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Article

High-speed rail's impact on athlete mobility, event management, and tourism: Enhancing recovery, accessibility, and experience

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Abstract: This study investigates the impact of high-speed rail (HSR) on athlete mobility, sport event management, and regional economic development, particularly in the context of major international sporting events. The research aims to address the role of HSR in improving accessibility, reducing travel times, and supporting efficient logistics for athletes, event staff, and spectators. This study employs a systematic literature review (SLR) methodology, using data from Scopus, to synthesize existing research. The review process involved screening 962 documents, resulting in the analysis of 71 relevant articles. The study follows PRISMA and SPAR-4-SLR guidelines to ensure methodological rigor and transparency in selecting and analyzing studies. The study highlights both the positive contributions of HSR, including enhanced mobility and economic benefits for host cities, as well as the challenges posed by spatial imbalances in infrastructure development. While HSR facilitates improved connectivity and contributes to the economic growth of metropolitan areas, smaller cities and peripheral regions often face marginalization in terms of economic opportunities and event participation. The findings suggest that although HSR significantly enhances event logistics, there is a pressing need for more inclusive infrastructure planning to ensure equitable access to these benefits. Additionally, the study underscores the environmental sustainability of HSR systems as an alternative to more carbon-intensive transport modes. Overall, this research provides insights into how HSR can be leveraged to improve the management of international sporting events and contribute to long-term urban and regional development while also addressing the existing disparities in accessibility and economic development across regions.

Keywords: accessibility; athlete mobility; high-speed rail; mega sporting events; regional economic development; sport event management; sustainable transport; transportation infrastructure

1. Introduction

The integration of high-speed rail (HSR) into transportation infrastructure has significant implications for athlete mobility, event management, and tourism, particularly in the context of international sporting events. HSR facilitates rapid intercity travel, which is crucial for athletes who need to arrive at venues in optimal condition, thereby enhancing their recovery and performance. While the benefits of HSR in reducing travel times and improving accessibility are well-documented, the specific impacts on athlete recovery and the logistics of managing large sporting events remain underexplored in the literature [1–3].

The Sustainable Development Goals (SDGs) provide a relevant framework for understanding the broader implications of HSR. Specifically, HSR aligns with SDG 9 (Industry, Innovation, and Infrastructure), which emphasizes the importance of

resilient infrastructure, and SDG 10 (Reduced Inequality), which seeks to ensure equitable access to economic benefits. However, the advantages of HSR are often disproportionately concentrated in major cities that are directly connected to HSR networks, leaving peripheral regions at a disadvantage in terms of accessibility and economic participation in international sporting events [4–6]. This disparity highlights the need for further research into the equitable distribution of HSR benefits and the potential for policy interventions to address these inequalities [7,8].

Moreover, the relationship between HSR and athlete recovery is critical, as long travel times can negatively impact athletes' physical conditions and performance outcomes [9,10]. Research indicates that efficient transportation options like HSR can mitigate the adverse effects of travel, thereby enhancing recovery and performance during competitions [11,12]. However, the specific mechanisms through which HSR influences athlete recovery require more in-depth investigation, as current studies have primarily focused on general transportation impacts rather than the nuanced effects on athletes [13,14].

The economic implications of HSR on local tourism and host cities for sporting events are also significant. Improved accessibility through HSR can lead to increased tourist attendance at sporting events, which can stimulate local economies [15,16]. However, these economic benefits are often limited to cities with HSR stations, while regions without such access may struggle to attract visitors and athletes [17,18]. This uneven distribution of economic advantages underscores the importance of developing policies that promote inclusive growth and equitable access to HSR [19,20].

As global efforts to reduce carbon emissions intensify, HSR presents an environmentally friendly alternative to air and road travel. Compared to traditional transportation methods, HSR has a lower carbon footprint, making it an attractive option for environmentally conscious travelers [21,22]. The expansion of HSR networks worldwide offers an opportunity to align transportation policies with sustainability goals, particularly in the context of major sporting events that attract large numbers of participants and spectators [23,24].

This research aims to address several key questions regarding the role of HSR in the management of mega sporting events. These questions include:

1) What are the key challenges identified in the literature regarding the management of accessibility and efficiency for mega sporting events in the context of HSR?
2) According to existing studies, how does high-speed rail (HSR) contribute to enhancing athlete mobility and improving logistical efficiency for mega sporting events?
3) What benefits have been identified in the literature regarding the integration of HSR with sport event management for mega sporting events?
4) What potential drawbacks or limitations associated with the use of HSR for mega sporting events are highlighted in the existing research?
5) What are the environmental benefits and economic implications of HSR for mega sporting events, as discussed in the literature?
6) What are the theoretical and managerial implications of HSR in the context of mega sporting events, based on the findings from the SLR?

