

Left handedness and Leadership in Interactive Contests

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Abstract

Left-handedness is known to provide an advantage at top level at many sports involving interactive contests. Earlier studies revealed that this is because of the innate superiority of left-handed contestants. Again, most of the renowned leaders of the world are known to have been left-handed. We analyze the data of batting and bowling performance in Cricket and verify the advantage of left-handedness for batsmen. For bowlers, left-handedness provide no advantage. Leadership play an important role in politics, sports and mentorship. In this paper we show that Cricket captains who bat left-handed have a strategic advantage over the right-handed captains in Test cricket. Our results demonstrate that critical importance of left-handedness and successful leadership. Our study shows that left-handed captains lead in more number of games and are significantly more successful than right-handed captains . Interestingly left-handed captains have a higher batting average than the right-handed counterparts, perhaps indicating that the left-handedness may help in handling the pressure of leading the teams.

Introduction

It has been widely accepted that 10% of humans are left-handed [1]. Polymorphism in human handedness existed since the Upper Paleolithic and all human populations have displayed significant bias towards right-handedness [2]. It has been established that left handers enjoy an advantage in sports, particularly those involving team activity [3]. These include sports like tennis, fencing, baseball and cricket. There is no evidence of left-handed advantages in non-interactive sports like gymnastics. This is possibly due to two reasons. First, they are possibly innately superior or they have negatively frequency-dependent strategic advantage compared to the right-handers. Recently it was shown that the low percentage of

lefties is a result of the balance between cooperation and competition in human evolution [4].

Leadership is one of the most important parameters to judge one's ability to lead or mentor in any team activities. Even though left-handers comprise of 10% of the general population, 57% of the last seven U.S Presidents have been left-handed. Presidents Gerald R. Ford, George Bush, Bill Clinton and Barack Obama are all left-handed. Even in sports, left-handed athletes like Babe Ruth (baseball), Tim Lincecum (baseball) and Clive Lloyd (cricket) are celebrated as great motivators in the world of sports. This imbalance between general population and left-handers gives rise to the popular belief whether left-handers are efficient leaders [5]. However, till date there has been no study or evidence to validate this belief. Earlier studies have confirmed that left-handed people are more likely to use the right hemisphere of their brain. While the left side of our brains is ruled by logic, the right side is ruled by intuition [6]. Logic is needed for leaders and intuition comes into play during any crisis. Even though some left-handers may be better equipped to accept the challenges of leadership in sports or in politics, there is no evidence or study to prove whether the left-handed leaders are successful during their tenure. In this paper we attempt to address the link between left-handedness and leadership taking help of the wealth of data available for sports [7–12]. We choose the game of Cricket as an example.

Cricket is a sport in which left handers have always enjoyed an advantage [1]. They are represented more often than expected in the general population. Again, left-handed players have a strategic advantage over the right-handers when they are uncommon. This is because they are more experienced facing the right handed competitors than vice versa. Various cricket experts and commentators assert that a combination of left-handed and right-handed batting pair enjoy an advantage, since the bowlers have to readjust the line he bowls [13]. Given the manner in which the game is played it would be interesting if left-handed batsmen are on an average more successful than their right-handed counterparts and similarly if left-handed bowlers are as successful as right-handed bowlers. Cricket is also a game in which an outcome depends a lot on the leadership. Contrary to the passive role of coach in Soccer or manager in Baseball, a Cricket captain is directly involved in the proceedings of a game. This can be viewed as team-leadership in the corporate world and leadership in politics. The captain chooses the batting order, sets up fielding positions and shoulders the responsibility of on-field decision-making and is also responsible at all times for ensuring that play is conducted within the Spirit of the Game as well as within the Laws. In this paper we address two issues - *i*) Is being left handed truly advantageous in team sports and *ii*) Do left-handers make better leaders. Earlier studies on handedness distribution research focussed predominantly on data

accumulated from several years. To understand the impact of handedness on performance it is essential to track the temporal distribution of handedness. For example, in Major League Baseball, frequencies of left-handed pitchers and batters increased logarithmically with time (between 1876 and 1985) and attained a stable overrepresentation at 30% [3]. Again, it was observed that in 2007 ICC Cricket World Cup left-handed batsmen were more successful than the right handed batsmen, and that most successful teams had approximately 50.5% left-handed batsmen [13]. Again it was found that a higher proportion (20%) of professional cricketers bowled with their left hand, leading to the theory that the left-handed advantage is tactical [3].

We are interested to longitudinally track left-hander frequencies in a team game like Cricket. We track the number of left-handed batsmen and bowlers among elite performers. Previous studies have confirmed that there has been a gradual increase in the proportion of left-handed people. There are therefore few left-handed elderly people but relatively more left-handers in the younger age groups [14, 15]. In terms of Cricket or any other games involving team activities, this is a welcome sign. Subsequently we test the hypothesis whether left-handed leaders enjoy any strategic advantage over their right-handed counterparts. In doing so we analyzed the success of left-handed captains and right-handed captains in the history of Cricket. One of the key factor in Cricket involves the handling of crisis during the proceedings of a game. Through out the history of the game, there are instances where captains perform worse when they are leading their teams. In particular, we also clarify whether handedness play any role in the individual as well as team performance of a captain.

