Indian Premier League – Effect of Distance Travelled by Teams during Group Stages on their Home and Away Wins

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Abstract

Background: Indian Premier League (IPL) is an Indian professional T20 league which has been played for the past 12 years. A huge amount of data is gathered and mined every year which could lead us to some interesting and hidden facts about factors which are responsible for a team to win the IPL trophy. Although the current form of athletes and team combinations play a key role in helping any team emerge victorious in IPL, this research analyzed a new parameter “Total Distance travelled by teams” and its effect on the Number of Home and Away wins. Methods: For five IPL seasons from 2015 to 2019 data was obtained regarding the miles every team clocked and their number of home and away wins. Conclusion: This study has shown that inter-state travel by IPL teams during group stages of the tournament had adverse effects on their Total Number of Home and Away wins.

Keywords: Cricket, Distance, Home and Away Wins, Indian Premier League, Sports Technology

How to cite this article: Karkera P, Bagchi A, Bhattacharya D (2020): Indian premier league- effect of distance travelled by teams during group stages on their home and away wins, Ann Trop Med & Public Health; 23(S17): SP231734. DOI: http://doi.org/10.36295/ASRO.2020.231734

1.Introduction:

Cricket is an outdoor sport played between two teams of 11 players each. Team that scores maximum number of runs wins the game. Cricket is played around the world at both domestic and international levels in three different formats: One day international (50 over’s per innings), Test Cricket (5 day match) and 20-20 format (20 over’s per innings). More than a billion people follow and love cricket around the world. Twenty 20 cricket since its inception in 2004 has redefined the game completely. A whole new level of batting innovations, bowling variations and fielding spectacles has become a part of cricket¹. Cricket, from a game of technique has now shifted more towards unique all round power hitting by batsman and distinct bowling actions by bowlers. Indian Premier League (IPL) is a professional T20 tournament in India consisting of eight teams. IPL which started in 2008 is the most attended cricket league all over the world. Teams in IPL play against each other two times during the league stage. Matches are played in a home and away round robin format². Top 4 franchises after the group stage qualify for playoffs. All the teams play 14 matches each during the group stage. This two months long tournament makes all the teams travel a lot throughout India for their Home and Away fixtures. With the popularity of IPL growing day by day, more and more emphasis is given by team owners on getting the right players for their teams. This team formations and hiring staff for the tournament does not come cheap. There are many factors which affects the cost of each team in a sports league. These factors are distance travelled, number of travelling, sequences of travelling etc³. If not managed properly, the distance of travelling leads to tournament scheduling problem. Tournament scheduling problem is when team franchises incur more cost than projected thereby reducing their margins. Some sports leagues across the world have addressed this scheduling problem as a part of their budget. This is natural, as popular leagues have huge economic importance due to excessive revenue generated by them⁴. Improper scheduling leads to more money being spent thereby reducing profits.
Break maximization and distance minimization are a new class of problem instances which are to be addressed. Governing bodies of leagues are yet to be pressurized by team franchises for a better schedule during the course of tournament which would minimize the tournament scheduling problem. However, team owners are yet to address this issue for the sake of winning a tournament. To have a proper Home and Away game balance and also to save cost researchers have used the Linear programming problems technique too, which solely focuses on the sports scheduling of the Indian Premier League. Thus we understand that the tournament scheduling problem affects travelling cost and requires optimization. But, does this scheduling problem affect the winning chances of a team? When it comes to predicting winners, we seldom consider their distance travelled for playing a match, into account. Mostly prediction of a match is based on the impact factor of each player playing in their respective teams. Also, performance of athletes on field is considered for finding overall weight of team. A player or teams past performances are also considered while predicting the results of a match but their current fitness level due to travel is highly ignored. A lot of exciting work has been done in Machine Learning and sports combined. Machine learning has been used recently for predicting outcome of games and also during player auctions. Using several factors like home ground advantage, previous performances. Also, venue, performance against opposition, current form researchers have tried predicting outcome of matches. Pre match presentations talk about players which might perform well in a particular match, mention about the nature of the pitch, what kind of team formation teams should go with. But, the one factor which is lying under the radar here is the distance travelled by teams.

