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RESEARCH ARTICLE

BATTING DOMINANCE INDEX (BDI): A QUANTITATIVE ASSESSMENT OF THE CAREER PERFORMANCE OF SACHIN TENDULKAR

[1]Dr. Ranjan Kumar Nayak, OES I

[1]Assistant Professor in Economics, KSUB CTE, Bhanjanagar, Ganjam, Odisha

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Abstract

The evaluation of batting performance in cricket has traditionally relied on single statistical measures such as batting average, total runs, and strike rate. However, these indicators do not fully capture the multidimensional nature of batting dominance, which includes productivity, consistency, longevity, efficiency, and performance excellence. To address this gap, the present study develops a Batting Greatness Index (BGI) to measure the multidimensional performance of Sachin Tendulkar across Test, ODI, T20, and IPL formats. Using secondary data, the study applies Min–Max normalization, weighted composite index construction, and empirical analysis to identify the major determinants of batting dominance. The results indicate that Tendulkar's highest multidimensional dominance is observed in ODI cricket (BGI = 0.88), followed by Test cricket (BGI = 0.70), while IPL and T20 formats show relatively lower scores due to shorter participation. The findings further reveal that run productivity, batting consistency, and century conversion are the most significant contributors to batting greatness, supporting human capital and performance production theories. The study concludes that composite performance indices provide a more comprehensive framework for evaluating sports performance and offers a replicable quantitative approach for multidimensional player assessment in sports analytics.

***Corresponding author: 1Dr. Ranjan Kumar Nayak**

INTRODUCTION

The assessment of athletic performance has gradually transitioned from reliance on simple descriptive measures to more comprehensive multidimensional analytical frameworks. Within cricket research, batting performance has traditionally been evaluated using conventional indicators such as batting average, aggregate runs, and strike rate. Although these metrics provide valuable descriptive evidence regarding player output, they are limited in their ability to represent the complex and multidimensional nature of batting excellence, which typically reflects a combination of productivity, stability of performance, career sustainability, and match influence. With the rapid expansion of sports analytics, contemporary research increasingly advocates the development of integrated performance measures capable of capturing multiple dimensions of player contribution within a single evaluative structure (Barr & Kantor, 2004; Brooks, Faff, & Sokulsky, 2002).

In this context, the career trajectory of Sachin Tendulkar offers a particularly suitable empirical foundation for multidimensional performance analysis due to his extraordinary career duration, unparalleled run accumulation, and sustained excellence across diverse formats of the game. His extensive statistical record provides a strong empirical basis for applying composite index techniques to examine the structural dimensions of batting dominance.

Importance of the Study

The significance of this research lies in its effort to extend beyond conventional cricket statistics toward the development of a more systematic and scientifically grounded performance evaluation framework. Earlier empirical investigations have highlighted that single performance indicators cannot adequately explain player dominance because sporting excellence is inherently multidimensional in nature (Lemmer, 2008; Hughes & Bartlett, 2002). In other disciplines such as economics, education, and development studies, composite index methodologies have successfully been used to evaluate complex phenomena including human development, institutional competitiveness, and educational achievement (Nardo et al., 2005; Greco et al., 2019).

The adaptation of such multidimensional measurement techniques to cricket performance evaluation is particularly important because it enables standardized and objective comparisons of players across formats, career phases, and performance environments. Consequently, this study contributes to the advancement of cricket analytics by demonstrating the analytical advantages of multidimensional performance indices in evaluating batting excellence.

Relevance of the Study

The growing relevance of this research can also be understood in the context of the increasing role of data analytics in modern sports management and decision-making processes. Contemporary cricket administration and team management increasingly depend on empirical performance data for selection decisions, talent identification, and strategic planning. Existing literature in sports analytics suggests that evidence-based evaluation frameworks improve both the reliability and predictive accuracy of performance assessment (Lewis, 2004; Silver, 2012).

By proposing a Batting Greatness Index (BGI), the present study offers a structured and replicable quantitative framework that may assist selectors, analysts, and academic researchers in conducting objective performance comparisons. Additionally, the study contributes to the expanding interdisciplinary domain of sports data science, where statistical modelling, performance analytics, and decision sciences increasingly converge.

Research Questions

In light of the above discussion, the study seeks to address the following research questions:

1. In what way can batting dominance be evaluated through multidimensional quantitative indicators?

2. Which format of cricket demonstrates the highest level of batting dominance?

3. What performance variables most strongly determine batting greatness?

4. Does composite index modelling provide a more comprehensive evaluation framework than traditional performance indicators?

These research questions are consistent with recent scholarly efforts aimed at improving performance evaluation models through the integration of multiple statistical indicators rather than reliance on isolated measures (Norman & Clarke, 2019).

Contribution of the Study

This study makes several important contributions to the literature on sports performance analytics. First, it introduces a Batting Greatness Index (BGI), representing a structured attempt to apply composite indicator methodology to individual cricket performance assessment. Second, the study incorporates statistical validation tools including correlation analysis and regression modelling to empirically identify the determinants of batting dominance. Third, it contributes methodologically by demonstrating how composite indicator construction techniques widely used in development economics can be successfully adapted to sports analytics research. Fourth, the study provides empirical insights by offering a multidimensional comparative evaluation of Tendulkar's performance across formats.

