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Batting Friendliness of Australian Test Cricket Grounds – A Quantitative Analysis

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Abstract

Australia has been the dominant cricketing nation for most of cricket history with the best win-loss record against all other cricketing nations. This dominance is particularly emphatic for Test matches played on home soil, which had perpetuated the myth that it is difficult for visiting teams to bat well in Australia. However, statistics on Australian Test pitches show that they are actually quite batting-friendly. The average runs per wicket were mostly over 30 with the Adelaide cricket ground leading the way with 35.39 followed by Perth (33.30), Brisbane (32.71) and Sydney (30.75) with only Melbourne (29.95) recording below 30. Large numbers of centuries, double centuries and triple centuries were recorded on Australian turfs, especially in Adelaide. In this paper, the relative batting-friendliness of Australian Test cricket grounds are analyzed and causative factors determined. It is found that ground size is the major factor with smaller grounds aiding batting performances. Also, environmental factors such as atmospheric moisture and wind tend to help bowlers to the detriment of batting performances.

INTRODUCTION

Australia has been the dominant cricketing nation for most of cricket history. It has the best win-loss record against all other cricketing nations. These records are even more emphatic for Tests played on its home soil. Table I shows the summary of the Test results against the visiting teams on the various cricket grounds up to and including the year 2020. The data are readily available from the websites cricketarchive.com [1] and cricinfo.com [2]. In all, 422 Test matches were played on Australian soil beginning at Melbourne (from 1877), Sydney (1882), Adelaide (1884), Brisbane (1931), Perth (1970), Hobart (1989) and Darwin (2003). Of them, the home team won 242 matches and lost 99 with lop-sided win-loss percentages of 57.35 to 23.46. One Test was tied and another abandoned (Table I). One must be reminded that before World War II, all Test matches in Australia were played to conclusion with no time limits and were called

'Timeless Tests' [3]. Altogether 90 such Tests were played (including 36 in Melbourne and 35 in Sydney), mostly against England, with Australia winning 53 and the visiting teams winning 35. Two Tests were drawn due to scheduling reasons. This meant that the Timeless Tests had a depressing effect on the number of drawn Tests. But the win-loss result has perpetuated the myth that it is most difficult for visiting teams to win Test matches on Australian soil. Nonetheless, a careful scrutiny of Table I indicates that there were substantial differences in the win-loss percentages on different Australian grounds. For example, the home team has the best winning percentage in Brisbane (64.53%), followed closely by Perth (56,82%), Sydney (56.56%) and Melbourne (56.14%) in that order. The visiting teams, on the other hand, had their best chance of winning in Melbourne (though only 28.07%), followed by Sydney (25.93%), Perth (25.00%) and Adelaide (22.78%) in that order; and the worst winning chance in Brisbane (12.90%). (We have not considered the Darwin and Hobart venues because of their relatively small sample sizes.) In this paper, we try to find causative reasons for these differences.

Table I. Summary of Test Matches played in Australia 1877-2020

Ground	Matches played	Won	Lost	Drawn	Tied	Aba-n'd	% Won	% Lost	% Drawn
Melbourne	114	64	32	17	0	1	56.14	28.07	14.91
Sydney	108	60	28	20	0	0	56.56	25.93	18.52
Adelaide	79	42	18	19	0	0	53.16	22.78	24.05
Brisbane	62	40	8	13	1	0	64.52	12.90	20.97
Perth	44	25	11	8	0	0	56.82	25.00	18.18
Hobart	13	9	2	2	0	0	69.23	15.38	15.38
Darwin	2	2	0	0	0	0	100.00	0.00	0.00
All	422	242	99	79	1	1	57.35	23.46	18.72