Data

We analyzed the handedness distribution for batsmen and bowlers in Test cricket, ODI cricket and T20 cricket. For Batsmen the data for year-end-rankings are collected from 1877 and 2011 (Test cricket), 1971 and 2011 (ODI cricket) and 2005 and 2011 (T20 cricket). We also collect the data for captains and their handedness for Test cricket and ODI cricket. Data for rankings and player's handedness is accessed from open source online database. Data for captaincy records is collected from the cricinfo website. In Test cricket we collect the information of 1553 bowlers, 131 bowlers bowled left-handed. In ODI cricket, 85 out of 1234 bowlers are left-handed while in T20 cricket 32 bowlers out of a total of 363 bowl left-handed. For batsmen, in Test cricket 482 players out of 2611 bat left-handed. In ODI cricket 384 players of a

total of 1880 bat left-handed, while in T20 cricket 134 players out of 528 bat left-handed. In Test cricket there has been 304 captains, 54 of them bat left-handed. Again in ODI cricket we collect information of 194 captains, of which 46 are left-handed.

Results

Previous studies have focussed on cross-sectional designs or where data over several years was combined [14]. It is vital to temporally track the handedness distribution in order to understand the impact of handedness on expert performance. In this section we track the ICC points of every player over time and then proceed to study the effect of left-handedness and leadership in Cricket. We differentiated the number of left handers by year for batsmen and bowlers (Figure 1). We observe that in Test cricket (1877 – 2011) among the top 100 batsmen, number of left-handers increases according to a second-order polynomial ($F(2, 132)=785.73$, $p = 0.000$, $R^2 = 0.92$). In ODIs and T20, the number of left-handers among the top 100 performers increases and decreases as reflected in the second-order polynomial. In Test cricket ($F(2, 21)=48.37$, $p = 0.000$, $R^2 = 0.82$) we observe a slow increase in number of left-handed bowlers who are among the top 100 in year-end ICC rankings (See Supporting Information (SI)). Next we focus our attention on the fraction of left-handers among the top 100 performers in batting and bowling in all forms of Cricket (See Figure 1). We evaluated the fraction of left-handers present in every ranking intervals for top 100 performers. If playing left-handed provides an advantage in performance, we expect fraction of left-handers to occupy higher rankings and that the fraction of left-handers would decrease with ranking intervals. In Test cricket there exists a higher fraction of left-handers occupying higher ranks representing top batting performance between 1877 and 2011. However, there is no clear relation between fraction of left-handers and ranking intervals. Similarly we don't observe any relation between fraction of left-handed bowlers and ranking intervals. In ODIs there exists a positive slope (See Table S7). This indicates that for bowlers, bowling left-handed is not an advantage in any forms of Cricket.

The above observations leads to the following question - Are left-handed batsmen indeed better than their right handed counterparts ? To analyze this we compare the batting as well as bowling averages of all left-handed and right-handed players for Test cricket, ODI cricket and T20 cricket (See Figure 2). We observe that on an average left-handed batsmen are significantly better than right-handed batsmen in Test cricket ($t = 3.77$, $p = 0.0001$) and ODI cricket ($t = 3.78$, $p = 0.0001$). There exists no significant

difference between batting averages of left-handed and right-handed batsmen in T20 cricket ($t = 1.49$, $p = 0.135$). As expected from our earlier observations, left-handed bowlers do not average better than right-handed bowlers (See Figure 2 for results of t -test.)

We proceed further to investigate whether left-handedness prove beneficial for Cricket captains. Although the ICC does not provide any official ranking for cricket captains, traditionally they are judged in terms of number of matches won. We collect the data of batting-handedness of the captains in Test cricket and ODI cricket. This is because the information of bowling-handedness is not properly documented. We do not consider T20 matches since the number of captains who led in T20 matches are too few to come to any conclusion. As show in Figure 3(A) we observe that in Test cricket the situation is significantly different, with the left-handed captains leading in more matches than the right-handed captains ($t = 4.12$, $p = 4.84 \times 10^{-5}$). We also study if the left-handed captains are more successful than the right-handed captains. In Test cricket we observe that left-handed skippers are more successful in terms of number of matches won ($t = 3.08$, $p = 0.002$). To check the robustness of the association between left-handedness and the number of matches, we perform a logistic regression of the form $\text{logit}(D_{left}) = C_0 + C_1M$, where D_{left} is a dummy variable which takes value 1 if a captain bats left-handed and is 0 otherwise. We observe that the number of matches led by a captain (M) is significantly ($P < 0.0001$) and positively associated with left-handedness. We also perform a logistic regression of the form $\text{logit}(D_{left}) = D_0 + D_1W$. Here too we observe that number of matches won by a captain (W) is significantly ($P = 0.005$) and positively associated with left-handedness. In ODI cricket too we observe significant relationship between left-handedness and M or W (See Table S9–S11 in SI). We do not observe any relationship between left-handedness and span of captaincy (S), where S is defined as the number of years a captain led the team.

