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The Factors Contributing to Overall Team Performance In Cricket Using Factor Analysis

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Abstract

Cricket, a sport known for its intricacy and diversity, requires an unusual combination of talents, techniques, and traits from its players. This research article uses factor analysis, a statistical instrument capable of uncovering latent factors. The research's objective is defined to find, assess, and understand the latent elements that contribute to cricket performance. The research goals are to uncover these hidden characteristics, evaluate their relative importance, and investigate potential relationships with player demographics and playing situations. This research article uses factor analysis, a statistical instrument capable of uncovering latent factors. This study aims to offer an organized system for understanding cricket aspects of performance, with practical benefits for players, coaches, and cricketing bodies. The findings from factor analysis promise to indicate that there are 4 factors involved in analysing the team performance for the tournament of ICC cricket world cup 2019.

Keyworks: cricket world cup, factor analysis, ICC, ODI cricket.

Introduction

Cricket in India is not just a sport. It is followed as a religion. Most of the people in this country who watches (or) follows the sport has their own sentiments about the game, as do the players who play it. On an international level, it is called the gentleman's game. The game is based on various aspects of 4 both physical and mental skills, strategy and also tolerance. Cricket is played in various formats, and each format has its own rules and regulations. Out of the mini formats at international level, cricket is observed to be played in three formats, from T20 cricket to test match cricket. The evolution of cricket has been great. among the formats the test cricket being the oldest which has more than 100 years of cricket and T20 being the newest format. As the game is changing day by day understanding the factors that contribute towards the success of the side needs to be analysed.

Professional cricket players endure a variety of hurdles, including physical fitness, technical prowess, resilience to stress, and strategic insight. Players must not only master these components but also create careful equilibrium between them in order to keep competing at the highest level. Understanding the underlying causes of cricket performance is critical for player development, talent discovery, and tactical team leadership.

While many studies have investigated into certain aspects of cricket effectiveness, such as batting tactics, bowling strategies, and mental toughness, there is a paucity of research that looked at the connected factors that influence effectiveness. The present investigation aims to fill that void through using a factor analysis to discover and quantify the hidden features that contribute to softball success.

In this research, we try to extract the factors that impact a cricket match or team performance the most. We are using tools that are powerful for factory analysis, like SPSS. Factor analysis is basically a method or a technique in which the large number of variables are collected to form a factor which has two or more variables based on the commonalities present between the variables in a single factor. The variables and the underlying communalities can be captured using factor analysis within a set of data. In cricket, factor analysis can assist in exploring the complexity of the game and getting to know the factors contributing to its success. By doing so, we can give valuable insights in terms of analytics to the players, coaches, and cricketing organisations.

Literature Survey

(Chowdhury et al., 2023)

This paper speaks about how cricket has changed the world since its introduction, and now that T20 cricket has taken place, the world has a new attraction. T20 cricket in India, called IPL, is the main focus of the study. The data from six years of IPL is collected and analysed here. In this paper, the impact of foreign players on the teams of the IPL is studied. This study has found out that 40 present influence of foreigners on the batting performance of the teams in the IPL and a 39persent influence of foreigners on the bowling performance of the team.

(Asad et al., 2022)

In this study, they have taken three international layers from three different countries, namely Rohit Sharma from India Ken Williamson from New Zealand and David Warner from Australia To find the effective runs they have scored and how they will impact the result of an ODI game. The data lacked variables like conditions and weather reports. The three players enter career stats until February 2022 have been taken for regression analysis and random forecast analysis. This paper tries to show the impact of a player on a cricket match.

(Rodrigues et al., 2019)

This paper focuses on evaluating of player performance based on the conditions and the level of performance so that the selectors can pick the best team for the different tour's. This research article uses factor analysis, a statistical instrument capable of uncovering latent factorsThe research suggests applying Multiple Random Forest Regression to forecast the batters and bowlers' qualities in ODI matches. The training dataset for this predictive model is a player's previous performance versus a certain opponent. The visiting team, opposition, and stadium are all input elements. Based on these inputs, the model creates a rank-wise list of batters and bowlers, assisting selectors to identify teams with desirable combination based on particular matchups.

