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RECEIVED: November 12, 2025.

ACCEPTED: January 17, 2026.

PUBLISHED: January 27, 2026.

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Bibliometric Analysis of Sports Mental Toughness and Sports Self-esteem

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ABSTRACT

Background & objective: Mental toughness and self-esteem are distinct psychological constructs relevant to sport and exercise. This study aimed to examine publication trends, geographical contributions, influential publications, and thematic patterns in research on these constructs.**Materials for Analysis:** This bibliometric study analyzed Web of Science records published between 1991 and 2025. The searches retrieved 526 records on mental toughness and 2,071 on self-esteem. Bibliographic data were analyzed descriptively, and keyword co-occurrence networks were visualized using VOSviewer version 1.6.20. Data collection was conducted on 17 April 2025.**Results:** Publication activity increased in both research areas, with a notable rise in mental-toughness publications after 2015. Research articles represented the largest document category in both datasets. England led the mental-toughness corpus, whereas the United States led the self-esteem corpus. Mental-toughness keywords emphasized coping, psychological skills, motivation, stress, and self-efficacy. Self-esteem keywords covered broader themes, including exercise, health, body image, development, and physical activity.**Conclusions:** The findings reveal different thematic emphases in the retrieved literature. However, differences in search scope and corpus composition limit direct comparisons. Future research should refine search strategies, validate corpus relevance, and investigate the relationship between mental toughness and self-esteem using studies that measure both constructs.

Keywords

Mental Toughness; Self-Esteem; Sports Psychology; Bibliometrics; Bibliometric Mapping; VOSviewer.

CITATION APA STYLE 7:

Hossen, F. ., Das, P. K. ., & Mitra, M. (2026). Bibliometric Analysis of Sports Mental Toughness and Sports Self-esteem. *INSPIREE: Indonesian Sport Innovation Review*, 7(01), 66-73. <https://doi.org/10.53905/inspire.v7i01.164> <https://doi.org/10.53905/inspire.v7i01.167>

INTRODUCTION

Context Research Context and Significance

Sport psychology examines psychological processes influencing athletes' performance, motivation, well-being, and adaptation to competitive demands (Galily et al., 2024; Gupta, 2025). Among relevant psychological constructs, mental toughness and self-esteem represent distinct but potentially interconnected dimensions: mental toughness concerns responses to demanding situations, whereas self-esteem reflects evaluations of personal worth (Fullerton et al., 2021). Understanding these constructs can clarify research on coping, confidence, resilience, and athletes' experiences in sport. However, neither construct independently determines athletic success, which depends on interactions among psychological, physiological, technical, social, and environmental factors (Dohme et al., 2019; Fletcher & Sarkar, 2012; Thuany et al., 2026). Therefore, examining their research trajectories and conceptual and empirical connections is important for identifying existing knowledge, thematic developments, and gaps in sport psychology literature.

Conceptual and Theoretical Foundations

Mental toughness is commonly understood as a psychological capacity to cope with competitive pressure, adversity, and demanding performance environments. Key attributes include self-belief, motivation, concentration, and pressure management (Jones et al., 2002), while subsequent research has examined its dimensions, measurement, and

psychological correlates (Gucciardi et al., 2014). Previous reviews have also highlighted its relevance to sporting success and ongoing challenges in defining the construct (Cowden, 2017; Crust, 2007). In contrast, self-esteem refers to an individual's overall evaluation of personal worth (Rosenberg, 1965) and differs from self-confidence, self-efficacy, and sport-specific self-perceptions. Resilience is similarly related to, but distinct from, mental toughness (Fullerton et al., 2021; Lin et al., 2017). These distinctions are essential for interpreting research across sporting contexts and populations. In sport, mental toughness may relate to persistence and coping under pressure, whereas self-esteem concerns self-evaluation, social acceptance, and psychological well-being. Although the constructs may be interconnected, their relationship, direction, and magnitude require empirical investigation. Experiences of success, failure, selection, and social evaluation may influence athletes' self-perceptions and responses to challenges (Beck & Haigh, 2014; Hall & Lindzey, 1959), but theoretical arguments alone cannot establish reciprocal effects. Systematically examining the literature can therefore clarify how both constructs have been studied, how related concepts have been addressed, and whether their research traditions have developed in an integrated or fragmented manner (Zhang & Parker, 2018).