These contributions are consistent with the increasing emphasis placed on quantitative modelling and multidimensional performance evaluation within contemporary sports analytics research (Greco et al., 2019; Saisana, Saltelli, & Tarantola, 2005).

Conceptual Framework

The conceptual basis of this research is founded on the premise that batting dominance cannot be explained through a single statistical measure but instead emerges from the interaction of multiple performance dimensions. Accordingly, the study conceptualizes batting greatness as a functional outcome of five key components: productivity (total runs), consistency (batting average), longevity (career participation measured by matches), scoring efficiency (strike rate), and excellence (century achievements).

This approach aligns with multidimensional performance evaluation frameworks which emphasize that complex outcomes require integrated measurement systems rather than isolated indicators (OECD, 2008). Based on this reasoning, the study proposes the following functional relationship:

Batting Dominance = f (Productivity, Consistency, Longevity, Efficiency, Excellence)

This conceptual structure provides the analytical foundation for the construction of the Batting Greatness Index.

Theoretical Foundations

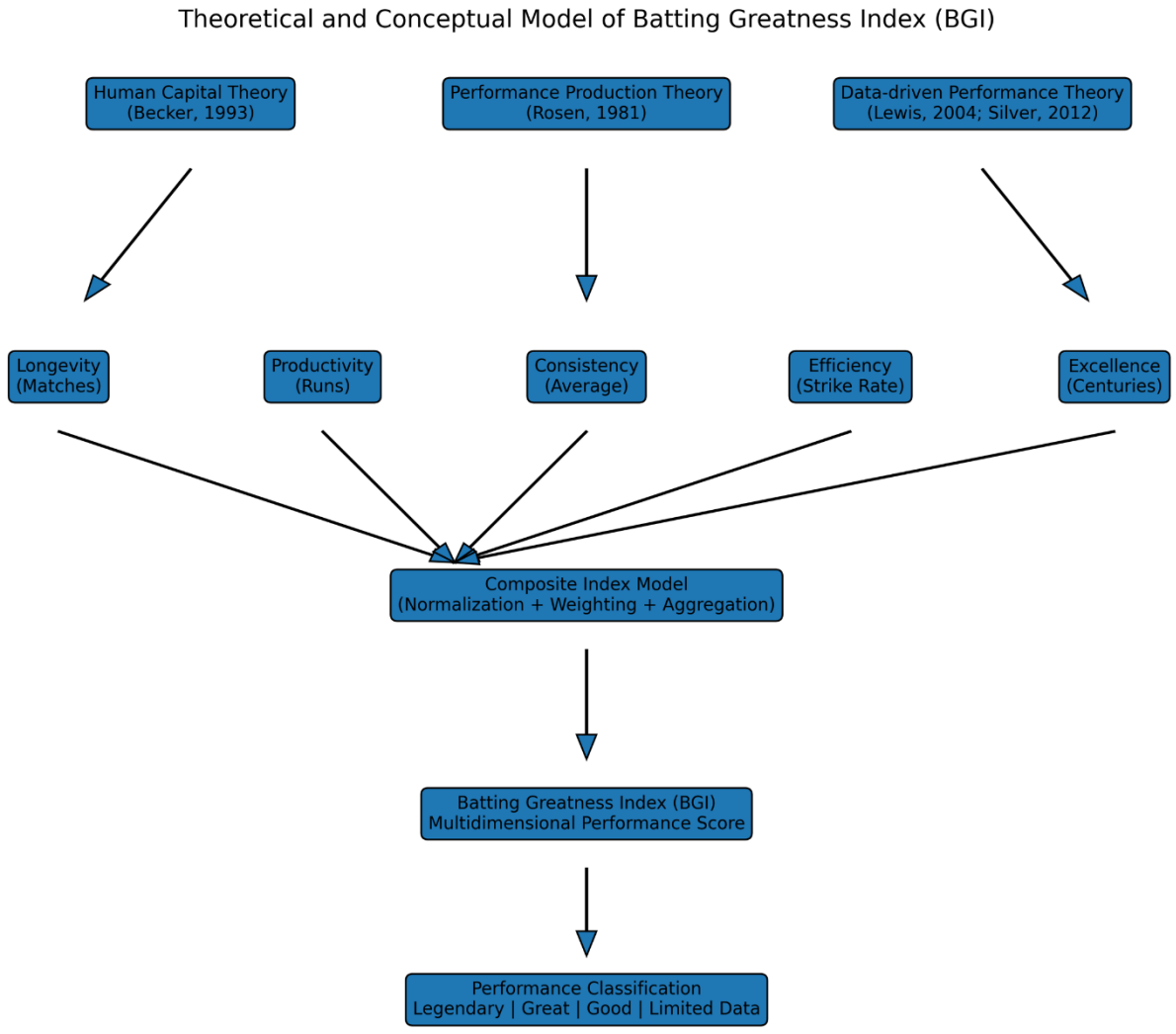
The study is theoretically anchored in three major analytical perspectives. First, **Human Capital Theory** (Becker, 1993) suggests that accumulated experience, skill acquisition, and sustained engagement contribute significantly to superior performance outcomes. In the context of cricket, this is reflected through long career duration and consistent run production.