Although in both forms of cricket we find evidence which suggests a leadership superiority of left-handers over the right-handers, in a team game like Cricket a lot of media scrutiny and criticism is showered on the captains. Lots of TV commentators and Cricket experts believe that pressure of leading the teams affect the personal performance of the captains. We analyze the effect of handedness on the batting average of captains when they lead their teams and when they do not (See Figure 3(B)). We observe that in Test cricket the batting average of left-handed captains is significantly higher than that of right handed captains ($t = -4.29$, $p = 2.42 \times 10^{-7}$). As before, we check the robustness of the association of left-handedness and performance of a captain. We perform a logistic regression of the form $\text{logit}(D_{left})$

$= A_0 + A_1 B_{Avg}$, where B_{Avg} is the batting average of the captain. We observe that batting average of the captain is significantly ($P < 1 \times 10^{-7}$) and positively associated with left-handedness of the captain. We summarize our results in Table 1. However, in ODI cricket we do not find any evidence which could possibly suggest a relationship between left-handedness and batting performance of captains (See Table S12 in SI).

Discussion

Almost a century ago only three of the top 30 batsmen were left-handers. Only Clem Hill of Australia held the top position. The succeeding decades did not see any major change. However, by 1934 the only significant left-handers were Maurice Leyland and Eddie Paynter. With the advent of Arthur Morris, Neil Harvey, Bert Sutcliffe and, above all, Sir Garry Sobers, left-handers started occupying elite (among top 100) positions during the 1950s. In the past couple of decades the number of top performers have swelled beyond comparison with that of previous generations. This is also supported by the second-order polynomial fit.

While we observe a steady rise of left-handed batsmen in the Test format, surprisingly in the shorter formats like ODI and T20, the number of elite left-handers appear to be on the rise since 1971 attaining almost a steady value in the last decade. It remains to be seen whether the number rises in the future. Earlier studies have shown that practicing with left-handed performers leads to improvement in visual anticipation of left-handed actions. This in turn helps the player to optimally prepare for any left-handed actions on the field. With the availability of myriad of information about the opponent's strength and weakness, the coaches and players are more accustomed for an in-depth opponent specific game preparation. One of the possibility of this increase in left-handed performers is that batsmen have worked over the years to provide themselves an advantage, since they are attacking the ball from a different angle and bowlers are accustomed to bowling at right-handed batsmen. Contrary to the batsmen we do not observe any corresponding increase in left-arm bowlers. In 1904 there were six left-armers in the top 20, with Wilfred Rhodes occupying second position in ICC rankings. One of the possible ways to counter the left-handed batsmen would be to bring in more left-handed bowlers. Although it was argued that left-handed bowlers have a tactical advantage since they have the benefit of unfamiliarity and bowl at a different angle, our study reveals that left-handed bowlers have been under-represented in all forms of

Cricket. One possible argument is that the left-handed bowling advantage has disappeared over time. Historical data reveals that only Wasim Akram and Chaminda Vaas has taken more than 350 wickets in Test cricket. Hence bowling left-handed is no more an advantage unless the bowler is supremely talented like Wasim Akram or Chaminda Vaas. We anticipate that the success of Wasim Akram or Chaminda Vaas will be difficult to replicate by future left-handed bowlers.

We focussed on another important aspect of the game - leadership. In Cricket an outcome of a game depends a lot on the leadership skills of the captains. As mentioned earlier the captain takes on-field decisions like bowling changes, field placements which affect the outcome of a game. We have seen successful Cricket captains like Sir Gary Sobers, Clive Lloyd, Graeme Smith, Sourav Ganguly, Stephen Fleming bat left-handed. We explore the idea whether left-handed captains have a tactical or strategic advantage over their right handed rivals in Test cricket as well as ODI cricket. We found evidence to suggest that left-handed captains are more successful than the right-handed captains in both forms of cricket. One possible reason might be attributed to the fact that a captain is as good as the team and that success of a team (or captain) is dependent on the performance of the entire team. However there are instances when the same team composition performed differently under different captains. In Test cricket, we observe that left-handed skippers tend to lead in more games than the right-handed counterparts and also more successful than right-handed skippers. We also observe that in Test cricket, the batting average of left-handed captains are higher than that of right-handed captains. This might be due to the innate ability of left-handed individuals to tackle the pressure of leading a side, which might have more to do with neurological advantage [6, 16, 17]. In limited over games in ODI cricket this advantage disappears due to the limited time available to amend the error in decisions committed during the course of the game.

There are few more aspects which deserve closer scrutiny. First, it has been seen earlier that left-handedness is more pronounced in men than women in many professional sports like tennis [18]. This is again attributed to the common gender differences observed in general population. These findings are however restricted to activities not involving any team involvement [18]. Sport-specific performance and leadership abilities depending on gender thus remains an open idea for further research. Secondly, in most cricketing nations there are many domestic competitions which serve as a road to international exposure. Most of the domestic players fail to make any international appearance due to lack of skills needed at the elite level. Due to non-availability of consistent information on domestic games we are unable to study

the number of lefties with high performance level in cohort of domestic players. We think that even in domestic level, playing left-handed will provide an advantage of being selected at international level.

To summarize, we have presented to the best of our knowledge, the first evidence of left-handedness and leadership advantage in the context of interactive contests. Our analysis shows that left-handedness has a positive effect on leadership and left-handed cricket captains are more successful than their right-handed counterparts. Also our results show that left-handed captains perform better than right-handed captains, perhaps indicating that they are able to handle the pressure of leadership better. However there is also a need to extend our study to other fields involving strong leadership - the role of political leadership in team performance and whether left-handed leaders are able to bring significant economic growth in a nation compared to right-handed counterparts. Leadership is critical for successful management of teams. Presence of an individual with exceptional entrepreneurial and motivational skills in any team work is essential. Community leaders who are guided by collective interests provide resilience to change in governance [19]. Our research indicates that perhaps left-handed leaders could be more influential in providing that coveted resilience and motivation to a team.