Development of the Research Field and Existing Evidence

Research on mental toughness has progressed from

qualitative studies of elite athletes to conceptual, measurement, and empirical investigations of coping, psychological skills, stress, and performance outcomes. Early research explored the attributes needed to sustain performance under pressure (Jones et al., 2002), while subsequent studies examined construct dimensionality, measurement, and sporting success (Gucciardi et al., 2014; Cowden, 2017; Crust, 2007). Despite this development, questions remain regarding conceptual definitions, measurement consistency, and the generalizability of findings. Meanwhile, self-esteem research spans self-evaluation, physical self-perceptions, social experiences, and well-being, including physical activity, body image, youth development, and psychosocial outcomes (Collins et al., 2019; Liu et al., 2015). Differences in definitions, measurement instruments, populations, and outcomes contribute to methodological heterogeneity and complicate comparisons between global self-esteem, physical self-perceptions, and sport-specific evaluations (Bustos et al., 2019; Chanal et al., 2005; Stein et al., 2007). Although mental toughness and self-esteem may both influence athletes' psychological functioning, their conceptual relevance does not necessarily indicate that they have been investigated jointly (Denovan et al., 2022; Golby & Wood, 2016). Their research traditions may overlap thematically while remaining largely separate. Establishing whether the literature is fragmented or integrated requires systematic evidence from publication patterns, citation relationships, and recurring research themes. Such an examination can clarify existing knowledge, identify underexplored connections, and guide future research on the relationship between these constructs in sport psychology.

Research Gap and Rationale for Bibliometric Analysis

Bibliometric analysis provides a quantitative approach to examining scientific development, intellectual structures, and thematic relationships through publication trends, citation patterns, collaboration networks, and keyword co-occurrence (Donthu et al., 2021; Župič & Čater, 2014). These methods complement narrative reviews by identifying influential publications, research communities, and recurring conceptual associations. However, bibliometric indicators reflect patterns of

scholarly attention rather than necessarily demonstrating research quality, theoretical validity, or causal relationships. Their interpretation therefore requires transparent search strategies, explicit inclusion criteria, reliable metadata, and reproducible analytical procedures. Although bibliometric mapping has been applied to sports mental toughness (Fatoni et al., 2026), the extent to which mental toughness and self-esteem share intellectual foundations, research communities, and thematic trajectories remains to be established. The principal research gap is therefore comparative and relational: whether these literatures converge around shared concepts and influential publications or develop along predominantly distinct trajectories. Addressing this gap requires systematic comparison of the two corpora using clearly documented search and analytical procedures. Accordingly, the originality of this study should be grounded in its verified comparative scope and empirical findings rather than an unqualified claim that no previous bibliometric investigation exists.

Research Objectives, Questions, and Contributions

This study aims to map the development, intellectual structure, and thematic trends of research on sports mental toughness and sports self-esteem through bibliometric analysis. It addresses five research questions concerning publication trends, influential contributors, citation patterns, thematic associations, and potential research gaps. The analysis also explores whether these two research areas exhibit conceptual convergence or remain largely distinct within the broader sport psychology literature. This study contributes to sport psychology by providing a comparative overview of the scientific literature, applying a systematic bibliometric approach, and identifying priorities for future research. The findings may help researchers and sport psychology professionals recognize established themes and formulate relevant empirical questions. However, the results must be interpreted in light of database coverage, search strategy, and metadata quality, as bibliometric patterns alone cannot establish causal relationships between mental toughness and self-esteem or their effects on athletic performance.