(Sharp et al., 2011)

This research article uses factor analysis, a statistical tool is capable of uncovering latent factors the commercial success of Twenty20 cricket and its appeal to spectators, together with the Cricket International Council's support for world events and the earnings of the Indian Premier League. The strategy is demonstrated utilising data from South Africa's maiden Twenty20 World Cup in 2007. The research focuses on creating a system to evaluate player performance in Twenty20 cricket, which might be useful for picking teams and strategy.

Sricharan Shah 2017

In this paper, factor analysis is done for around $85 considering the 9th season of the Indian Premier League and 95 batsmen and 95 bowlers from the 2015 Cricket World Cup. The two different data sets are taken to compare the two formats of the game and find the comparison between the results. This person confirms the earlier studies that batting capabilities and cricket are more dominant than bowling capabilities.

Problem statement

While numerous studies have investigated individual aspects of cricket performance, such as batting techniques, bowling strategies, and mental resilience, there is a rareness of research that holistically examines the interconnected factors influencing performance. This study seeks to address this gap by conducting a factor analysis to identify and assess the latent factors that contribute to success in cricket.

Research Objectives

To achieve this purpose, the study will pursue the following objectives:

1. To uncover undetected variables that account for variances in cricket which in tern acts as indicators of performance.
2. To find for what extent these factors will imply the overall performance.

Framework

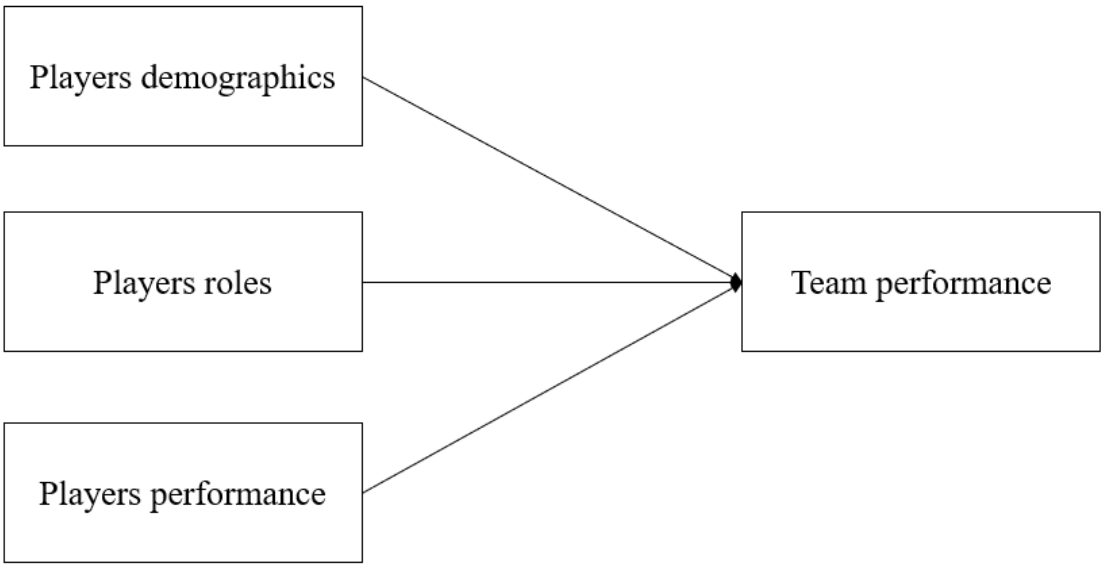


Fig: Framework of the research

Methodology

1. Data collection
   The study considers players who had played the 2019 cricket world cup. The 2019 cricket world cup was conducted in the ODI format. ODI cricket full form is one day international.
2. Secondary data was collected for the study. The data for this study was collected from various websites like cricbuzz.com and espncricinfo.com. A total of ten teams participated in the World Cup out of the qualified 16 teams according to the ranking, with a total number of players sums up to 150. This World Cup was hosted by England
3. Datavariables
   The data here was collected and filtered on the basis of performance-related variables, which are shown in the table below.