Professional athletes are in constant search for a competitive edge over its opponent. Manipulating or disturbing circadian rhythms may offer such competitive advantage. Circadian rhythms are daily cycles of physical and psychological factors such as body temperature, body cortisol levels and alertness. Air travel desynchronizes the perfectly set Circadian rhythms by offsetting sleep-wake cycle. Research shows that an athlete’s performance is hugely impacted by interstate air travel, especially when the travel is in the eastward direction. With increase in the professionalism of sport it results in increase in congestion of competitions and training demands for athletes. Any modern professional athlete will have a significant amount of travel commitments, ranging from short haul domestic travels (<5h) to long haul international travels (>20h). Athletes need to recover from this travel for ensuring proper training or competition success. For example, teams in Australian Rules football showed drastic reduction in kicks, markings and handballs when playing away matches after travel as compared to playing at home. Athletes tend to have shown suppressed neuromuscular force and power, increased fatigue and soreness which will affect their competition. Research also advises that distance and sprint running performance of athletes are affected. Dynamic muscular strength and endurance of elbow flexors, is damaged following west-east travel. This damage is more when the travel is across 6 times zones for untrained individuals. The effects that travel has are significant in the amount of sleep that an Athlete gets. Sleep deprived athletes tend to have poor performances due to impaired judgment, inability to concentrate etc. The sleep rating for athletes was poorer before away game than Home games and a better Coach rating and Impact rating was observed for athletes in home games than away. Slowed reaction times, decreased daytime alertness and upset mood are also some of the side effects shown in athletes after travel. Psychological task performance may also be affected along with reduced appetite, weakness and headaches. Hence, a combination of desynchronisation between internal circadian rhythms with the external environment, as well as impedence of recovery processes make long-haul travels an issue for most teams.

We often read about teams blaming fatigue of players as a reason behind them losing a match. Players getting ruled out of tournaments because of injuries and fatigue due to travel is not uncommon. Lot of efforts are put in by teams travelling city to city for each match they play. In many IPL seasons few teams had more than one Home grounds, making them travel for even their Home matches. We never realise how many miles are clocked by teams in a season. A consistent home field advantage has been noted in a variety of Amateur and professional sports dating back to the 1800s. Apart from familiarity, fans and referees, fatigue has also been considered for helping the Home team win. Researchers demonstrated that a visiting team if travelled west to east and crossing at least one time zone shows a significant increase in probability of home team winning. Impact of home team winning a match increases with distance that the
other team travels, but at a decreasing rate\textsuperscript{(15)}. In this paper, distance travelled by each IPL teams (excluding Chennai Super Kings and Rajasthan Royals due to ban of 2 years) for a total period of 5 
years (2015 to 2019) is calculated along with their number of Home and Away wins. This will help 
us to shed light on a unique parameter which might affect the chances of a team winning. The 
findings of this study will also help the IPL team owners understand whether there is another 
parameter than just Team formations and Player performances which affect their chances of 
winning a tournament. This research will demand for a better and more balanced schedule from the 
IPL governing council for teams during the IPL season.

Table 1. Team Names with acronyms

<table>
<thead>
<tr>
<th>TEAM NAMES</th>
<th>ACRONYM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mumbai Indians</td>
<td>MI</td>
</tr>
<tr>
<td>Royal Challengers Bangalore</td>
<td>RCB</td>
</tr>
<tr>
<td>Sunrisers Hyderabad</td>
<td>SRH</td>
</tr>
<tr>
<td>Kings Xi Punjab</td>
<td>KXIP</td>
</tr>
<tr>
<td>Delhi Capitals</td>
<td>DC</td>
</tr>
<tr>
<td>Kolkata Knight Riders</td>
<td>KKR</td>
</tr>
</tbody>
</table>

2. Material & methods:

2.1. Selection of the subject

This research is a Quantitative analysis done on the Total distance travelled by 6 IPL teams 
during group stages with respect to their number of Home and Away wins. Home and Away wins 
was considered as our dependent variable and Distance travelled by teams as our independent 
variable. Research was conducted for 5 years and 270 matches played from 2015 to 2019 with 6 
teams namely Mumbai Indians, Royal Challengers Bangalore, Delhi Capitals, Sunrisers 
Hyderabad, Kings XI Punjab and Kolkata Knight Riders. The study excluded Chennai Super Kings 
and Rajasthan Royals as they faced a ban for two years for seasons 2016-17. Inclusion of Chennai 
Super Kings and Rajasthan Royals would have led to unfair comparison between 6 teams which 
have played all 5 seasons and 2 teams playing just 3. This would have given us abnormality while 
analysing.