MATERIALS FOR ANALYSIS

Research Design

This study employs a bibliometric research design to examine the development, intellectual foundations, and thematic structure of research on sports mental toughness and sports self-esteem. Bibliometric analysis quantitatively identifies patterns in scientific production, citations, collaboration, and conceptual development (Donthu et al., 2021; Župič & Čater, 2014). The analysis combines performance analysis, which evaluates scholarly productivity and impact, with science mapping, which explores relationships among publications, researchers, and concepts (Aria & Cuccurullo, 2017). Because mental toughness and self-esteem are conceptually distinct constructs, their bibliographic records are initially analyzed as separate corpora before examining potential thematic connections. The research follows a systematic workflow involving database searching, eligibility assessment, metadata extraction, deduplication, standardization, bibliometric analysis, and interpretation. These procedures aim to ensure transparency and reproducibility, with the final analyses determined by the availability and quality of the retrieved bibliographic data.

Data Sources and Search Strategy

This study uses the Web of Science (WoS) as the primary bibliographic database, consistent with the original investigation, which reported a search conducted on 17 April 2025 using VOSviewer version 1.6.20. However, the original search syntax and database settings were insufficiently documented for exact replication. Scopus may be included as a complementary database to broaden coverage, provided that duplicate records, metadata inconsistencies, and differences in database coverage are addressed systematically. The search strategy distinguishes three objectives: identifying research on mental toughness in sport and exercise, research on self-esteem in these contexts, and publications explicitly addressing both constructs. This approach enables separate bibliometric mapping and examination of potential conceptual connections. The proposed search strings must be tested and documented before implementation, including the search date, database indexes, filters, and retrieval counts, to ensure transparency and reproducibility.

Table 1. Proposed database-specific search strategies

Search purpose	Web of Science Core Collection	Scopus
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Mental toughness corpus	TS=("mental toughness" AND (sport* OR athlete* OR exercise))	TITLE-ABS-KEY("mental toughness" AND (sport* OR athlete* OR exercise))
Self-esteem corpus	TS=("self-esteem" OR "self esteem") AND (sport* OR athlete* OR exercise))	TITLE-ABS-KEY(("self-esteem" OR "self esteem") AND (sport* OR athlete* OR exercise))
Joint-construct corpus	TS=("mental toughness" AND ("self-esteem" OR "self esteem") AND (sport* OR athlete* OR exercise))	TITLE-ABS-KEY("mental toughness" AND ("self-esteem" OR "self esteem") AND (sport* OR athlete* OR exercise))

Note. These are proposed queries, not verified retrieval results. WoS TS searches Topic fields, while Scopus TITLE-ABS-KEY searches titles, abstracts, and keywords. Search syntax and database behavior should be checked in the live interfaces before execution.

Bibliometric Tools and Analytical Procedures

Bibliometric analyses should use clearly documented software, versions, and procedures. VOSviewer version 1.6.20 and complementary tools such as Bibliometrix should be reported only if actually used (Aria & Cuccurullo, 2017). Annual publication output should be examined separately for mental toughness, self-esteem, and joint-construct corpora where sufficient records are available. Performance analysis should assess authors, journals, institutions, and countries using defined indicators, including publication and citation counts and the h-index where appropriate. Counting methods should be specified, and publication productivity distinguished from citation impact, considering publication age and database coverage. Citation, co-citation, and bibliographic coupling analyses can identify influential publications, intellectual foundations, and shared reference patterns (Zupic & Čater, 2015). Keyword co-occurrence analysis should examine recurring conceptual associations after standardizing spelling variants and synonyms, while distinguishing author keywords from indexed keywords where appropriate. Co-authorship analysis may examine collaboration among authors, institutions, and countries. For each network, researchers should document the unit of analysis, counting method, thresholds, and relevant software settings. Network links and clusters should be interpreted as patterns of scholarly association rather than evidence of causality, theoretical equivalence, research quality, or formal research consortia.

Network Construction and Visualization

VOSviewer may be used to construct and visualize bibliometric networks by specifying the analysis type, unit of analysis, counting method, and applicable minimum-occurrence or minimum-citation threshold. Normalization, clustering, and other settings should be documented, including whether default or customized values were applied. Network maps represent publications, authors, sources, institutions, countries, or keywords as nodes, with links indicating bibliometric relationships and link strength reflecting their measured intensity. Cluster colors distinguish groups identified by the clustering algorithm, while spatial proximity illustrates network relatedness rather than causal influence or substantive equivalence. To support reproducibility, the study should retain the exported data, search records, thesaurus file where applicable, and relevant software settings. These materials or suitable derived files should be shared as supplementary resources where feasible and permitted by database licensing. Figures should be exported at sufficient resolution for labels and links to remain legible, with captions specifying the unit of analysis and principal analytical settings.