RUNS SCORED	THE TOTAL NUMBER OF RUNS SCORED IN THE WORLD CUP 2019
BATTING AVERAGE	IT IS DEFINED AS THE NUMBERS OF RUNS IN AVERAGE A PLAYER HAS SCORED
STRIKE RATE	IT IS DEFINED AS THE NUMBERS OF RUNS SCORED DIVIDED BY THE NUMBER OF BALLS FACED.
BOUNDARIES-4S	TOTAL NUMBER OF BOUNDARIES HIT BY THE BATSMAN
BOUNDARIES-6	TOTAL NUMBER OF BOUNDARIES HIT BY THE BATSMAN
CENTURIES	THE NUMBER OF TIMES THE PLAYERS HAD MADE 100 RUNS
HALF-CENTURIES	THE NUMBER OF TIMES THE PLAYERS HAD MADE 50 RUNS
WICKETS TAKEN	THE TOTAL NUMBER OF WICKETS TAKEN BY THE BLOWER
BOWLING AVERAGE	THE NUMBER OF WICKETS THAT A BOWLER CAN TAKE ON AN AVERAGE
ECONOMY RATE	THE NUMBERS OF RUNS THAT A BLOWER CAN CONCEDED
BOWLING-STRIKE RATE	THE RATE AT WHICH A BLOWER CAN TAKE A WICKET
MAIDEN OVERS	THE NUMBER OF OVERS A BOWLER HAS NOT GIVEN EVEN 1 RUN
FOUR-WICKET HAULS	THE NUMBER OF TIMES THE BOWLERS HAS TAKEN 4 WICKETS IN THE MATCH
FIVE-WICKET HAULS	THE NUMBER OF TIMES THE BOWLERS HAVE TAKEN 5 WICKETS IN THE MATCH
CATCHES TAKEN	THE TOTAL NUMBER OF TIMES A PLAYER HAS TAKEN IN THE TOURNAMENT
STUMPINGS	THE NUMBER OF TIMES THE WICKET KEEPER IS INVOLVED IN THE STUMPING OUT A BATSMAN

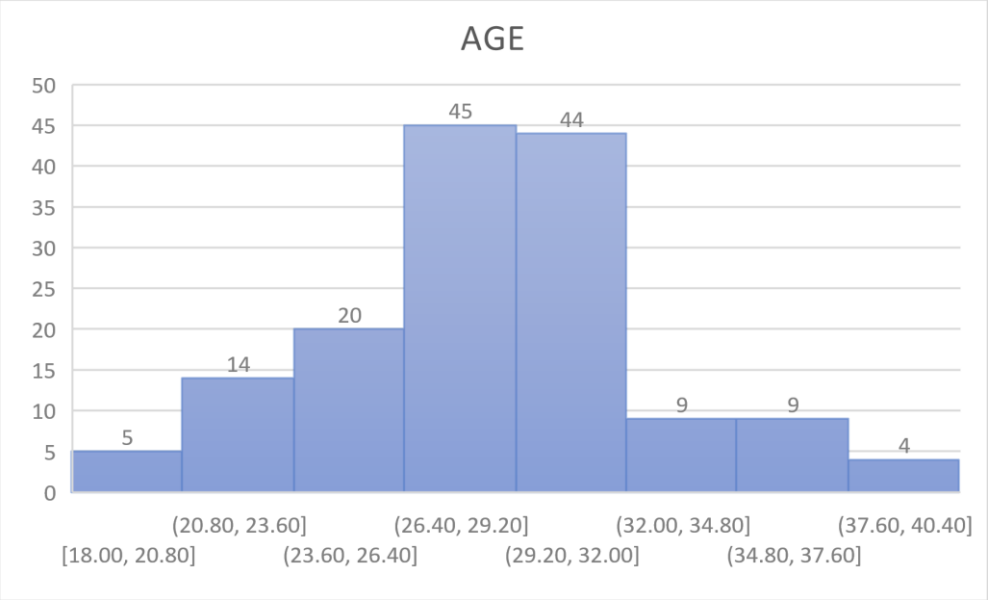
Table: The variables considered for the research