Acknowledgement

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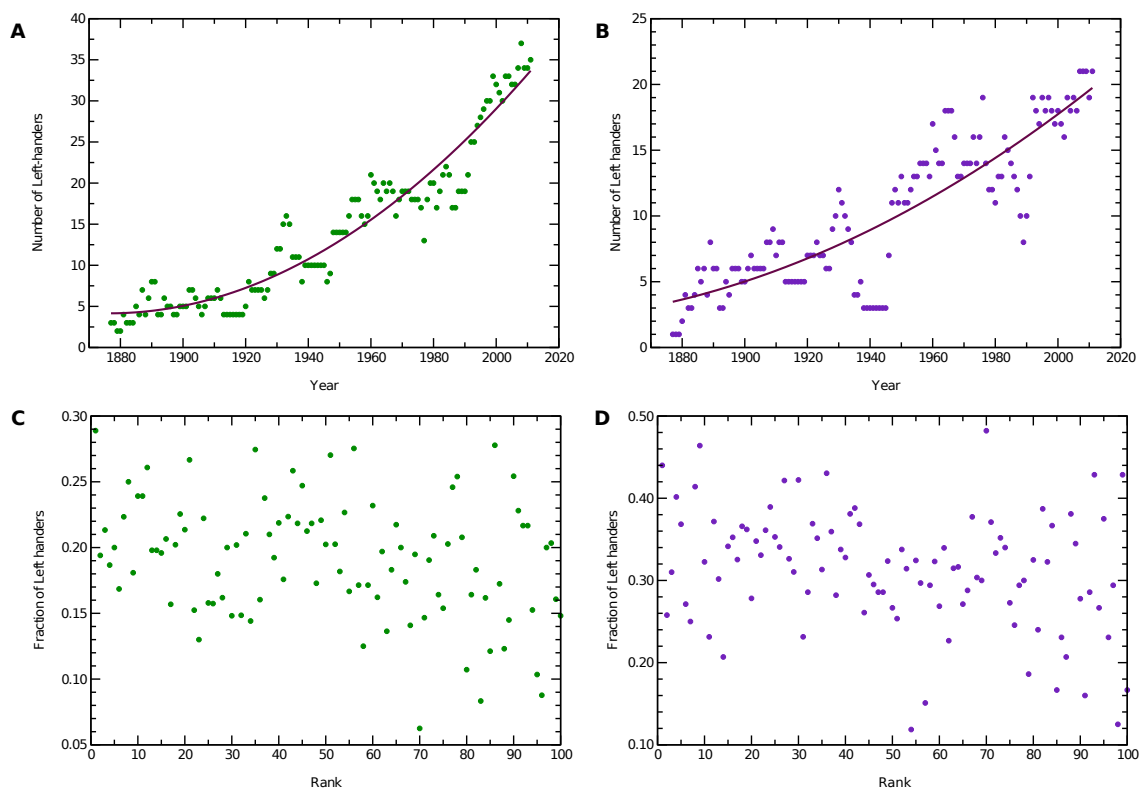


Figure 1. Left-handedness in year-end rankings (A) Number of left handed batsmen in the top 100 ICC rankings over time for Test cricket (1877 – 2011). (B) Number of left handed bowlers in the top 100 ICC rankings over time for Test cricket (1877 – 2011). The data was fitted to a second-order polynomial. (A) $R^2 = 0.9225$, $P < 1 \times 10^{-7}$, (B) $R^2 = 0.7539$, $P < 1 \times 10^{-7}$. Fraction of left-handers at various ranking intervals of (C) top 100 batsmen Test cricket (1877 – 2011) and (D) top 100 bowlers in Test cricket (1877 – 2011). There is no clear pattern of relationship between fraction of left-handers and ranking intervals.