Research Questions and Analytical Alignment

The analytical framework should align each research question with an appropriate indicator, unit of analysis, and expected output. The following table presents the proposed alignment for the revised study.

Table 2. Alignment between research questions and bibliometric analyses

Research question	Bibliometric indicator or technique	Unit of analysis	Software or procedure	Expected output
RQ1. How has scientific production evolved over time?	Annual publication counts and descriptive temporal analysis	Publications by year	Database exports; Bibliometrix or reproducible descriptive analysis	Annual production table and trend graph
RQ2. Which authors, journals, institutions, and countries contribute most substantially?	Publication counts, citation indicators, and h-index where appropriate	Authors, sources, institutions, countries	Bibliometrix or database-derived indicators	Productivity and citation tables
RQ3. What intellectual foundations characterize the field?	Citation and co-citation analysis	Documents, cited references, authors, or sources	VOSviewer; cited-reference analysis	Citation tables and intellectual-structure maps
RQ4. What conceptual and thematic groupings emerge?	Keyword co-occurrence and cluster interpretation	Author keywords or indexed keywords	VOSviewer; thematic analysis if supported	Keyword network and cluster summary
RQ5. What research directions are suggested by the mapped literature?	Temporal keyword analysis where available, bibliographic coupling, and critical interpretation	Keywords and documents	Selected mapping procedures plus manual examination of relevant publications	Evidence-informed future research priorities

Collaboration analysis should be included as a complementary procedure if the study intends to describe research collaboration among authors, institutions, or countries. Bibliographic coupling should likewise be reported only if the corresponding analysis is actually conducted. Each final research question must be answerable using the available metadata and the analyses reported in the manuscript.

Reliability, Transparency, and Methodological Limitations

Transparency and reproducibility require documenting search strings, retrieval dates, inclusion criteria, data-cleaning procedures, software versions, and analytical thresholds. Search strategies, thesaurus files, and analysis scripts should be shared

as supplementary materials where permitted. Reviewer procedures, inter-rater reliability, and validation processes should be reported only when actually performed. Several limitations may affect interpretation, including database coverage, search terminology, eligibility criteria, and incomplete or inconsistent metadata. Citation counts are also influenced by publication age and disciplinary practices. Furthermore, bibliometric indicators describe publication patterns and scholarly relationships but cannot independently establish intervention effectiveness or causal relationships between mental toughness and self-esteem. Findings and future research priorities should therefore distinguish observed bibliometric patterns from conclusions requiring further empirical investigation.

RESULTS

Research trends on sports mental toughness

Upon searching on the Web of Science, 526 results of sports mental toughness that are present globally appeared on the screen. This data search revealed that no Indian publications were present on sports mental toughness, clearly indicating the need for exploring the topic to enhance sports performance. Moreover, the extent of work published in the area of sports mental toughness is very limited and could be explored more globally and nationally. The exponential growth was found by searching the number of publications done over a period of time, i.e., the number of publications increasing with increasing time. Before 2015, very limited research was done on this particular

topic. Nevertheless, after 2015 the number of publications increased drastically, as shown in Figure 1, indicating increasing interest in or requirement of conducting research in this particular area. The exported data of publications types revealed that out of 526 publications, 85.93% publications are research articles and remaining 14.06% publications are falls under meeting abstract, review, early excess, editorial material, book review, proceeding paper and book chapter as shown in the Figure 2. The top 20 countries involved in sports mental toughness are given in the Figure 3. England is the top most country involved in sport mental toughness research followed by USA, Australia, China, and Canada.