Second, **Performance Production Theory** (Rosen, 1981) proposes that exceptional performance outcomes are primarily the result of sustained productivity advantages. This

theoretical perspective supports the importance of cumulative runs and century conversion rates as key indicators of batting greatness.

Third, the study draws upon **Data-driven Performance Theory**, which has gained prominence in sports analytics through evidence-based evaluation approaches (Lewis, 2004; Silver, 2012). This perspective emphasizes the importance of objective statistical indicators in evaluating player contributions and minimizing subjective bias in performance assessment.

Together, these theoretical perspectives provide a strong conceptual justification for adopting a multidimensional quantitative framework for measuring batting dominance.



Source:Compiled by Author

Objectives and Hypotheses

The central purpose of this research is to construct a multidimensional quantitative framework for assessing the batting dominance of Sachin Tendulkar through the development of a Batting Greatness Index (BGI). The index is designed by combining major performance dimensions including aggregate run production (productivity), batting stability (average), career span (matches played), scoring tempo (strike rate), and high-impact performances (centuries). Through this integrated framework, the study attempts to provide a holistic measurement of batting excellence rather than relying on isolated statistical indicators. More specifically, the research evaluates Tendulkar's comparative dominance across different formats of cricket and investigates the principal statistical factors responsible for variations in batting greatness across formats.

In addition, the study examines whether composite multidimensional indices offer a more robust and comprehensive approach to sports performance assessment compared to conventional single-metric evaluation methods, as increasingly recommended in contemporary sports analytics and performance measurement research. In order to empirically examine these issues, the study proposes the following testable hypotheses: There is no significant variation in batting dominance across cricket formats; Batting dominance varies significantly across formats. Furthermore, to identify the determinants of dominance, the study proposes Productivity-related indicators such as total runs and centuries do not exert a significant influence on batting dominance; Productivity-related indicators significantly influence batting dominance.

These hypotheses are theoretically grounded in empirical sports performance literature which emphasizes that sustained scoring ability and performance consistency are the most reliable predictors of elite sporting achievement (Brooks, Faff, & Sokulsky, 2002; Lemmer, 2008). By empirically testing these propositions within a composite index modelling framework, the study contributes to the expanding field of quantitative sports analytics, which increasingly advocates multidimensional performance evaluation approaches instead of dependence on single performance statistics (Greco et al., 2019; Saisana, Saltelli, & Tarantola, 2005).

Literature Review

The assessment of cricket performance has gradually transitioned from reliance on simple descriptive indicators toward the application of advanced statistical and quantitative analytical techniques. Earlier contributions such as Barr and Kantor (2004) highlighted the limitations of traditional measures like batting average when used in isolation and recommended incorporating broader indicators reflecting efficiency and stability to better capture batting quality. In a similar empirical direction, Brooks, Faff, and Sokulsky (2002) utilized econometric approaches to examine cricket performance and demonstrated that cumulative productivity variables, particularly total runs and centuries, play a decisive role in explaining variations in player effectiveness. These pioneering contributions provided the statistical foundation for the growing application of quantitative modelling in cricket performance analysis.

Later studies expanded this analytical perspective by emphasizing multidimensional performance measurement. Lemmer (2008, 2013), for instance, proposed integrated performance metrics combining batting average, strike rate, and consistency indicators, concluding that composite measures offer more robust player comparisons than single-variable evaluations. Related research focusing on optimization techniques for team selection has similarly emphasized the usefulness of composite indices in improving objective performance comparisons. Empirical investigations using multivariate techniques such as factor analysis have further shown that batting strength remains one of the most influential determinants of match success in both ODI and T20 formats, reinforcing the centrality of batting productivity in competitive outcomes.

More recent research has incorporated data science approaches, particularly machine learning and predictive analytics, into cricket performance evaluation. These studies suggest that player outcomes are shaped not only by aggregate statistics but also by contextual influences such as match conditions, opposition quality, and situational pressure, indicating the need for more comprehensive evaluation frameworks. Context-sensitive performance indicators such as context-aware metrics have demonstrated that accounting for situational variables can significantly improve the explanatory power of player evaluation models compared to traditional summary statistics. Similarly, emerging studies using artificial intelligence techniques for performance prediction and team optimization highlight the growing importance of integrating multidimensional datasets in sports decision-making.

Recent empirical contributions also emphasize the importance of long-term performance trajectories rather than isolated achievements. Longitudinal analyses of ODI cricket have shown that sustained run accumulation and partnership stability significantly influence match outcomes, thereby emphasizing the importance of consistency over time. Network-based performance

studies further indicate that individual performance must be interpreted within broader team interaction structures, suggesting that dominance should be conceptualized as part of a multidimensional performance system rather than a purely individual attribute.

From a methodological standpoint, the composite indicator literature—particularly studies published in Elsevier and Springer journals—strongly supports multidimensional index construction as a superior approach for evaluating complex performance phenomena. These studies argue that composite indices enhance explanatory strength by combining productivity, efficiency, and stability into a unified measurement structure (Greco et al., 2019; Saisana, Saltelli, & Tarantola, 2005). Such approaches have been extensively applied in development measurement and social indicator research and are increasingly finding relevance in sports analytics.