4. Data preprocessing
   Before conducting factor analysis, the data was collected to ensure that the variables were of the correct type.
5. Factor analysis: principal component factor analysis
6. Statistical software: SPSS version 27.

Demographics

When we compare the average age of the players from each team it is found that Bangladesh has the lowest average age as a team which is 27 years.

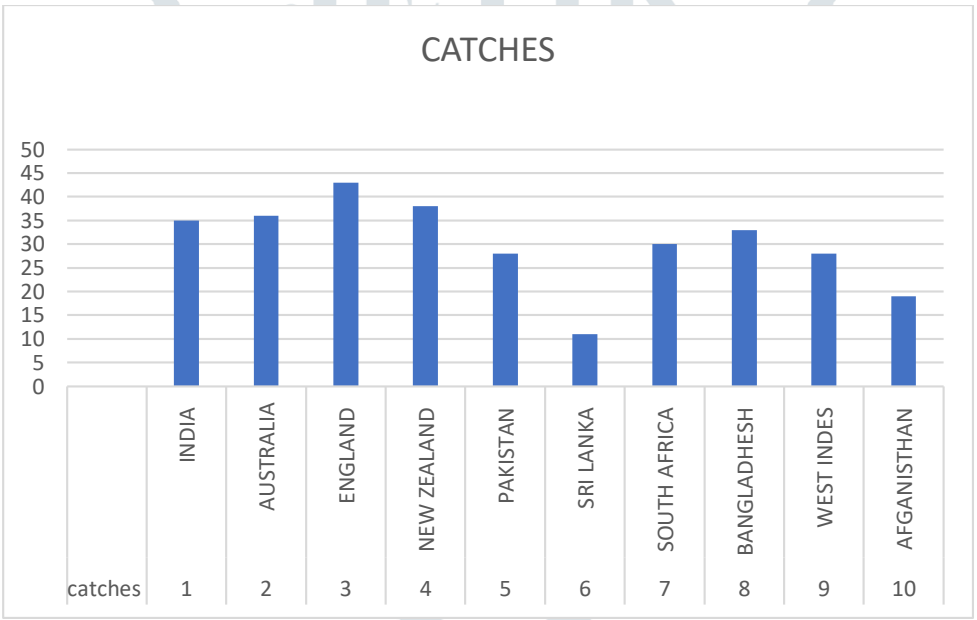
And south Africa and Australia having the average age of the team the highest with the average age of 30 years.



Coming to the catches in the tournament

England had the highest number of total catches taken by the team hence reaching the final of the tournament.

The second best was New Zealand with 38 catches and thus being the other team in the final of the tournament.



Results and discussion

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
Runs Scored	141.81	156.063	149
Batting Average	24.820335570469798	21.122695121857817	149
Strike Rate	79.044496644295280	34.280295842100720	149
Boundaries-4s	12.89	15.496	149
Boundaries-6	2.25	3.520	149
Centuries	.21	.640	149

Half-Centuries	.77	1.188	149
Wickets Taken	4.16	5.821	149
Bowling Average	27.043288590604020	42.691359630317160	149
Economy Rate	3.102416107382550	2.919332960419702	149
Bowling-Strike Rate	28.326308724832220	42.777624287246260	149
Maiden Overs	.89	1.691	149
Four-Wicket Hauls	.11	.377	149
Five-Wicket Hauls	.07	.300	149
Catches Taken	2.01	2.282	149
Stumpings	.08	.411	149

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.744
Bartlett's Test of Sphericity	Approx. Chi-Square	1963.693
	df	120
	Sig.	.000

Interpretation

From the table we can see that the KMO value is 0.744 which is greater than 0.5, hence can be used for factor analysis.