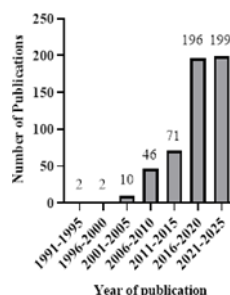


Figure 1. Number of publications on sports mental toughness over period of time

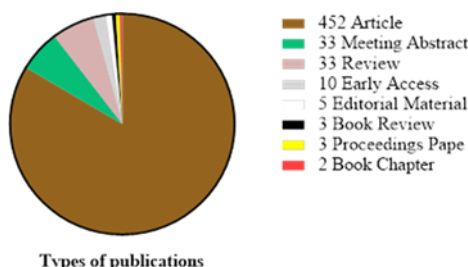


Figure 2. Types of publication on sports mental toughness

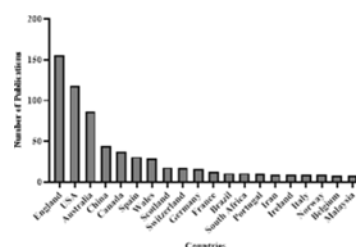


Figure 3. Top 20 countries involved in sports mental toughness research

The most cited top 5 publications (As per Web of Science) on sports mental toughness with their journal name and citation score are presented in the Table 3.

Table 3. Most Cited publications on Sports mental toughness as per Web of Science

SL No	Publication Name	Journal Name	Citations
1	Psychological Characteristics and Their Development in Olympic Champions	Journal of Applied Sport Psychology	613
2	What Is This Thing Called Mental Toughness? An Investigation of Elite Sport Performers	Journal of Applied Sport Psychology	389
3	Psychological Resilience in Sport Performers: A Review of Stressors and Protective Factors	Journal of Sports Sciences	328
4	A Framework of Mental Toughness in the World's Best Performers	The Sport Psychologist	248
5	The Concept of Mental Toughness: Tests of Dimensionality, Nomological Network, and Traitness	Journal of Personality	237

VOSViewer data on Sports Mental Toughness

As shown in the Figure 4, the keywords related to sports mental toughness in different publications are personality, sports psychology, athlete, coping strategies, coping skills, self-efficacy,

psychological skill, social support, health, toughness, motivation, mental health, goals, self-confidence, competition, talent identification, stress, anxiety, exercise, experience, well-being, emotional intelligence and many more.

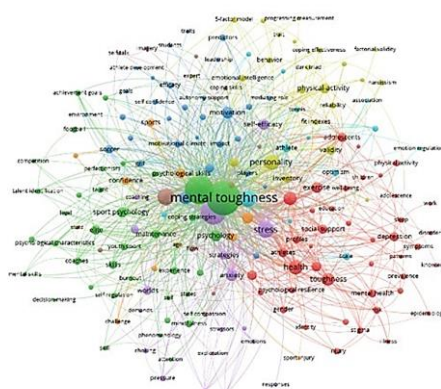


Figure 4. Global network visualization map on sports mental toughness research

Research trends on Sports self-esteem

Upon searching on the Web of Sciences, total 2071 publications of sports self-esteem were found globally and the number of publications on sports self-esteem increased

exponentially. Whereas, only 8 results were found nationally on sports self-esteem which clearly shows though globally sports self-esteem are trending, it is not explored in India. Hence,

research on sports self-esteem need to be done for the upcoming generation. This study found that out of 2071 publications, 92.22% publications are research articles and remaining 7.77% publications are falls under other types of publications as shown in the Figure 6. The top 20 countries involved in sports self-

esteem are given in the Figure 7. USA is the top most country involved in sport self-esteem research followed by England, Japan, Canada, and Australia. India holds 49th position for publishing on Sports self-esteem.

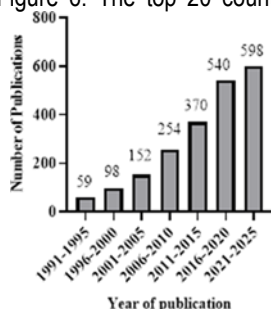


Figure 5. Number of publications on sports self-esteem over period of time



Figure 6. Types of publication on sports self-esteem

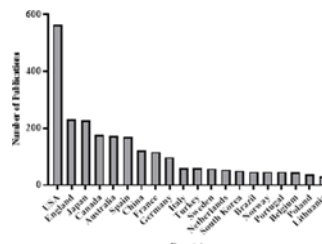


Figure 7. Top 20 countries involved in sports self-esteem research toughness

This research calls for exploring the sports self-esteem in order to enhance the sports performance and success in India. The most cited top 5 publications (As per Web of Science) on

sports self-esteem with their journal name and citation score are presented in the Table 4.