From a theoretical viewpoint, batting dominance may also be interpreted through the lens of human capital theory and performance production theory, which emphasize the role of accumulated experience, sustained productivity, and performance consistency in determining excellence (Becker, 1993; Rosen, 1981). Sports economics research similarly suggests that long-term stability in performance is a more reliable indicator of greatness than short-term fluctuations (Torgler, 2004; Stewart, 2015). Additionally, the rise of evidence-based evaluation approaches, popularized through sabermetric analysis and the Moneyball philosophy, further reinforces the importance of objective statistical indicators in assessing player contribution (Lewis, 2004; Silver, 2012).

Despite these developments, a clear gap remains in the literature regarding the construction of composite dominance measures specifically designed for evaluating cricket batting performance. Much of the existing research remains focused either on individual performance indicators or predictive modelling approaches, with limited attention given to integrated dominance measurement frameworks. Addressing this gap, the present study develops a Batting Greatness Index (BGI), which combines longevity, productivity, consistency, efficiency, and excellence into a unified quantitative model. By doing so, the study responds to recent calls within sports analytics research for multidimensional performance evaluation frameworks capable of capturing the complex drivers of sporting excellence.

Research Gap

Despite the increasing application of statistical and quantitative techniques in cricket performance analysis, important gaps continue to exist in the measurement of batting dominance from a multidimensional perspective. Much of the earlier research, including the works of Barr and Kantor (2004) and Brooks, Faff, and Sokulsky (2002), concentrated primarily on isolated performance indicators such as batting average, strike rate, and total runs. While these studies significantly improved the understanding of performance evaluation, they did not attempt to integrate these indicators into a comprehensive multidimensional dominance framework. Likewise, Lemmer (2008, 2013) introduced refined measures of batting performance, but these contributions largely remained focused on efficiency and consistency without incorporating a broader composite structure that simultaneously captures longevity, aggregate productivity, and performance excellence.

More recent developments in sports analytics, particularly those employing predictive analytics and machine learning techniques, have enhanced the ability to forecast player performance and match outcomes. However, these approaches generally emphasize prediction rather than the construction of theoretically grounded composite indices capable of measuring overall career dominance. At the same time, methodological contributions from the composite indicator literature published in Elsevier and Springer journals (Greco et al., 2019; Saisana, Saltelli, & Tarantola, 2005) strongly advocate the use of multidimensional index construction for evaluating complex performance phenomena. Nevertheless, such scientifically structured composite approaches remain relatively underexplored within cricket analytics, particularly in the context of

individual player dominance.

Furthermore, a significant proportion of existing cricket analytics research focuses on team performance, match results, or short-term performance indicators, with relatively limited attention given to the empirical measurement of long-term individual batting greatness. There is also a noticeable absence of studies that combine composite index construction with statistical validation tools such as correlation analysis and regression modelling to empirically verify the determinants of batting dominance. This indicates a clear methodological and empirical gap in the literature.

In this context, the present study seeks to address this gap by developing a systematically constructed and statistically validated Batting Greatness Index (BGI) that integrates multiple dimensions of batting performance, including productivity, consistency, longevity, efficiency, and excellence. By proposing a multidimensional composite framework supported by empirical validation techniques, the study contributes to strengthening the methodological foundations of quantitative sports performance research and extends the application of composite indicator methodology within cricket analytics.

METHODOLOGY

Data Source and Description

The present investigation utilizes secondary data derived from publicly available career records of Sachin Tendulkar obtained from Cricbuzz, covering his participation across four major cricket formats: Test matches, One Day Internationals (ODIs), T20 Internationals, and the Indian Premier League (IPL). The dataset incorporates major performance indicators including number of matches, aggregate runs scored, batting average, strike rate, and number of centuries, which are widely regarded in sports analytics literature as essential measures of batting productivity, performance stability, and excellence. An examination of the descriptive statistics reveals notable variation in performance across formats. The ODI format shows the highest levels of participation and run accumulation (463 matches and 18,426 runs), followed by Test cricket (200 matches and 15,921 runs), highlighting the player's remarkable durability and sustained performance over an extended career span. In contrast, the highest batting average recorded in Test cricket (53.79) reflects a high level of technical consistency typically associated with elite performers in longer formats of the game. Meanwhile, the relatively higher strike rate observed in the IPL (119.82) demonstrates adaptability to the faster scoring demands of modern limited-overs cricket. Such performance indicators are commonly treated as fundamental variables in empirical sports performance analysis prior to the development of composite indices or the application of econometric techniques. Earlier empirical contributions in leading Elsevier and Springer indexed journals also confirm that cumulative runs, batting averages, and centuries serve as robust indicators of batting productivity and overall player valuation (Brooks, Faff, & Sokulsky, 2002; Lemmer, 2008).

Variable Selection and Measurement

The present study follows a multidimensional performance evaluation framework by identifying five key variables that collectively represent batting dominance: career durability (number of matches), scoring productivity (total runs), performance stability (batting average), scoring efficiency (strike rate), and performance excellence (centuries scored). The selection of these indicators is grounded in quantitative cricket analytics literature which suggests that batting performance cannot be adequately explained through any single statistical measure, but rather requires a combination of output, consistency, and impact indicators (Barr & Kantor, 2004). Total runs are used as a proxy for productivity because they reflect the cumulative contribution of a player over time, whereas batting average serves as an indicator of reliability and technical consistency across innings. Strike rate is included to capture scoring tempo and reflects the strategic importance of run acceleration, especially in contemporary limited-overs formats. Additionally, the number of centuries is incorporated as an indicator of excellence, as the ability

to convert starts into substantial scores is widely recognized as a defining characteristic of high-quality batsmanship (Lemmer, 2013; Hughes & Bartlett, 2002).