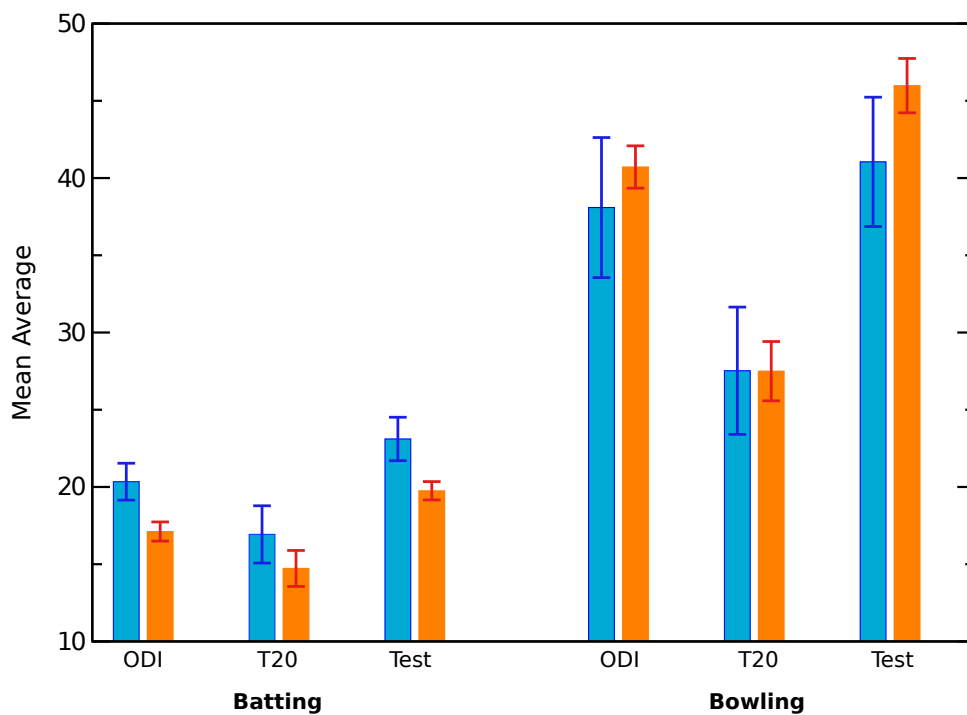


Figure 2. Mean Batting and Bowling Averages Mean batting average and mean bowling average of left-handed players (blue) and right handed players (orange) in Test cricket (1877 – 2011), ODI cricket (1971-2011) and T20 cricket (2005-2011). The left handed batsmen have significantly higher batting averages than right handed batsmen in Test cricket and ODI cricket. Left-handed bowlers do not have better average than the right-handed bowlers in ODI cricket ($t = 0.88$, $p = 0.38$), T20 cricket ($t = -0.44$, $p = 0.65$) and Test cricket ($t = -0.11$, $p = 0.91$).