BATTING SUMMARY OF TEST MATCHES PLAYED IN AUSTRALIA

The batting summary of Test matches played on the major cricket grounds in Australia are taken from References [1], [2] and [4] and entered in Table II. Contrary to prevailing perceptions, Australian cricket grounds were well-prepared and batting-friendly. The average runs per wicket were mostly over 30 with Adelaide leading the way with 35.39 followed by Perth (33.30), Brisbane (32.71) and Sydney (30.75) with only Melbourne (29.95) recording below 30. Large numbers of centuries, double centuries and triple centuries were recorded on Australian turfs (Table II). Also listed in Table II are a quantity called 100+200+300, which was first formulated by the author, which is equivalent to the total number of hundreds, i.e., counting a double century as '2 hundreds' and a triple as '3' [5]. Adelaide recorded the highest centuries per match (2.329) followed by Perth (2.023), Brisbane (1,871), Sydney (1.676) and Melbourne (1.658) in that order. Adelaide also recorded the highest double centuries per match

(0.266) followed by Perth (0.159), Sydney (0.130), Melbourne (0.105) and Brisbane (0.081) in that order. As for 100+200+300 per match, Adelaide (2.608) once again leads the pack followed by Perth (2.205), Brisbane (1.952), Sydney (1.815) and Melbourne (1.772) in that order. Incidentally, cricket's greatest batsman Don Bradman was not out on 299 against South Africa in Adelaide in 1932, when he ran out of partners, which was 1 run away from adding to the double centuries column under Adelaide. Adelaide leads in yet another category 'century in each innings' with 8, double that of second place Brisbane (4), and double again that of Melbourne and Sydney (2 each) (from [6]). Incidentally, Adelaide's number (8) is still far ahead of those of second place Kolkata and Karachi (5 each) amongst all international grounds. Interestingly, of the number 8 in Adelaide, 5 were achieved by visiting players (Hammond, Headly, Compton, Hazare and Kanhai) [6]. In summary, Adelaide may well be the most batting-friendly ground on the entire planet Earth.

Table II. Batting Summary of Test Matches played in Australia

Ground	Runs/ Wicket	100s	200s	300s	100+ 200+ 300	100 in ea. Inngs	100/ match	200/ match	100+ 200… /match
Melbourne	29.95	189	12	1	202	2	1.658	0.105	1.772
Sydney	30.73	181	14	1	196	2	1.676	0.130	1.815
Adelaide	35.39	184	21	1	206	8	2.329	0.266	2.608
Brisbane	32.71	116	5	0	121	4	1.871	0.081	1.952
Perth	33.30	89	7	1	97	0	2.023	0.159	2.205

CAUSATIVE FACTORS FOR BATTING FRIENDLINESS OF AUSTRALIAN PITCHES

With so many indicators pointing to the batting friendliness of the Adelaide cricket ground, one is led to surmise that this is not a random coincidence, but that there must be causative factors behind this. The first obvious investigation would be to focus on ground size, since smaller grounds are likely to produce more boundaries and over-boundaries than larger ones. Australian cricket grounds are very nearly elliptical in shape and their dimensions are well-documented [7−11]. For an ellipse, the longest diameter is expressed as $2a$, where a is the semi-major axis. Likewise, the shortest diameter is denoted as $2b$, with b being the semi-minor axis. The area of the ellipse is then $A = \pi ab$. The areas of the Australian grounds are calculated from the values of a and b and entered in Table III. The Brisbane cricket ground was the largest, followed by Melbourne, Sydney, Perth and Adelaide in that order. Clearly, the highest batting indicators were recorded on the smallest Adelaide cricket ground. The particularly narrow width of that ground meant that strokes made square off the pitch reached the

Table III. Australian Test Cricket Ground Sizes					
Ground	Length 2*a*, m	Breadth 2*b*, m	Semi-major axis *a*, m	Semi-minor axis *b*, m	Area πab, m^2
Melbourne	171	146	85.5	73	19,608
Sydney	156	154	78	77	18,868
Adelaide	167	124	83.5	62	16,264
Brisbane	170.6	150	85.3	75	20,085
Perth	165	130	82.5	65	16,847

boundary quicker and more often. In Fig. 1, the runs/wicket is plotted against the ground area. The inverse relation between the two parameters is evident. Denoting the two variables as y and x, respectively, they are related by the equation representing a rectangular hyperbola:

$$xy = c \tag{1}$$

where c is a constant. Summing both sides, we have:

$$\sum y_i = c \sum \frac{1}{x_i} \tag{2}$$

whence:

$$c = \frac{\sum y_i}{\sum \frac{1}{x_i}} \tag{3}$$

From the values found in Table II, one gets: c = 594,568.75. The least-squares error rectangular hyperbola thus obtained is also shown in Fig. 1.