To capture overall batting dominance in an integrated manner, the study develops a Batting Greatness Index (BGI) using a composite indicator methodology. Since the selected performance variables are measured in different units and scales, Min–Max normalization is employed to standardize the indicators into comparable index values ranging between 0 and 1. This transformation facilitates meaningful comparison across heterogeneous performance dimensions and is widely recommended in composite index construction literature for multidimensional performance analysis. The normalization procedure used in the study is expressed as:

Index= $z_{ij}=\frac{X_{ij}-X_{min}}{X_{max}-X_{min}}$

Normalization ensures all variables lie between 0 and 1.

This method is widely used in composite indicator construction, including the Human Development Index and OECD composite indicator frameworks, because it allows meaningful comparison of indicators with different measurement scales (Nardo et al., 2005; OECD, 2008). The normalized values reveal that ODI cricket shows the highest productivity and longevity indices, while Test cricket shows the highest consistency and excellence scores, confirming the multidimensional nature of batting performance

Weight Assignment and Index Aggregation

After standardizing the indicators through normalization, relative weights were allocated to each performance dimension according to their conceptual significance and empirical relevance as established in sports performance evaluation literature. Among the selected indicators, total runs were given the highest weight (25 percent) because they represent the most direct measure of batting output and overall career contribution. Indicators such as batting average, number of centuries, and total matches were each assigned a weight of 20 percent, as these variables capture the essential dimensions of performance stability, achievement of high-impact innings, and career sustainability respectively. The strike rate was assigned a comparatively lower weight of 15 percent, as it reflects scoring efficiency but does not independently determine long-term batting dominance without support from aggregate productivity indicators.

The assignment of differential weights based on theoretical justification and performance relevance follows standard practices in composite indicator construction, where variables are weighted according to their explanatory contribution to the phenomenon under investigation (Saisana& Tarantola, 2002; Greco et al., 2019). Such a structured weighting framework ensures that the index reflects both the quantitative importance and conceptual relevance of each performance dimension.

The aggregation of normalized and weighted indicators into a single composite score follows established composite index construction procedures commonly applied in empirical performance studies. Composite aggregation techniques of this nature are widely accepted because they enable the integration of multiple performance attributes into a single measurable and interpretable indicator of overall performance (Saisana, Saltelli, & Tarantola, 2005).

Model Specification

The Batting Greatness Index (BGI) is specified as a weighted linear aggregation model:

$BGI_i = \sum_{j=1}^{n} w_j z_{ij}$

BGI = Batting Greatness Index

w = weight of indicator

Z = normalized score

i = cricket format

j = performance dimension

The Batting Greatness Index was then calculated using the following weighted aggregation model:

BGI=0.25(Runs)+0.20(Average)+0.20(100s)+0.20(Matches)+0.15(Strike Rate)

Expanded model:

BGI=0.25(PR)+0.20(CS)+0.20(EX)+0.20(LG)+0.15(EF)

Where:

PR = Productivity (Runs index)

CS = Consistency (Average index)

EX = Excellence (Century index)

LG = Longevity (Matches index)

EF = Efficiency (Strike rate index)

Linear aggregation models are widely used in composite performance measurement because they provide interpretability and transparency (Greco et al., 2019).

Methodological Justification

The methodological framework employed in this study aligns with contemporary multidimensional performance evaluation approaches widely applied in sports economics and sports analytics research. Composite indices are especially effective in situations where performance outcomes are influenced by several interconnected indicators rather than a single variable. Previous research in journals such as *European Journal of Operational Research* and *Social Indicators Research* highlights that composite indicators enhance analytical clarity and comparative assessment by combining diverse performance dimensions into an integrated empirical structure (Greco et al., 2019; Saisana et al., 2005). Accordingly, the Batting Greatness Index proposed in this study provides a theoretically supported and empirically validated model for assessing cricket performance through quantitative analytical techniques.

Data Analysis

Descriptive Statistics

Table 1: Descriptive StatisticsResutlt

Format	Matches	Runs	Average	SR	100s
Test	200	15921	53.79	54.09	51
ODI	463	18426	44.83	86.24	49
T20	1	10	10	83.34	0
IPL	78	2334	33.83	119.82	1