Table 4. Most Cited Publications on Sports Self-Esteem as per Web of Science

SL No	Publication Name	Journal Name	Citations
1	Physical activity and mental health in children and adolescents: a review of reviews	British Journal of Sports Medicine	1,479
2	A systematic review of the psychological and social benefits of participation in sport for children and adolescents: informing development of a conceptual model of health through sport	International Journal of Behavioural Nutrition and Physical Activity	1,395
3	Toward a psychology of positive youth development	American Psychologist	1,316
4	Reciprocal Effects of Self-Concept and Performance From a Multidimensional Perspective Beyond Seductive Pleasure and Unidimensional Perspectives	Perspectives on Psychological Science	867
5	The influence of physical activity on mental well-being	Public Health Nutrition	741

VOSViewer result on Sports self-esteem

The national network visualization map for sports self-esteem presented in the Figure 8. As shown in the Figure 8, the keywords related to sports self-esteem in different publications are Covid-

19, self-efficacy, gym, exercise, lockdown, adherence, music, gym workout, esteem, life, social support, athletes, body image, sedencary behaviour, school, enrolment, coaching, participation and few more.

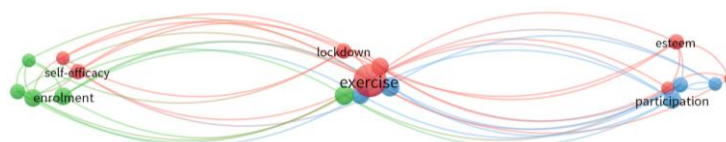


Figure 8. National network visualization map on sports self-esteem

The global network visualization map for sports self-esteem presented in the Figure 9; the keywords related to sports self-esteem in different publications are children, exercise,

adolescents, esteem, health, personality, anxiety, gender, stress, obesity, perceptions, sports participation quality of life and many more.

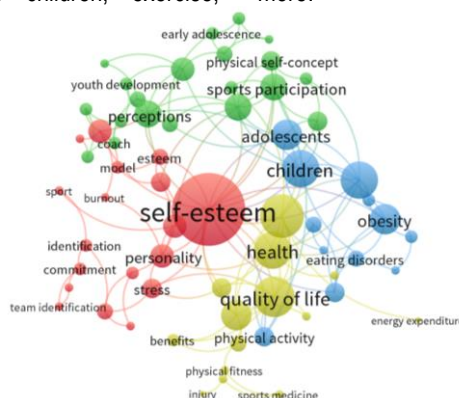


Figure 9. Global network visualization map on sports self-esteem

DISCUSSION

Overview and Interpretation of the Main Findings

This bibliometric study examined sports mental toughness and sports self-esteem research using Web of Science (WoS)

records published between 1991 and 2025. The reported searches retrieved 526 records on mental toughness and 2,071 on self-esteem, with publication activity increasing over time and

a notable rise in mental-toughness publications after 2015. England led the mental-toughness corpus, whereas the United States led the self-esteem corpus. The keyword patterns also differed: mental toughness was associated with coping, psychological skills, motivation, stress, and self-efficacy, while self-esteem encompassed exercise, health, development, body image, and physical activity. These findings suggest distinct thematic emphases within the broader sport and exercise psychology literature (Biddle & Asare, 2011; Zeiger & Zeiger, 2018). However, the larger self-esteem corpus should be interpreted cautiously because it may include broader physical activity, health, and developmental research rather than exclusively sport-specific self-esteem studies. Therefore, publication volume does not necessarily indicate the relative importance of either construct. Although the findings provide an initial comparison of publication patterns, geographical representation, influential publications, and keyword emphases, the available results do not establish detailed intellectual structures or collaboration networks because complete network statistics and co-citation, bibliographic coupling, and co-authorship analyses were not documented. Future research should refine search strategies, validate corpus relevance, and report comprehensive network indicators to clarify the conceptual connections between mental toughness and self-esteem.