2.2. Selection of variables

The variables selected for this study were, Team Name, Travelled From, Travelled To, Winner, 
Total Distance travelled in kilometres (kms), Total Number of Home wins and Total Number of 
Away wins. As the study is completely based on Total distance travelled by teams and their 
number of wins, data of inter-state travel for each match was obtained through “Travelled From” 
and “Travelled To” variables. Number of Home and Away wins variables gave us the exact 
number of wins for each team during all the 5 seasons for this study.

2.3. Data collection/procedure

First step of Data acquisition involved acquiring all the data from official Cricbuzz website, 
which had fixtures and results shown for each and every match during a single season. For each of 
the 6 teams, the above indicators of Team Name, Travelled From, Travelled To, Winner, Number 
of Home wins and Number of Away wins were filled with correct data scrapped from the Cricbuzz 
website for all the 14 matches that a team plays during the group stages. This data acquisition and 
indicators filling step was repeated for all the 5 seasons. In the second step our most important 
indicator which was “Total Distance travelled in kilometres (kms)” was calculated from the data 
acquired in Stage 1. “Travelled From” and “Travelled To” indicators were already filled for all the 
teams for every season. From this data the distance between both the states that a team travelled 
was calculated with the help of Google search. Example, for a team who has played one match in 
Bangalore and the Next in Mohali, “Travelled from” variable; was Bangalore and “Travelled To” 
variable; was Mohali. Aerial distance between Bangalore and Mohali was then calculated and 
filled into our “Total Distance Travelled in kilometres (kms)” indicator. It may happen that a team 
after playing a match at a given location, does not travel to another location and remains there itself

... for their next fixture. In such scenarios the Aerial distance travelled was noted as Zero. Likewise for all the seasons, 420 total distances were calculated for all the teams combined. After the second stage all the five seasons’ distances was cumulated for each team and every teams “Total Distance travelled” value was obtained. This gave us a clear picture as to which team had travelled the most and which team had travelled the least.

The third stage included calculating the Home and Away wins for all the 6 teams. From the data in step 1 each team was filtered based on “Travelled To” and “Winner” indicator. For a team having “Travelled To” as their Home ground and was declared as the winner of the match, it was considered as a Home win. Likewise if a team had travelled to any place other than its Home Ground and had won the match, was considered as an Away win. In few IPL seasons, teams had Home grounds in other states as well, other than its Home state. These wins were also considered as a Home win. Likewise, Number of wins was calculated for all the 5 seasons for all 6 teams and listed the Total Number of Home and Away wins individually. All the data was tabulated for each team in four categories; Team Name, Total Distance Travelled (kms), Total Home wins and Total Away Wins. For visually representing the tabulated results Tableau 2020.1 was used. Tableau 2020.1 is the latest analytical tool for Data Visualization which provided ease for computing our findings. In Tableau 2020.1 the tabulated results were visualized in the form of line graph for perfectly distinguishing between each value and each team from least to highest. From the Visualized data a conclusion was drawn as to whether there is an effect of Distance travelled on the number of Home and Away wins of teams or not.

2.4. Statistical Technique

SPSS Statistics version 24 was utilized for identifying correlation between our dependent & independent variables. In SPSS, Spearman’s rank order correlation technique was used for finding existence of positive or negative correlation between Total distance travelled, Wins percentage and Rank of teams. The level of statistical significance was considered at p=0.05. Along with Tableau, analysis using SPSS provided more support to our analysis to reach concrete results.