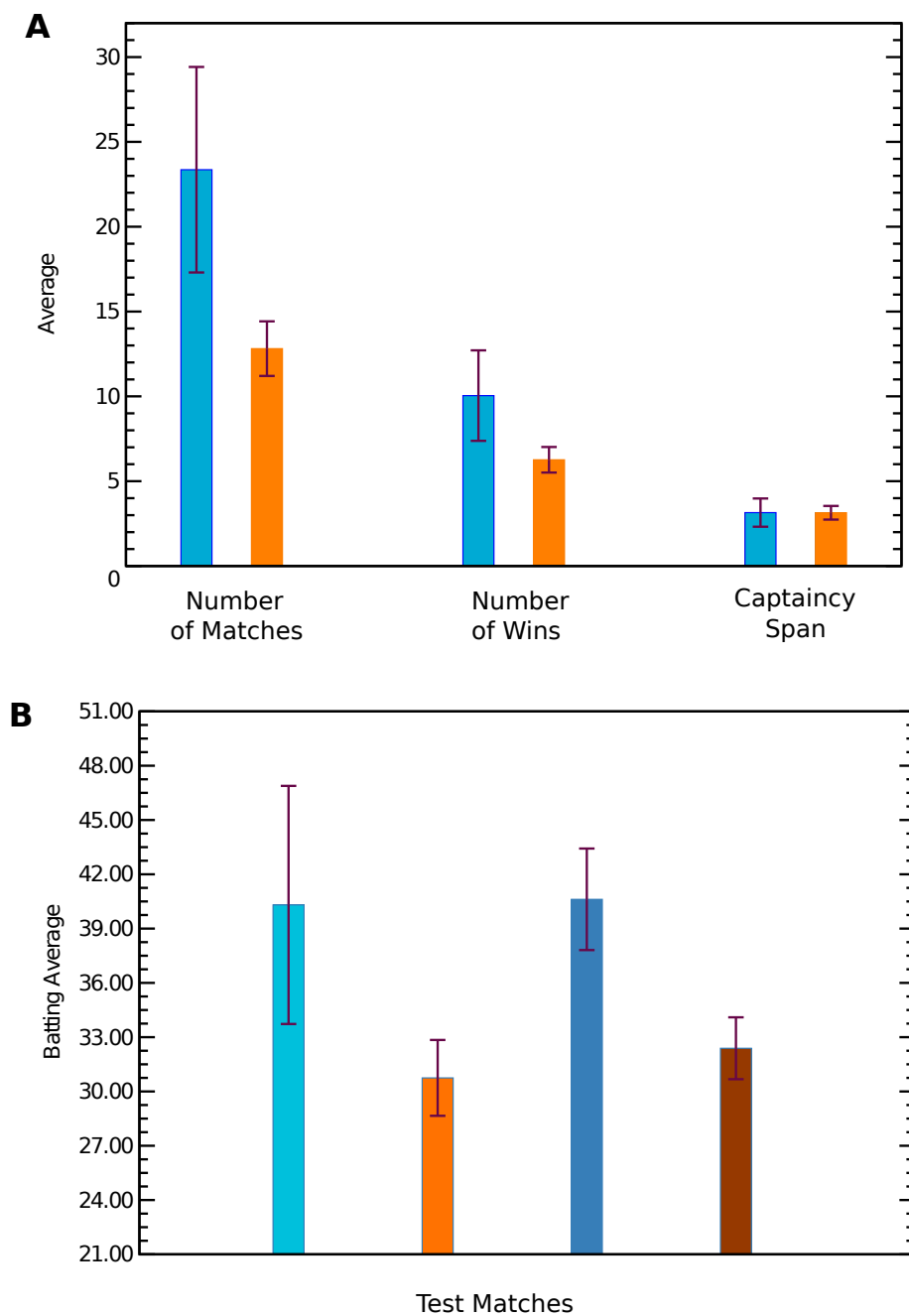


Figure 3. Leadership and left-handedness (A) Average number of matches captained, won and average captaincy span of skippers who are left-handed (blue) and right-handed (orange) for Test cricket (1877 – 2011). We observe that left-handed skippers led and won in more matches than the right handed skippers. However no significant difference is observed in terms of captaincy span for left-handed and right-handed skippers. (B) Comparison of mean batting average of captains who bat left-handed (blue) and right-handed (orange) with that of ‘not as a captain’ who bat left-handed (dark-blue) and right-handed (brown). In Test cricket captains batting left-handed show higher average than the captains batting right-handed ($t = 4.12$, $p = 4.84 \times 10^{-7}$). Again left-handed batsmen playing ‘not as a captain’ have higher batting average than the right-handed batsmen ($t = -4.09$, $p < 0.0001$)

Table 1. Results for the logit regression used for predicting the effect of left-handedness on number of match played (M), number of wins (W), span of captaincy (S) and batting average B_{Avg} . We mark in bold font the coefficients that are statistically significant (p-value < 0.05).

		Model		
		Coef.	Std.Err.	p-value
Total Number of Captains		304		
Number of left-handed Captains		54		
Number of Right-handed Captains		250		
<hr/>				
Model for D_{left}				
Intercept		-2.02	0.21	$< 1 \times 10^{-7}$
Number of Matches	M	0.03	0.008	4.84×10^{-7}
Prob > Chi-square		$< 1 \times 10^{-7}$		
<hr/>				
Model for D_{left}				
Intercept		-1.79	0.18	$< 1 \times 10^{-7}$
Number of Wins	W	0.049	0.017	0.005
Prob > Chi-square		0.0056		
<hr/>				
Model for D_{left}				
Intercept		-1.86	0.24	$< 1 \times 10^{-7}$
Span of Captaincy	S	0.081	0.04	0.062
Prob > Chi-square		0.0677		
<hr/>				
Model for D_{left}				
Intercept		-3.28	0.50	$< 1 \times 10^{-7}$
Batting Average	B_{Avg}	0.05	0.012	$< 1 \times 10^{-7}$
Prob > Chi-square		$< 1 \times 10^{-7}$		

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Left handedness and Leadership in Interactive Contests : Supporting Information

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Game of Cricket

Cricket is a bat-and-ball game played between two teams of 11 players each. The team batting first tries to score as many runs as possible, while the other team bowls and fields, trying to dismiss the batsmen. At the end of an innings, the teams switch between batting and fielding. The International Cricket Council (ICC) is the government body which controls the cricketing events around the globe. Although ICC includes 120 member countries, only ten countries with ‘Test’ status - Australia, England, India, South Africa, New Zealand, West Indies, Bangladesh, Zimbabwe, Pakistan and Sri Lanka play the game extensively. There are three versions of the game - ‘Test’, One Day International (ODI) and Twenty20 (T20) formats. Test cricket is the longest format of the game dating back to 1877. Usually it lasts for five days involving 30 – 35 hours. Shorter formats, lasting almost 8 hours like ODI started in 1971 and during late 2000 ICC introduced the shortest format called T20 cricket which lasts approximately 3 hours.

Regression Results

In ODIs and T20, the frequencies of left-handers among the top 100 performers increases and decreases as reflected in the second-order polynomial. In case of ODIs $F(2, 38)=84.13$, $p = 0.000$, $R^2 = 0.81$ and for T20 matches we observe $F(2, 4)=21.28$, $p = 0.0074$, $R^2 = 0.91$. Similar pattern of initial increase and decrease in left-handers among the top 100 players in observed for the bowlers in T20 cricket ($F(2, 4)=18.23$, $p = 0.0098$, $R^2 = 0.90$). However, in ODI cricket ($F(2, 22) = 64.49$, $p = 0.000$, $R^2 = 0.85$) we observe a slow increase in number of left-handed bowlers who are among the top 100 in year-end ICC rankings. Contrary to Test cricket, in ODIs we observe that fraction of left-handed batsmen decrease

linearly with ranking intervals (See Table S8; $F(1, 98)=49.65$, $p=0.000$, $R^2 = 0.33$). Surprisingly except in ODI cricket we don't observe any relation between fraction of left-handed bowlers and ranking intervals. In ODIs there exists a positive slope (See Table S7; $F(1, 98)=4.07$, $p=0.0465$, $R^2 = 0.0399$). This indicates that for bowlers, bowling left-handed is not an advantage in any forms of Cricket. Things look different for batsmen in ODIs where batting left-handed provides an advantage.