Communalities

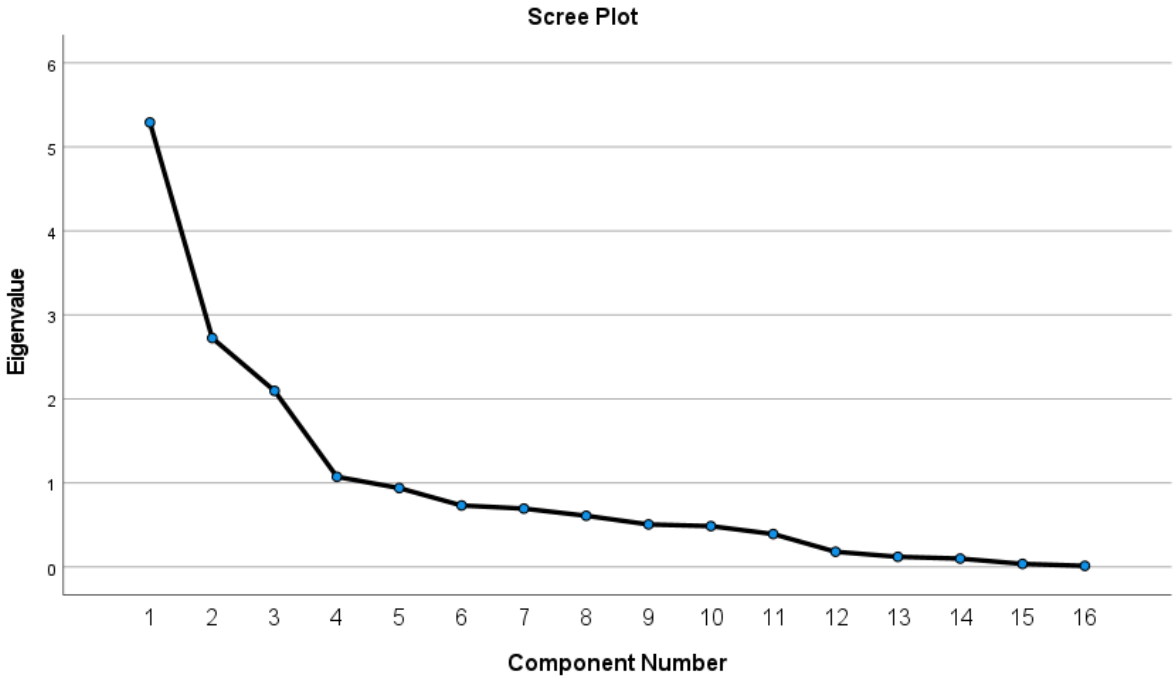
	Initial	Extraction
Runs Scored	1.000	.941
Batting Average	1.000	.794
Strike Rate	1.000	.381
Boundaries-4s	1.000	.878
Boundaries-6	1.000	.500
Centuries	1.000	.578
Half-Centuries	1.000	.655
Wickets Taken	1.000	.889
Bowling Average	1.000	.926
Economy Rate	1.000	.728
Bowling-Strike Rate	1.000	.922
Maiden Overs	1.000	.605
Four-Wicket Hauls	1.000	.540
Five-Wicket Hauls	1.000	.476
Catches Taken	1.000	.567
Stumpings	1.000	.807

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.292	33.073	33.073	5.292	33.073	33.073	4.732	29.578	29.578
2	2.725	17.032	50.105	2.725	17.032	50.105	2.681	16.758	46.336
3	2.096	13.101	63.206	2.096	13.101	63.206	2.579	16.121	62.457
4	1.074	6.711	69.917	1.074	6.711	69.917	1.194	7.460	69.917
5	.939	5.872	75.789						
6	.732	4.576	80.365						
7	.695	4.344	84.709						
8	.610	3.811	88.519						
9	.507	3.166	91.685						
10	.486	3.040	94.725						
11	.392	2.451	97.176						
12	.181	1.132	98.309						
13	.121	.756	99.065						
14	.100	.623	99.688						
15	.037	.229	99.917						
16	.013	.083	100.000						

Extraction Method: Principal Component Analysis.