3. Results and Discussion:

The dataset prepared during this study had all matches data since the 2015 edition of the IPL, till the season played in 2019. Results obtained are analytically represented in Figure 1. Teams are placed in ascending order based on the Total Distance they have travelled. From the results it was quite evident that the schedules followed during all 5 seasons were not at all equitable and fair. There is a complete and unfair advantage which is clearly noted for some teams and very little for the others. This unfair advantage is completely hidden and is not easily visible while the teams perform during the season. While obtaining the data one interesting factor worth noticing was the amount of ‘To and Fro’ travel that some teams clocked. Schedule prepared was very tough on some teams as they went through unnecessary back and forth travel.
The summary of data obtained after Acquisition step are indicated below in Table 2. Each of these teams play 7 Home matches and 7 Away matches during a single season. Hence, total number of home and away matches played from 2015 to 2019 for each team was taken as 35 and percentage of home and away wins was calculated accordingly. For all the 6 teams 3 parameters were introduced which would guide us to our conclusion, Total Distance Travelled, Total Home wins % and Total Away wins %.

Figure 1. Analytical Representation of Acquired Data for all 6 Teams
3.1. Analysis of Total Distance Travelled

After summing up Distance that a team travelled from 2015 to 2019, observation was drawn that Kings XI Punjab have travelled the most amongst all 6 teams. KXIP have travelled 71,474 kms which is 18,116 more than the least travelled team which is Sunrisers Hyderabad. SRH have travelled a mere 53,358 kms in all 5 seasons combined followed closely by Mumbai Indians with 56,957 kms. The amount of back and forth travel that MI and SRH had to cover were significantly lesser that KXIP. This means more time to relax and recover for the athletes.

3.2. Analysis of Total Home Wins

Home ground advantage is what every team looks forward to in IPL and want to win every match in front of their Home crowd. From Figure 1 we observe that the team which has most number of Home wins is Sunrisers Hyderabad. SRH have won 23 matches at Home out of total 35 matches played. This is a massive number, as winning 65.71% of their matches at home showcases their dominance. Contrarily, Royal Challengers Bangalore has minimum Home wins in all 5 seasons combined with only 14 wins.

3.3. Analysis of Total Away Wins

A better performance by teams in Away matches, almost guarantees a spot of any team in the playoffs. Team Mumbai Indians have the highest Away win percentage from all 35 matches played, showcasing why they are such a successful franchise in IPL. Mumbai Indians have double the number of wins (20) in Away fixtures than Kings XI Punjab (10).

Table 2. Total Distance travelled along with Percentage of Home and Away wins

<table>
<thead>
<tr>
<th>Teams</th>
<th>Total Distance Travelled (Kms)</th>
<th>Total Home Wins %</th>
<th>Total Away Wins %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mumbai Indians</td>
<td>56957</td>
<td>57.14</td>
<td>57.14</td>
</tr>
<tr>
<td>Royal Challengers Bangalore</td>
<td>65953</td>
<td>40</td>
<td>42.86</td>
</tr>
<tr>
<td>Kings XI Punjab</td>
<td>71474</td>
<td>45.71</td>
<td>28.57</td>
</tr>
<tr>
<td>Delhi Capitals</td>
<td>58975</td>
<td>57.14</td>
<td>34.29</td>
</tr>
<tr>
<td>Sunrisers Hyderabad</td>
<td>53358</td>
<td>65.71</td>
<td>45.71</td>
</tr>
<tr>
<td>Kolkata Knight Riders</td>
<td>71279</td>
<td>57.14</td>
<td>48.57</td>
</tr>
</tbody>
</table>

Results obtained from SPSS software are tabulated in Table 3 & 4. The data processed in SPSS was operated with Spearman's rank-order correlation method. Table 3 indicates a clear negative correlation between Team’s win percentage and Total Distance Travelled. Also, the test was found significant at 0.019 indicating evidence against null hypothesis. There is less than 5% probability that results are random. Hence, null hypothesis can be rejected. Alternative hypothesis which states there is significant effect of Distance Travelled by teams on their wins percentage stands true. This strengthens our results obtained in Table 2, where SRH have travelled least distance and have most wins under their belt. Likewise, KXIP who had travelled more had least wins to their name.