T20 Bowling (S1)

Source	SS	df	MS	Number of obs = 7		
Model	223.47619	2	111.738095	F(2, 4) =	18.23	
Residual	24.5238095	4	6.13095238	Prob > F =	0.0098	
Total	248	6	41.3333333	R-squared =	0.9011	
				Adj R-squared =	0.8517	
				Root MSE =	2.4761	

count	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
year	5499.631	1084.971	5.07	0.007	2487.269	8511.993
year^2	-1.369048	.270162	-5.07	0.007	-2.119138	-.6189575
_cons	-5523151	1089310	-5.07	0.007	-8547560	-2498742

ODI Bowling (S2)

Source	SS	df	MS	Number of obs = 25		
-----+-----				F(2, 22) =	64.49	
Model	655.610063	2	327.805032	Prob > F	= 0.0000	
Residual	111.829937	22	5.08317895	R-squared	= 0.8543	
-----+-----				Adj R-squared	= 0.8410	
Total	767.44	24	31.9766667	Root MSE	= 2.2546	

count	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
-----+-----						
year	201.498	38.85431	5.19	0.000	120.9191	282.0769
year^2	-.0502415	.0097184	-5.17	0.000	-.0703963	-.0300868
_cons	-202013	38834.53	-5.20	0.000	-282550.8	-121475.1
-----+-----						

Test Bowling (S3)

Source	SS	df	MS	Number of obs = 135		
Model	3080.73611	2	1540.36806	F(2, 132)	=	202.19
Residual	1005.63426	132	7.61844137	Prob > F	=	0.0000
Total	4086.37037	134	30.4953013	R-squared	=	0.7539
				Adj R-squared	=	0.7502
				Root MSE	=	2.7602

count	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
year	-1.78299	.6800458	-2.62	0.010	-3.128188	-.4377919
year^2	.0004898	.0001749	2.80	0.006	.0001438	.0008358
_cons	1624.518	660.8187	2.46	0.015	317.3534	2931.683

Test Batting (S4)

Source	SS	df	MS	Number of obs = 135		
-----+-----				F(2, 132) = 785.73		
Model	10594.974	2	5297.487	Prob > F = 0.0000		
Residual	889.959336	132	6.74211618	R-squared = 0.9225		
-----+-----				Adj R-squared = 0.9213		
Total	11484.9333	134	85.7084577	Root MSE = 2.5966		

count	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
-----+-----						
year	-6.114889	.6397396	-9.56	0.000	-7.380357	-4.84942
year^2	.0016294	.0001645	9.90	0.000	.0013039	.0019548
_cons	5741.218	621.652	9.24	0.000	4511.529	6970.908

ODI Batting (S5)

Source	SS	df	MS	Number of obs = 41		
Model	2237.65743	2	1118.82871	F(2, 38) =	84.13	
Residual	505.366964	38	13.2991306	Prob > F =	0.0000	
Total	2743.02439	40	68.5756098	R-squared =	0.8158	
				Adj R-squared =	0.8061	
				Root MSE =	3.6468	

count	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
year	63.56454	18.12749	3.51	0.001	26.86736	100.2617
year^2	-.0158119	.0045523	-3.47	0.001	-.0250276	-.0065962
_cons	-63853.37	18045.47	-3.54	0.001	-100384.5	-27322.23

T20 Batting (S6)

Source	SS	df	MS	Number of obs = 7		
Model	177.333333	2	88.6666667	F(2, 4)	=	21.28
Residual	16.6666667	4	4.16666667	Prob > F	=	0.0074
Total	194	6	32.3333333	R-squared	=	0.9141
				Adj R-squared	=	0.8711
				Root MSE	=	2.0412

count	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
year	4113.405	894.4344	4.60	0.010	1630.057	6596.753
year^2	-1.02381	.2227177	-4.60	0.010	-1.642173	-.4054461
_cons	-4131623	898011.5	-4.60	0.010	-6624903	-1638344

ODI Bowling (S7)

Source	SS	df	MS			
Model	.030679526	1	.030679526	Number of obs =	100	
Residual	.739184359	98	.007542698	F(1, 98) =	4.07	
Total	.769863885	99	.007776403	Prob > F =	0.0465	
				R-squared =	0.0399	
				Adj R-squared =	0.0301	
				Root MSE =	.08685	

fraction_left	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
rank	.0006068	.0003009	2.02	0.046	9.73e-06	.0012038
_cons	.1688902	.0175008	9.65	0.000	.1341603	.20362

ODI Batting (S8)

Source	SS	df	MS	Number of obs = 100		
-----+-----				F(1, 98) =	49.65	
Model	.247576933	1	.247576933	Prob > F	= 0.0000	
Residual	.488626402	98	.004985984	R-squared	= 0.3363	
-----+-----				Adj R-squared	= 0.3295	
Total	.736203335	99	.007436397	Root MSE	= .07061	

fraction_left	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
-----+-----						
rank	-.0017237	.0002446	-7.05	0.000	-.0022092	-.0012383
_cons	.320948	.0142289	22.56	0.000	.2927113	.3491848
-----+-----						

Logistic Regression Results

In ODI, there is a significant difference between average number of matches led by captains who bat left-handed with those who bat right-handed ($t = 2.69$, $p = 0.007$). In ODI cricket its seen that there is a significant difference between the left-handed and right-handed captains in terms of number of matches won (for ODI $t = 2.40$, $p = 0.017$). To check the robustness of the association between left-handedness and the number of matches, we perform a logistic regression of the form $\text{logit}(D_{left}) = C_0 + C_1M$, where D_{left} is a dummy variable which takes value 1 if a captain bats left-handed and is 0 otherwise. We observe that the number of matches led by a captain (M) is significantly ($P = 0.0119$) and positively associated with left-handedness. We also perform a logistic regression of the form $\text{logit}(D_{left}) = D_0 + D_1W$ for ODI matches. Here too we observe that number of matches won by a captain (W) is significantly ($P = 0.0247$) and positively associated with left-handedness. In ODI cricket we do not observe any advantage of left-handers over right-handers in terms of batting average ($t = -1.73$, $p = 0.084$). As before, we check the

robustness of the association of left-handedness and performance of a captain in ODI cricket. We perform a logistic regression of the form $\text{logit}(D_{left}) = A_0 + A_1 B_{Avg}$, where B_{Avg} is the batting average of the captain. We do not observe any significant association between batting average and left-handedness of the captain ($P = 0.08$).