Evolution and Development of the Research Field

Publication activity increased in both research areas, with a more noticeable rise in mental-toughness publications after 2015. These trends suggest growing scholarly attention, although the available results do not establish statistically defined developmental phases or exponential growth. Previous research has explored mental toughness in relation to conceptualization, assessment, coping, and sporting performance (Crust, 2007; Cowden, 2017; Gucciardi et al., 2014; McKay et al., 2023). However, the bibliometric findings cannot determine the factors responsible for the observed increase. Self-esteem research encompasses broader physical activity, health, developmental, and psychosocial themes, including youth mental health, sport participation, self-concept, and well-being (Eime et al., 2013; Nuryana et al., 2023). This breadth may partly explain the larger self-esteem corpus but also raises questions about its specificity to sport-related self-esteem.

Intellectual Structure and Influential Knowledge Foundations

The highly cited mental-toughness publications reported in Table 1 address elite performers' psychological characteristics, conceptual definitions, resilience-related processes, and the construct's dimensional and nomological properties. These themes reflect scholarly interest in defining, measuring, and understanding mental toughness in relation to sporting outcomes (Jones et al., 2002; Crust, 2007; Gucciardi et al., 2014; Cowden, 2017). In contrast, the self-esteem citation ranking encompasses broader intellectual traditions, including developmental psychology, public health, physical activity, and self-concept research. The reported publications address youth mental health, the psychosocial benefits of sport participation, positive youth development, self-concept and performance, and physical activity-related well-being (Eime et al., 2013; Wade et al., 2026). However, these topics do not necessarily indicate a direct focus on sport-specific self-esteem or its relationship with mental toughness (Lin et al., 2017). These differences suggest distinct thematic emphases in the retrieved corpora, although the interpretation remains provisional because citation rankings do not constitute formal co-citation analysis. Citation frequency may

reflect theoretical contributions, methodological approaches, or review value, but does not independently establish research quality or theoretical validity. Moreover, older publications generally have had more time to accumulate citations. Future analyses should distinguish total citations from citation rates, consider publication age, and verify each publication's relevance to the focal constructs. A more comprehensive assessment of intellectual structure would require co-citation networks, cluster composition, and examination of the publications underlying each cluster.

Conceptual and Thematic Structure

The mental-toughness keyword map highlights coping, self-efficacy, psychological skills, motivation, stress, self-confidence, and emotional intelligence, reflecting psychological processes relevant to athletes' responses to demanding situations (Ayranci & Aydın, 2025; Corrêa et al., 2023). However, these constructs are distinct: self-efficacy concerns perceived capability, self-esteem reflects personal worth, and resilience overlaps with but differs from mental toughness (Gupta & McCarthy, 2022). In contrast, self-esteem maps encompass broader themes of exercise, health, body image, youth development, and psychosocial well-being, including COVID-19 and physical activity-related topics (Balloo et al., 2024; Tomanek & Lis, 2021; Liu et al., 2015). These differences may partly reflect search scope and corpus composition rather than fundamental distinctions between the constructs. Understanding their relationship requires distinguishing general, physical, and sport-specific self-esteem from self-confidence and self-efficacy. Separate keyword searches cannot establish empirical connections between mental toughness and self-esteem; future research should use joint searches and systematically examine studies measuring both constructs. Complete network statistics, including cluster membership, link strength, counting methods, and clustering settings, are also needed to support robust interpretations. Documented keyword standardization and sensitivity analyses would further improve transparency and determine whether the observed thematic patterns remain consistent across analytical procedures.

Comparison with Previous Studies

The findings align with sport psychology literature emphasizing coping, competitive pressure, psychological skills, and performance-related characteristics in mental-toughness research (Crust, 2007; Jones et al., 2002; Gucciardi et al., 2014; Cowden, 2017). The reported keyword patterns reflect these established research interests, although keyword occurrence does not establish the strength or direction of relationships examined in individual studies. In contrast, the self-esteem corpus encompasses broader themes, including physical activity, mental health, youth development, self-concept, and well-being. This breadth raises questions about whether the retrieved publications specifically address sport-related populations and constructs (Collins et al., 2019; Oliván et al., 2019). The study follows established bibliometric approaches to publication trends, citation patterns, and keyword co-occurrence (Donthu et al., 2021; Župič & Čater, 2014), but stronger interpretation requires transparent search strategies, corpus validation, and detailed network indicators (Eck & Waltman, 2009). The geographical findings also require verification. England was reported as the leading country in mental-toughness research, whereas the United States led the self-esteem corpus. The reported absence of Indian publications in the mental-toughness results contrasts with eight national results and a 49th-place ranking in the self-esteem section. These discrepancies cannot be resolved without