Table 3. Correlation Analysis for Total Distance Travelled and Win Percentage of Teams

<table>
<thead>
<tr>
<th>Correlation</th>
<th>Teams Win Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spearman’s rho</td>
<td>Total Distance Travelled</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
</tr>
</tbody>
</table>

http://doi.org/10.36295/ASRO.2020.231734
Rank of teams is the position they secured after completion of League stage round. As only top 4 teams qualify for playoffs it necessary for teams to have lesser rank (1, 2, 3 or 4). Table 4 indicates positive correlation between Rank of Teams after league stage with the Total distance travelled by them. A Sig. (2-tailed) value of 0.043 supports the positive correlation showcasing significance.

Table 4. Correlation Analysis for Total Distance Travelled and Rank of Teams

<table>
<thead>
<tr>
<th>Correlation</th>
<th>Rank of Teams in League Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spearman’s rho</td>
<td>Total Distance Travelled</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To those who are already familiar with Twenty-Twenty format of Cricket, know that there is certain amount of unpredictability associated with the format. Researchers have tried to relate factors which might reduce this unpredictability. According to a study researchers have not linked air travel with having an effect on athletes sleep patterns\(^{(10)}\). There were trends shown by athletes of increased wake time, decreased sleep efficiency and sleep quality but these effects were very minimal and not significant. Eastward inter-state travel associating with 1.5 to 2 hour advances in the body clock also had very little effects on the sleep patterns of athletes\(^{(10)}\). Thus sleeping pattern of athletes getting affected due to travel and having an effect on their performance can be ruled out. However, research has shown sizeable home field advantage due to intra time zone travel\(^{(9)}\). Teams which are weak performers at home matches, also tend to win more than their relative ability during home fixtures. This outcome seems to be higher for non-regional matches\(^{(16)}\). Studies have proven the impact which travel has on an athlete or a team, but whether it affects their winning chances or not was the major findings in this paper. Our study used the technique of data analysis to assess the effect of Distance travelled on the Number of Home and Away wins of IPL teams during the 2015 to 2019 season. 5 seasons of Indian Premier League data provided enough support to our analysis giving distinct and clear results. As there was little work done before in proving how and where does travel affect a team’s performance, these results directly lead us to answers. Results also show that on an average during a single season teams in IPL travel around 12,600 kms, which is a huge number when compared to other professional leagues around the globe\(^{(17)}\). When iterated individually, this average has increased more because of only selected teams every year. Whereas, rest of the teams cover less miles in every single season. The longest distance that a team had to travel during the 2019 season is the Chennai-Mohali route, mapping 1,994 kms in one direction\(^{(18)}\). Similarly, the shortest distance is between Delhi and Jaipur covering a meagre 236 kms\(^{(18)}\). Having a Quantitative analysis for our research provided clearer facts to answer all the research questions and was easily visually represented as well in Figure 4, for discussion.

Team Sunrisers Hyderabad with the most number of Home wins has travelled the least. On the contrary team Kings XI Punjab who has travelled the highest, bag least number of Away wins. SRH have qualified for playoffs in 4 seasons from 2015 to 2019, whereas KXIP have failed to even make it to 1. This sums up the journey of both SRH and KXIP in IPL so far based on their Total Distance Travelled. Kings XI Punjab has been in the bottom two of IPL group stage standings 3 times out of the 5 seasons, and has also made the playoffs on only two occasions so far\(^{(19)}\). The second least travelled team which is Mumbai Indians have the most number of Away wins to its name. Having travelled less has clearly helped MI make the playoffs and become IPL champions 3
times from 2015 to 2019. Their winning streak in odd seasons has been an impeccable achievement in IPL by any team. Mumbai Indians have seldom travelled back and forth for their matches during any season which also pushes them a bit ahead of other teams. Royal Challengers Bangalore who is the Third most travelled team, are yet to win an IPL trophy. RCB have qualified for playoffs on only 2 occasions during the last 5 seasons. Our analysis showcases their poor form at Home with the least number of wins among all 6 teams. On one hand were teams are seen dominating the home grounds, RCB has failed to make it as a fortress for them. Could distance travelled by RCB be the important piece missing in their puzzle to win an IPL trophy? Delhi Capitals on the other hand are hidden in between all 6 teams, with no significant affect shown when analysed based on Distance travelled. Kolkata Knight Riders emerged as a special case in this analysis with good balance of Home and Away wins. KKR has performed exceptionally well, inspite of being the Second most travelled team. KKR had to cover long miles for their Away matches as they were the only team hailing from East India. Surprisingly where we have 4 teams who have been directly affected by the miles they travelled, KKR despite of getting to travel a lot have qualified for the playoffs 3 times from 2015 to 2019. SPSS analysis of our dependent and independent variables provided more support to our results obtained in Figure 1. There was negative correlation shown between, Teams wins percentage and total distance travelled. Our study was able to statistically prove that more the distance travelled by teams will have negative effect on their wins percentage. For both Home and Away wins the effect of Distance is the same wherein if any team is travelling for longer distances, there will be a clear added advantage to their opponents. Our study also clarified the effect of Total Distance travelled on position or rank of teams in league stages. Only 4 teams qualify for playoffs and a positive correlation with Distance travelled indicated higher rank of a team with more distance travel. This states as the distance covered by any team increases, they are pushed further down in the points table. This justifies why KXIP did not make it to even one playoff during these five years.