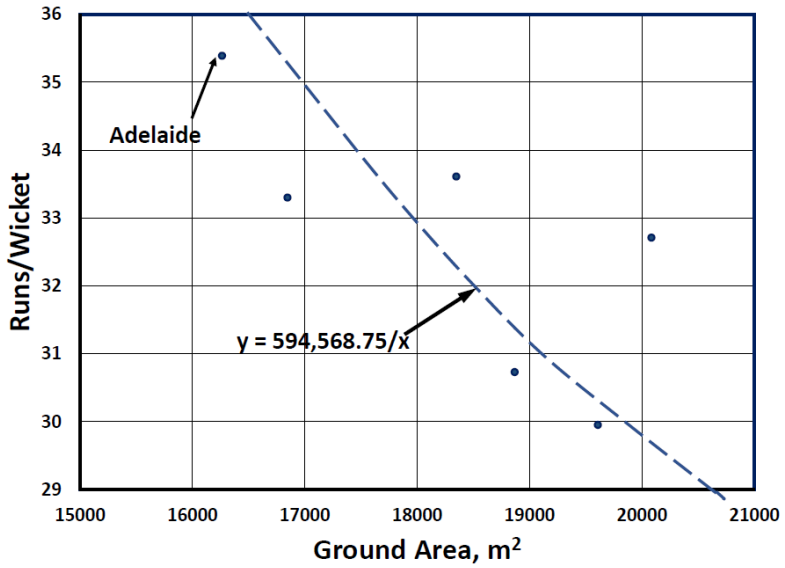

FIGURE 1.

Other causative factors include atmospheric conditions during play. For example, atmospheric moisture helps pace bowlers with their swing, whereas atmospheric winds favor flighted spinners, each time to the detriment to the batsmen. Both of these factors are related to rainy conditions, before, after and in between rains. In order to analyze these effects, one has to access climatic data at the playing locations. Much of Australia lies in the tropical zone, and Test cricket is played in the balmy summer months. Table IV shows the frequency of Test matches during various months. Incidentally, the vast majority of the matches were played in the months of December and January at Melbourne, Sydney and Adelaide whereas at Brisbane and Perth, they were played during November and December months (Table IV). (If a match straddled two months, then it is counted as .5 for each month.) The average monthly rainfall at each location is shown in Table V. To study the effects of atmospheric conditions, we calculate the weighted average monthly rainfall (WAMR) for each location, which is equal to the average monthly rainfall weighted to the monthly frequency of matches played. This quantity appears in Table V.

Table IV. Test Matches Played in Each Month

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total
Melbourne	0	0	58	28	18	10	114
Sydney	1	25	20	57.5	19.5	7.5	108
Adelaide	0	7	26	35.5	9.5	1	79
Brisbane	0	35.5	23.5	2	1	0	62
Perth	1	13.5	20.5	2.5	5.5	1	44

Table V. Weighted Average Monthly Rainfall, inches							
Ground	Monthly Average Rainfall, inches						Wt. Av. Mo. Rainfall, in.
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	
Melbourne	2.4	2.4	2.3	1.8	1.8	1.6	2.037
Sydney	3.2	3.9	2.9	5.0	5.0	5.6	4.222
Adelaide	1.7	1.1	1.0	1.0	0.9	0.8	0.994
Brisbane	4.0	5.1	5.1	6.5	6.6	5.1	5.169
Perth	2.0	1.0	0.4	0.4	0.9	0.6	0.688