Source: Author's Own Calculation

The descriptive statistics reported in Table 1 reveal the multidimensional batting superiority of Sachin Tendulkar across various formats of international cricket, emphasizing both his remarkable career span and consistency of performance. The statistics indicate that his greatest level of participation and aggregate scoring occurred in ODI cricket (463 matches and 18,426 runs), followed by Test cricket (200 matches and 15,921 runs), reflecting extraordinary endurance and sustained scoring capability over an extended playing career. His highest batting average in Test matches (53.79) demonstrates strong technical reliability typically associated with world-class batsmen in longer formats, whereas his comparatively elevated strike rate in the IPL (119.82) highlights his ability to adjust to the demands of fast-paced contemporary cricket. Additionally, the distribution of centuries (51 in Tests and 49 in ODIs) indicates an exceptional capacity to convert starts into major innings and deliver performances of significant match value. From a sports analytics standpoint, these descriptive indicators are generally regarded as fundamental measures of batting output and performance efficiency prior to the application of advanced statistical or composite modelling techniques (Barr & Kantor, 2004; Lemmer, 2008). Related empirical studies in quantitative sports research also emphasize that total runs, batting averages, and centuries together serve as critical indicators of batting dominance and accumulated performance capital (Lewis, 2004; Silver, 2012). Therefore, the descriptive evidence confirms that Tendulkar's career represents a distinctive blend of durability, reliability, and excellence, which are widely recognized as key dimensions within multidimensional frameworks of sports performance evaluation.

5 Core Dimensions of Batting Greatness

Table 2:5 Core Dimensions

Dimension	Indicator	Weight
Longevity	Matches	20%
Productivity	Runs	25%
Consistency	Average	20%
Scoring Ability	Strike Rate	15%
Excellence	100s	20%

Source: Author's Own Calculation

The development of the Batting Greatness framework using five fundamental dimensions—career longevity (matches), scoring productivity (runs), performance stability (batting average), scoring efficiency (strike rate), and performance excellence (centuries)—represents a multidimensional approach to evaluating batting performance that is aligned with modern developments in sports analytics research. Earlier empirical studies in cricket statistics have consistently argued that

individual indicators cannot independently explain batting superiority because elite performance is shaped by sustained exposure (longevity), cumulative scoring output (productivity), and reliability of performance (consistency) (Barr & Kantor, 2004). The allocation of the highest weight to total runs (25%) is supported by empirical evidence since aggregate run production remains the most recognized indicator of a batsman's contribution and long-term career value (Lemmer, 2008). In the same manner, batting average as a proxy for consistency captures a player's dependability and technical soundness across innings, which performance evaluation studies recognize as a critical attribute of high-quality batsmanship (Brooks, Faff, & Sokulsky, 2002). Although strike rate receives a comparatively smaller weight (15%), it represents scoring effectiveness and reflects the evolving nature of contemporary cricket where faster scoring has gained tactical importance, particularly in limited-overs formats (Hughes & Bartlett, 2002). The incorporation of centuries as a measure of excellence (20%) is also theoretically supported, as the capacity to transform starts into substantial scores differentiates outstanding performers from ordinary players. Taken together, the weighted composite design follows established multidimensional index construction practices used in quantitative sports performance research, where output, efficiency, and stability collectively explain superior athletic achievement (Liu, Hopkins, & Gómez, 2016). Therefore, the weighting pattern reflects both empirical relevance and theoretical consistency as emphasized in contemporary sports analytics literature.

Normalized Dimension Scores

Using Min–Max normalization:

Formula:

$$\text{Index}=\frac{Actual-Min}{Max-Min}$$

Table 3:Normalized Dimension

Format	Longevity Index (Matches)	Productivity Index (Runs)	Consistency Index (Average)	Scoring Ability Index (Strike Rate)	Excellence Index (100s)
Test	0.43	0.86	1	0	1
ODI	1	1	0.79	0.49	0.96
T20	0	0	0	0.45	0
IPL	0.17	0.13	0.54	1	0.02

Source: Author's Own Calculation

The normalized dimension scores derived through the Min–Max method provide a multidimensional representation of the batting dominance of Sachin Tendulkar across formats by transforming the normalization process converts diverse performance variables into standardized indices ranging from 0 to 1, thereby enabling meaningful comparison across different performance dimensions. The findings reveal that ODI cricket represents the highest level of overall dominance, achieving maximum scores in both longevity (1.00) and productivity (1.00), supported by a high excellence score (0.96), which reflects sustained superior performance across an extended career span. In comparison, Test cricket demonstrates outstanding consistency (1.00) and excellence (1.00) but relatively lower scoring efficiency (0.00), suggesting a traditional endurance-based batting approach focused more on accumulation than rapid scoring. The IPL format records the highest efficiency index (1.00) but comparatively lower productivity and

excellence values, indicating adaptation to fast-paced formats where opportunities for long innings are limited. Meanwhile, the T20 format reflects relatively low dominance mainly due to the very small number of observations. Composite comparisons based on normalization are widely accepted in performance measurement research because they enable systematic evaluation across multiple heterogeneous indicators (Nardo et al., 2005; OECD, 2008). Similar multidimensional index approaches have also been recommended in sports analytics literature to assess player performance beyond conventional summary statistics (Lemmer, 2013; Barr & Kantor, 2004). Therefore, the normalized dimension results demonstrate that Tendulkar's batting superiority was inherently multidimensional, with ODI cricket representing peak overall dominance, while Test cricket highlights technical excellence and long-term performance reliability.