In depth research has already been conducted on the effects that travel has on an athlete. Researchers have demonstrated that it is more difficult for the body to adjust itself due to advances in daily routine during travel\(^9\). Study has shown disturbances in internal body routine because of differences in clock time during Home and Away matches\(^10\). Further this study leaves us with enough data for predicting the winner of IPL 2020. Now for future analysis discuss about the Distance that teams will travel in the 2020 season of IPL and come up with the top four franchises which might qualify for playoffs. Prediction for 2020 season based on their distance travelled would directly strengthen and support our analysis even more. Already there has been work done on this parameter wherein researchers were also able to optimize the Distance travelled by teams by nearly 30%, which is the need of the hour for IPL teams\(^5\). Studies have proven that a more fair and equitable schedule can be prepared, showcasing reduction by almost 37,000 kms in the total distance travelled by teams\(^5\). This equitability will completely eradicate the possibility of unfair competitions while playing during IPL season.

4. Conclusion:

This study investigated whether Distance travelled by IPL teams during group stages affect their chances of winning in Home and Away fixtures. Travel has been an unavoidable stress for many high performance athletes since the beginning of their career. Regular short and long haul travel will continue to be a part of the competition; it is how well the authorities manage it which makes it a boon or a curse for athletes. From the results of this study it can be found out that the Distance travelled by teams during Group stages does in fact have an effect on their Number of Home and Away wins. With the help of data our study analysed that 4 teams, SRH, MI, RCB and KXIP had a direct effect on their Home and Away wins based on the total distance they travelled. Also, it can be observed that the teams which have travelled the least, remain on top of the table and have better chances of qualifying for the playoffs as compared to the teams which have travelled more. These astonishing numbers of distances are minus the distance that teams travel for reaching the airports and stadiums at various match venues.

The above critical points are important for IPL team franchises to consider, while looking for success in IPL. This study proves that there does exist another parameter apart from Team

formations and Player performances for winning an IPL tournament. The Indian Premier League governing council which is responsible for coming up with schedule for IPL every season should focus on having a more balanced schedule. Having a more balanced schedule would even up things for teams to compete in a fair environment. Distance travelled by teams, which was only considered till now by IPL franchises as a monetary factor to be included as a part of budget, should also be taken into account for its effect on them winning or losing a tournament. IPL 2019 witnessed a comparatively better schedule, in all the 5 seasons, as teams had only 1 Home ground for their Home fixtures. This came as a relief from earlier seasons wherein teams had multiple Home grounds and had to travel even to play Home matches. Thus, strategically this could lead to a better Home and Away travel ratio, thereby solving the issue of distance travelled. Also, the training staff travelling with teams must be equipped enough to have a proper planning and strategies for dealing with fatigue in athletes due to travel. Reports show that highly trained and motivated athletes are very less affected by Jet lag due to travel. Hence, post travel recovery and preparing the athlete before travel would definitely come in handy for reducing effect of distance travelled on their game performance.

Ethical Clearance: Not applicable

Source of Funding: Self-funded

Conflict of Interest: There is no conflict of interest among the authors

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