checking the original database records and search procedures. Accordingly, country-level publication counts should be interpreted in relation to database coverage and retrieval criteria rather than as definitive indicators of national research capacity.

Practical Implications

The findings may help sport psychologists and coaches identify relevant areas for athlete development, including coping strategies, psychological skills, confidence, self-esteem, and resilience. However, these constructs should be distinguished when designing assessments or interventions, and practical decisions should be guided by empirical evidence and athletes' individual needs. The bibliometric results identify research themes but do not establish the effectiveness of specific interventions or coaching approaches. For researchers and sports organizations, the geographical distribution highlights the importance of verifying country-level representation and encouraging research across diverse sporting and cultural contexts. The broader self-esteem themes also suggest opportunities to investigate psychological well-being alongside athletic performance, while distinguishing general populations from competitive athletes. Overall, the bibliometric map can guide future research priorities and evidence reviews, but practical recommendations require validation through empirical studies.

CONCLUSION

This bibliometric study provides a comparative overview of sports mental toughness and sports self-esteem research in the Web of Science database from 1991 to 2025. The findings reveal increasing publication activity and distinct thematic emphases, with mental-toughness research focusing on coping, stress, motivation, and psychological skills, while self-esteem research covers broader themes such as physical activity, health, body image, and psychological well-being. However, these differences

Research Gaps and Future Research Agenda

Future research should investigate the empirical relationship between mental toughness and self-esteem through joint searches, systematic screening, and studies involving athletes across different ages, sports, and competitive levels. Researchers should distinguish general, physical, and sport-specific self-esteem from self-efficacy and self-confidence while improving measurement comparability and documenting instrument validity and reliability (Cowden, 2017; Crust, 2007). Longitudinal and intervention studies could clarify temporal associations, while broader cultural representation and clearer differentiation between general health-related and athlete-specific research would strengthen interpretation. Bibliometric studies should also report reproducible search strategies, screening and deduplication procedures, software settings, and complete network indicators. Sensitivity analyses using alternative keyword thresholds and normalization methods would further improve robustness and transparency, providing a stronger foundation for understanding the conceptual and empirical connections between mental toughness and self-esteem.

may reflect variations in search scope and corpus composition, and the study does not establish a direct empirical relationship between the two constructs. Future research should improve search transparency, construct definitions, data-cleaning procedures, and network reporting while conducting empirical studies involving both constructs among athletes across diverse sporting and cultural contexts.

DECLARATIONS

Author Contributions (CRediT)

Farok Hossen: Conceptualization, Investigation, Data curation, Formal analysis, Writing – original draft.

Prasanta Kumar Das: Conceptualization, Formal analysis, Writing – original draft.

Mukesh Mitra: Conceptualization, Investigation, Writing – original draft.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of Interest

The authors declare that they have no competing interests that could have influenced the conduct, analysis, interpretation, or reporting of this study.

Data Availability

The bibliographic records analyzed in this study were retrieved from the Web of Science database. Access to the underlying records may be subject to the database provider's licensing and access conditions. The

search strategy, data-processing procedures, and analysis files should be made available by the authors where permitted by the applicable database terms.

Acknowledgements

The authors acknowledge the Web of Science database for providing access to the bibliographic records used in this study and the developers of VOSviewer for providing the software used to visualize the bibliometric data.

Generative AI Disclosure

Generative artificial intelligence was used to assist with drafting, language refinement, and revision of portions of the manuscript. The use of these tools was intended to support academic writing and organization, not to replace the authors' responsibility for the research. The authors remain responsible for verifying the accuracy of the bibliographic data, analytical interpretations, references, and all statements presented in the manuscript.

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