ODI Captains - Number of Matches (S9)

Logistic regression	Number of obs	=	194
	LR chi2(1)	=	6.33
	Prob > chi2	=	0.0119
Log likelihood = -103.09616	Pseudo R2	=	0.0298

dummy_left	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
matches	.0090874	.0035978	2.53	0.012	.0020358	.016139
_cons	-1.48881	.21966	-6.78	0.000	-1.919336	-1.058285

ODI Captains - Number of Wins (S10)

```

Logistic regression
Number of obs   =      194
LR chi2(1)      =      5.04
Prob > chi2     =      0.0247
Pseudo R2      =      0.0237
Log likelihood = -103.73798

```

```

-----
dummy_left |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----+-----
      win |   .013975   .0062023    2.25  0.024   .0018188   .0261313
     _cons | -1.412165   .2071639   -6.82  0.000  -1.818199  -1.006131
-----

```

ODI Captains - Captaincy Span (S11)

Logistic regression	Number of obs	=	194
	LR chi2(1)	=	2.17
	Prob > chi2	=	0.1410
Log likelihood = -105.17593	Pseudo R2	=	0.0102

dummy_left	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
span	.0797564	.0535117	1.49	0.136	-.0251246	.1846375
_cons	-1.485301	.2793352	-5.32	0.000	-2.032787	-.9378136

ODI Captains -Batting Average (S12)

```

Logistic regression              Number of obs   =       193
                                LR chi2(1)       =       3.03
                                Prob > chi2        =       0.0819
Log likelihood = -104.47498      Pseudo R2      =       0.0143

```

```

-----
dummy_left |      Coef.   Std. Err.    z    P>|z|    [95% Conf. Interval]
-----+-----
batting_avg |   .0265207   .0154562    1.72   0.086   - .0037728   .0568142
      _cons |  -1.961719   .508635   -3.86   0.000   -2.958626   -.964813
-----

```

Information about players

- **Clem Hill**, the Australian left-handed batsman, ranked among the finest cricketers in the world during a long period. At the age of 16 he put together the remarkable score of 360 in an Inter-College match at Adelaide. Till 1893 This was the highest innings hit in Australia. He averaged 39.21 during his sporting days.
- **Maurice Leyland** played for England and scored 2,764 for England. In 41 Tests he averages 46.06 with nine centuries, seven of which are against the formidable Australian team.
- **Eddie Paynter** was a left-handed batsman who averaged 84.42 for his seven Tests against Australia, a figure which no other Englishman could approach. Overall Paynter's average was 59.23 in Test cricket. He was an attacking batsman, particularly effective against slow spin, but also played with aplomb against the quick bowlers.
- **Sir Garry Sobers** of West Indies scored 8032 in Test cricket which includes 22 centuries. He averages 57.78 in Test cricket. Apart from being an excellent batsman and a great left-arm slow bowler, he was an enterprising captain.

- **Arthur Morris** , the acme of elegance and the epitome of sportsmanship, scored 3533 runs at an average of 46.48 with personal highest Test score of 206 during his playing days for Australia.
- **Neil Harvey** is one of Australia's all-time favorite cricketing talents. He was a gifted left-hand batsman, brilliantly athletic fielder, and occasional off-spin bowler. He averages 48.41 in Test cricket.
- **Bert Sutcliffe** of New Zealand played 42 Tests, making 2,727 runs with an average of 40.10 and a highest score of 230 not out against India at Delhi in 1955-56. He also captained New Zealand in both Tests against the visiting West Indians in 1951-52, and again for the last two Tests in South Africa in 1953-54.
- **Wilfred Rhodes** of England was slow left-arm bowler who took 127 wickets in Test cricket with a bowling average of 26.96. He also scored 2325 runs with an average of 30.19.
- **Wasim Akram** of Pakistan is rated by many as the best left-arm fast bowler of all time, and his career record certainly speaks volumes about his abilities. In Test cricket he took 414 wickets at an average of 23.62, while in the ODIs he took 502 wickets with an average of 23.52.
- **Chaminda Vaas** of Sri Lanka has been rated as one of the great left-arm bowlers. He took 355 wickets in Test cricket (bowling average of 29.58) and 400 wickets in the ODIs (bowling average of 27.53).
- **Clive Lloyd** was a crucial ingredient in the rise of West Indian cricket. He was a hard-hitting left-handed batsman and one of the most successful captains in history of cricket having won two World Cups in 1975 and 1979. With an astute tactical brain he led the West Indies to the top of world cricket for two decades.
- **Sourav Ganguly** of India is placed sixth by Wisden in their greatest ODI batsmen of all time. He proved to be a tough, intuitive and uncompromising leader and galvanized his team to win abroad in Test matches and also led to the World Cup final in 2003. He is one of most successful captains of India.
- **Graeme Smith** of South Africa is not only a successful left-handed batsman but also one of the most successful captains in both forms of Cricket.

- **Stephen Fleming** of New Zealand will be remembered for being the most successful captain for his country and also one of the longest serving captains in the history of the game.