaping team performance across collegiate basketball seasons within the Lone Star Conference.

The results suggest that while other factors may contribute to team performance, such as offensive and defensive metrics, crowd dynamics, and logistical considerations, the influence of playing at home remains paramount. The significant positive effect of home games on win-loss outcomes underscores the psychological and environmental advantages conferred by the familiar surroundings, supportive fan base, and reduced travel-related stressors inherent to home court advantage.

Surprisingly, the determinants traditionally associated with the home court advantage, such as crowd size, season length, and travel distance, did not emerge as significant factors influencing winning percentage in the context of this study. Contrary to expectations, these variables did not exert a discernible impact on team performance, suggesting that other factors may be at play in determining the home court advantage phenomenon. In light of these findings, coaches, players, and administrators should continue to recognize and leverage the home court advantage as a significant factor in collegiate basketball competition. By fostering a supportive and energized home crowd, optimizing travel logistics, and implementing effective game strategies tailored to the home environment, teams can maximize their chances of success and maintain a competitive edge on the court.

5. CONCLUSIONS

The findings of this study provide a valuable foundation for future research aimed at unraveling the complexities of the home court advantage phenomenon in basketball. One avenue for future research involves investigating the team's level of familiarity with the venue as a determinant of the home court advantage. Examining factors such as prior experience playing in the arena, familiarity with court dimensions and conditions, and the psychological comfort associated with home venues can provide valuable insights into the impact of venue familiarity on team performance. Additionally, researchers may explore the role of athlete motivation in shaping the home court advantage. By examining motivational factors such as team cohesion, intrinsic motivation, and external incentives, researchers can elucidate the psychological dynamics that influence player performance and contribute to the home court advantage phenomenon. By elucidating the interplay between environmental factors, psychological dynamics, and competitive outcomes, researchers can contribute to the ongoing discourse surrounding athletic performance and inform strategies to optimize team success in collegiate basketball and beyond.

Appendix A

Table A1. TAMUC Women's Pythagorean Expectation Results

	Points For	Points Against	Pythagorean Expectation	Winning %
2018-19	2300	1997	0.8771	64.52
2019-20	2330	1760	0.9802	90.32
2020-21	1355	1196	0.8502	77.77

Table A2. TAMUC Men's Pythagorean Expectation Results

	Points For	Points Against	Pythagorean Expectation	Winning %
2018-19	2667	2434	0.7810	72.7
2019-20	2337	2251	0.6275	60
2020-21	1001	1018	0.4417	50

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