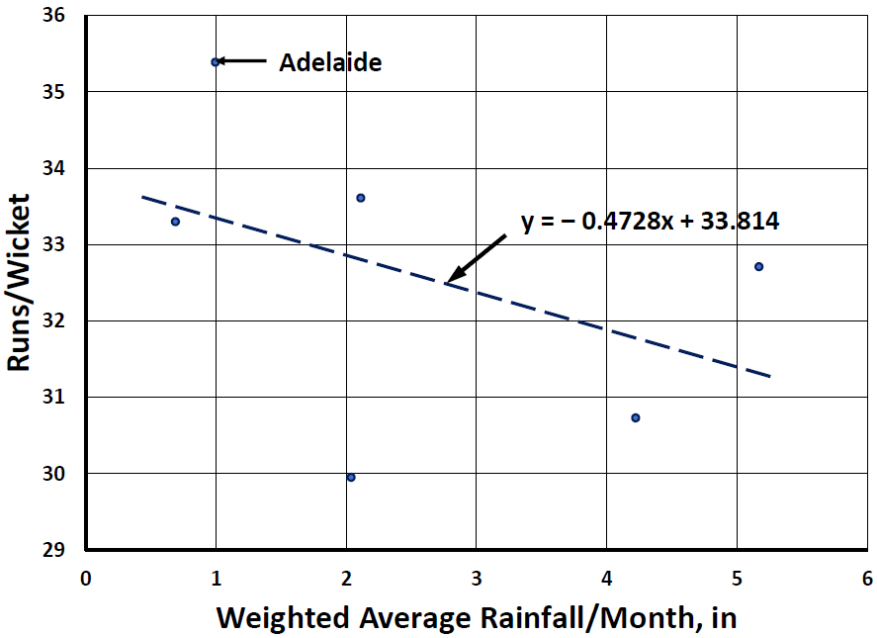

FIGURE 2.

The WAMR was the highest for Brisbane (5.169) and Sydney (4.222), intermediate for Melbourne (2.037) and the lowest for Perth (0.688) and Adelaide (0.994). This is understandable as Brisbane and Sydney, located on the east coast, are under the influence of the Pacific Ocean. Figure 2 is the scatterplot of runs/wicket against WAMR which is our parameter for atmospheric moisture. In this case, a linear trend line sufficiently describes the inter-relationship between the two variables:

$$y = mx + c \tag{4}$$

where the slope m and y-intercept c are given, respectively, by:

$$m = \frac{n\sum x_i y_i - \sum x_i \sum y_i}{n\sum x_i^2 - \left(\sum x_i\right)^2} \tag{5}$$

and

$$c = \frac{\sum y_i \sum x_i^2 - \sum x_i \sum x_i y_i}{n\sum x_i^2 - \left(\sum x_i\right)^2} \tag{6}$$

where n is the number of samples. Clearly, there was a negative correlation between WMAR and runs/wicket. Thus, the WMAR effect acted in the same direction as the ground size effect, but it was not as pronounced as the latter.

CONCUDING SUMMARY

Causative factors for batting effectiveness on Australian cricket grounds were identified and demonstrated. It was found that ground size was the main factor which determined batting scores, with smaller grounds facilitating higher scores. Environmental factors such as moisture and wind also played their roles by favoring the bowlers and restricting the batsmen.

REFERENCES

[1] http://www.cricketarchive.com.

[2] http://www.cricinfo.com.

[3] https://en.wikipedia.org/wiki/Timeless_Test.

[4] http://howstat.com/cricket/statistics/grounds/GroundStats.asp

[5] A. Tan, The Three Ws of West Indian Cricket – A statistical analysis, *Math. Spectrum, 33*, 11−14, 2000-1.

[6] https://stats.espncricinfo.com/ci/content/records/282951.html.

[7] https://en.wikipedia.org/wiki/Melbourne_Cricket_Ground.

[8] https://en.wikipedia.org/wiki/Sydney_Cricket_Ground.

[9] https://en.wikipedia.org/wiki/Adelaide_Cricket_Ground.

[10] https://en.wikipedia.org/wiki/Brisbane_Cricket_Ground.

[11] https://en.wikipedia.org/wiki/Perth_Cricket_Ground.