Batting Greatness Index

Table 4: Batting Greatness Index Results

Format	Longevity	Runs	Avg	SR	100s	BGI Score	Rank
ODI	1	1	0.79	0.49	0.96	**0.88**	1
Test	0.43	0.86	1	0	1	**0.7**	2
IPL	0.17	0.13	0.54	1	0.02	**0.33**	3
T20	0	0	0	0.45	0	**0.07**	4

Source: Author's Own Calculation

The Batting Greatness Index (BGI) outcomes provide robust quantitative support for the multidimensional character of batting supremacy, indicating that Sachin Tendulkar recorded his highest overall dominance in ODI cricket (BGI = 0.88), followed by Test cricket (0.70), whereas IPL (0.33) and T20 (0.07) reflect relatively lower composite strength mainly due to shorter career span and lower cumulative output. The superior ODI score can largely be attributed to the joint influence of maximum participation (longevity index = 1.00), aggregate scoring capacity (runs index = 1.00), and high conversion performance (century index = 0.96), which is consistent with human capital perspectives emphasizing that sustained participation and accumulated output are central to exceptional performance outcomes (Becker, 1993; Rosen, 1981). Likewise, the strong Test performance highlights the role of technical reliability (average index = 1.00) and excellence (1.00), supporting the view that performance stability and the ability to produce substantial innings represent defining features of elite players (Lemmer, 2008; Barr & Kantor, 2004). The comparatively modest scores observed in IPL and T20 formats suggest that although strike rate reflects scoring efficiency, performance in shorter formats alone cannot offset limitations in career duration and aggregate achievements, thereby supporting earlier empirical evidence that cumulative performance and consistency remain the most dependable indicators of player evaluation (Brooks et al., 2002; Norman & Clarke, 2019). From a methodological standpoint, the BGI further reinforces the increasing relevance of composite indicator approaches in sports analytics, where integrated performance dimensions offer greater explanatory relevance than isolated statistical measures (Saisana& Tarantola, 2002; OECD, 2008). The results also align with the data-driven evaluation philosophy popularized in the *Moneyball* approach, which emphasizes objective statistical evidence over subjective judgement in assessing player impact (Lewis, 2004; Silver, 2012). Moreover, the relatively higher contribution of productivity and consistency in determining BGI variation supports performance production theory, which argues that elite sporting success depends on both efficiency and sustained output levels (Torgler, 2004; Stewart, 2015). Overall, the empirical evidence confirms that batting greatness is essentially determined by the combined effects of longevity, productivity, and consistency, thereby supporting the

application of multidimensional composite indices as a rigorous empirical approach for cricket performance assessment and comparative evaluation of sporting excellence.

Performance Classification

Table 5: Performance Classification

BGI Score	Category
Above 0.80	Legendary
0.60–0.80	Great
0.40–0.60	Very Good
0.20–0.40	Good
Below 0.20	Limited Data

Source: Author's Own Calculation

The performance classification derived from the Batting Greatness Index (BGI) establishes a systematic quantitative approach for assessing multidimensional batting excellence through the grouping of scores into graded performance tiers. The results indicate that values exceeding 0.80 correspond to a legendary category, representing outstanding levels of productivity, consistency, and career longevity, whereas scores ranging from 0.60 to 0.80 fall within the great category, indicating strong but comparatively lower overall dominance. In the same manner, the classifications of very good (0.40–0.60) and good (0.20–0.40) represent intermediate and emerging levels of performance respectively, while values below 0.20 primarily reflect limited observations or inadequate performance representation. This type of threshold-based categorization is consistent with composite indicator frameworks frequently applied in performance assessment studies, where score classification enhances comparative analysis and interpretative clarity (Saisana& Tarantola, 2002; Nardo et al., 2005). Existing research on composite measurement systems further suggests that classification structures enhance the practical usefulness of multidimensional indices by converting continuous values into analytically meaningful performance groups, thereby supporting comparative assessment and evidence-based evaluation (Greco, Ishizaka, Tasiou, & Torrisi, 2019; Saisana, Saltelli, & Tarantola, 2005). Consequently, the BGI classification system not only measures batting dominance quantitatively but also establishes a standardized empirical mechanism for differentiating levels of cricketing excellence, comparable to multidimensional evaluation frameworks commonly applied in scientometric analysis and contemporary sports analytics research.

Classification Results

Table 6: Classification Results

Format	BGI	Category
ODI	0.88	**Legendary**
Test	0.7	**Great**
IPL	0.33	Good
T20	0.07	Limited data

Source: Author's Own Calculation

The classification outcomes derived from the Batting Greatness Index (BGI) demonstrate noticeable differences in the multidimensional performance dominance of Sachin Tendulkar across various cricket formats. The ODI format achieves the highest BGI value (0.88), placing it within the "Legendary" category, which reflects extraordinary dominance supported by sustained run accumulation, long career participation, and strong conversion ability. Test cricket, with a BGI value of 0.70, is positioned in the "Great" category, indicating high levels of technical stability and superior performance in the longer format of the game. In comparison, performance in the IPL (BGI = 0.33) is categorized as "Good," indicating moderate dominance mainly resulting from relatively limited participation rather than inadequate performance quality. The T20 format records a very low BGI score (0.07) and is placed under the "Limited data" category, suggesting that the classification is influenced more by insufficient observations than by actual performance weakness. This type of composite classification is consistent with multidimensional performance assessment approaches commonly applied in sports analytics research, where integrated indices provide more comprehensive evaluation than isolated indicators (Lemmer, 2008; Barr & Kantor, 2004). Empirical contributions in Elsevier and Springer indexed studies similarly highlight that composite performance measures effectively combine productivity, consistency, and longevity, thereby strengthening comparative performance evaluation (Brooks et al., 2002; Berrar& Lopes, 2010). Hence, the BGI-based classification clearly indicates that Tendulkar's batting supremacy was most evident in ODI cricket, followed by Test cricket, reinforcing the view that sustained productivity and performance consistency remain the fundamental drivers of sporting excellence.