From the above table and scree plot we can explain that the number of factors extracted is 4. And these 4 factors explain 69.98% of the total variance. The factor which is having eigen values more than 1 is considered.

Component Matrix[a]

	Component			
	1	2	3	4
Runs Scored	.930			
Boundaries-4s	.897			
Batting Average	.862			
Half-Centuries	.774			
Centuries	.678			
Boundaries-6	.645			
Maiden Overs	-.461	.452	.419	
Economy Rate	-.496	.676		
Wickets Taken	-.528	.556	.537	
Catches Taken		.543		
Strike Rate				
Bowling Average		.598	-.675	
Bowling-Strike Rate		.622	-.651	
Four-Wicket Hauls			.558	
Five-Wicket Hauls			.549	
Stumpings				.847

Extraction Method: Principal Component Analysis.

a. 4 components extracted.

The component matrix is showing that there is a high loading for only one factor which is wrong. Here there is a over lap between the variables and the factors. Hence we use the rotated component matrix.

Rotated Component Matrix[a]

	Component			
	1	2	3	4
Runs Scored	.951			
Boundaries-4s	.920			
Batting Average	.855			
Half-Centuries	.777			
Centuries	.730			
Boundaries-6	.701			
Catches Taken	.516			-.488
Strike Rate	.483			
Wickets Taken		.910		
Maiden Overs		.742		
Four-Wicket Hauls		.714		
Five-Wicket Hauls		.679		
Bowling-Strike Rate			.956	
Bowling Average			.956	
Economy Rate		.428	.695	
Stumpings				.884

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Interpretation

As one can observe the variables has only one factor with high factor loading.

1. The variables Runs Scored, Boundaries-4s, Batting Average, Half-Centuries, Centuries, Boundaries-6, Strike Rate contribute to the first factor and it is named as **Batting Attributes.**
2. Wickets Taken, Maiden Overs, Four-Wicket Hauls, Five-Wicket Hauls contribute to the second factor which can be named as **Bowling Attributes.**
3. Bowling-Strike Rate, Bowling Average, Economy Rate these variables contribute towards the team collective behaviour and this is the third factor extracted. The name for this factor is the **Collective Attributes**.
4. Catches Taken, Stumpings contribute to the 4th factor and can be named as **Fielding Attributes**.

Thus, over all 4 factors are extracted from the variables namely **Batting Attributes, Bowling Attributes, Collective Attributes and** as **Fielding Attributes**

Conclusion and Future Study

In conclusion, this research article used factor analysis as a powerful analytical technique to conduct an in-depth investigation into the elements that affect performance in the sport of cricket. We identified and looked at the latent aspects that lead to success at the cricket pitch using a broad sample of professional cricket players and an exhaustive evaluation of numerous associated with performance variables.

Our factor analysis research studies have shed light on the multidimensional nature of cricket performance. We found unique hidden elements that account for variances in cricket metrics for performance spanning from batting and bowling statistics to psychological variables and playing settings.

Studying the evolution of cricket players over time can provide a better understanding of how performance variables alter as players advance in their careers. Investigating the impact of technical advances in cricket, such as Hawk-Eye technology for ball detection or wearable performance monitoring devices, on the play of players and strategies.

Mental Health and Well-being Investigating cricket players' mental wellness and well-being, including the psychological elements that improve their resilience as well as performance amid duress.

Additional research should take consideration of the effects of external factors including as rule changes, warming temperatures altering playing circumstances, and the ever-changing baseball landscape

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