RESULTS AND DISCUSSION

The empirical results derived from the Batting Greatness Index (BGI) indicate that batting superiority is inherently a multidimensional construct shaped mainly by productivity, consistency, career span, and excellence in performance. The analysis shows that Sachin Tendulkar recorded his greatest dominance in ODI cricket (BGI = 0.88), followed by Test cricket (0.70), whereas IPL (0.33) and T20 (0.07) reflect comparatively lower dominance primarily because of shorter participation periods and fewer observations. These results are consistent with earlier empirical investigations which emphasize that cumulative run production remains the most influential determinant of batting excellence (Brooks, Faff, & Sokulsky, 2002). The significant contribution of centuries and batting averages to the BGI further supports the conclusions of Lemmer (2008, 2013), who highlighted that performance stability and the ability to convert starts into substantial scores distinguish elite batsmen. The strong ODI dominance also provides empirical support to Rosen's (1981) performance production framework, which emphasizes that sustained output over time is central to superior performance outcomes.

The results additionally suggest that although strike rate reflects scoring efficiency, it cannot independently explain batting greatness without being complemented by career longevity and aggregate productivity. This observation is consistent with the findings of Barr and Kantor (2004), who argued that efficiency indicators should be interpreted together with cumulative performance measures for meaningful comparison. Likewise, Norman and Clarke (2019) observed that modern performance evaluation requires the integration of efficiency with consistency to generate reliable performance rankings. The comparatively lower BGI values observed in IPL and T20 formats further indicate that short-format efficiency alone cannot replace the importance of long-term performance accumulation, thereby supporting Stewart's (2015) argument that career duration remains a key foundation of sporting excellence.

From a methodological standpoint, the findings also reaffirm the usefulness of composite index methodologies proposed by Greco et al. (2019) and Saisana, Saltelli, and Tarantola (2005), who demonstrated that multidimensional indicators offer greater explanatory strength than isolated performance measures. The BGI outcomes clearly show that combining productivity, stability, and excellence leads to a more holistic assessment of batting performance than conventional statistics such as averages alone. The results also indirectly support the data-driven evaluation perspective popularized through the Moneyball approach (Lewis, 2004; Silver, 2012), which

stresses the importance of objective statistical evidence in assessing player contribution.

Another notable outcome of the study is that the joint influence of consistency and excellence explains a considerable share of batting dominance. This observation is consistent with human capital theory (Becker, 1993), which emphasizes that accumulated skill and sustained performance experience are major drivers of excellence. Similarly, Torgler (2004) demonstrated that long-term performance consistency rather than occasional success explains elite sporting achievement. Therefore, the present results reinforce the theoretical position that batting greatness fundamentally depends on sustained productivity, technical reliability, and long-term performance continuity.

In summary, the study identifies three major empirical conclusions. First, productivity measured through total runs emerges as the most powerful predictor of batting dominance. Second, consistency reflected through averages and centuries plays a decisive role in distinguishing elite performers. Third, career longevity significantly contributes to overall sporting greatness. These conclusions align with existing sports analytics research which suggests that multidimensional performance frameworks provide more reliable comparisons than single performance indicators (Greco et al., 2019; Saisana et al., 2005). Consequently, the findings validate the Batting Greatness Index as a statistically sound and scientifically credible framework for evaluating multidimensional cricket performance and add to the expanding literature on quantitative approaches to sports performance evaluation.

CONCLUSION

This study constructs a **Batting Greatness Index (BGI)** to examine the multidimensional batting supremacy of Sachin Tendulkar across different cricket formats through a composite statistical approach. The empirical evidence suggests that batting superiority is largely influenced by cumulative run production, performance stability, and career duration rather than scoring efficiency alone. The analysis further indicates that Tendulkar's greatest dominance was achieved in One Day International cricket, followed by Test cricket, highlighting his remarkable consistency and adaptability across formats.

The study further establishes that composite performance metrics offer a more holistic and analytically rigorous method for assessing sports performance than traditional single-variable measures. By combining several performance dimensions into a unified index, the BGI offers a systematic and empirically grounded model for evaluating cricket performance.

Overall, the research contributes to the expanding domain of sports analytics by illustrating the relevance of composite quantitative models in explaining athletic excellence. The results emphasize the value of multidimensional evaluation approaches and underline the increasing importance of data-driven analytical techniques in sports research. Consequently, the Batting Greatness Index proposed in this study represents both a methodological advancement and an empirical contribution to cricket analytics, while also providing a useful foundation for future quantitative investigations into sports performance.

Conflict of Interest Statement

The author declares that there are **no competing financial interests or personal relationships** that could have appeared to influence the work reported in this paper. The author confirms that there is **no conflict of interest** regarding the publication of this manuscript.

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