A systematic literature review (SLR) will be employed to synthesize existing research and identify gaps in knowledge, ultimately providing a comprehensive understanding of HSR's impact on the sporting landscape [25–28].

The anticipated findings of this SLR will offer valuable insights for policymakers and event organizers, guiding the development of inclusive and sustainable transportation policies that leverage HSR for the benefit of all stakeholders involved in international sporting events. By addressing the identified gaps in the literature, this research aims to contribute to a more equitable and sustainable future for sports transportation and event management [29,30].

The intersection of high-speed rail (HSR), athlete mobility, event management, and tourism presents a rich area for exploration, particularly in light of the Sustainable Development Goals (SDGs). The potential for HSR to enhance recovery, accessibility, and the overall experience for athletes and spectators is significant. However, the challenges of equitable access and economic disparity must be addressed to fully realize these benefits. This research, through a systematic literature review (SLR), will synthesize existing studies to identify gaps in knowledge, focusing on HSR's impact on athlete recovery, event management, and regional economic growth. The findings aim to contribute to academic discourse and provide practical recommendations for the effective integration of HSR into the sporting ecosystem, fostering a more inclusive and sustainable approach to managing international sporting events [31–33].

2. Materials and methods

2.1. Research approach/design

This study employs a systematic literature review (SLR) methodology to evaluate the impact of high-speed rail (HSR) on athlete mobility, event management, and tourism in the context of major international sporting events. The SLR approach is particularly effective in synthesizing existing research, allowing for a comprehensive understanding of how HSR enhances accessibility and efficiency for athletes, event organizers, and tourists. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines are utilized to ensure methodological rigor and transparency in the study selection process, which is crucial for reproducibility and reliability in research [34,35]. Additionally, the SPAR-4-SLR (Scientific Procedures and Rationales for Systematic Literature Reviews) principles guide the justification of methodological decisions, including the inclusion criteria and thematic synthesis, thereby reinforcing the study's credibility [36].

2.2. Inclusion and exclusion criteria

To maintain the relevance and quality of the selected articles, strict inclusion and exclusion criteria were implemented. Only peer-reviewed articles published between 2010 and December 2024 and indexed in Scopus were included. This timeframe captures significant developments in HSR research, particularly during a period of global expansion in HSR infrastructure [37,38]. Articles must explicitly address the role of HSR in athlete mobility, event management, or tourism, drawing from disciplines such as social sciences, business, management, and economics [39].

Conversely, studies not meeting these criteria, including those not indexed in Scopus or published outside the specified timeframe, were excluded to ensure a focused and relevant review [40,41].

2.3. Procedure

The comprehensive search was conducted within the Scopus database, chosen for its extensive coverage of high-quality peer-reviewed literature across various disciplines relevant to HSR [42]. The search strategy targeted three thematic areas: athlete mobility, event management, and tourism, utilizing a structured Boolean keyword string such as ("High-Speed Rail" OR "HSR") AND ("athlete mobility" OR "event management" OR "tourism"). This approach yielded 962 documents, which were subsequently screened for duplicates and relevance based on titles and abstracts, resulting in 387 articles shortlisted for further review [43]. After applying the inclusion and exclusion criteria, 71 articles were identified as relevant for inclusion in the final review, demonstrating the effectiveness of the systematic search strategy [44].

2.4. Critical appraisal and justification

A critical appraisal process was conducted using the Quality Assessment Checklist for Survey Studies in Psychology (Q-SSP), which evaluates methodological rigor and relevance [45]. This assessment ensured that only high-quality studies were included, enhancing the validity and reliability of the findings. The decision to utilize Scopus as the sole data source was based on its established reputation for indexing high-quality research, although this may have excluded relevant studies from other databases [46]. The focus on English-language articles was intended to maintain consistency in analysis, despite the potential exclusion of valuable insights from non-English studies [47]. The selected timeframe of 2010 to December 2024 was crucial for capturing the most recent developments in HSR research, ensuring that the review reflects current trends and findings in the field [48].

2.5. Search workflow

The research methodology follows a systematic workflow comprising five main steps: Identifying articles in Scopus, screening for relevance, conducting full-text assessments, evaluating selected articles using Q-SSP criteria, and thematically synthesizing the findings [49]. This structured approach enhances transparency and facilitates reader understanding of the research process, ensuring that the methodology is both rigorous and reproducible [50]. A visual representation of this workflow is provided in the appendix to further clarify the research process.

2.6. Synthesis of data and thematic analysis

The selected articles were analyzed using qualitative content analysis to identify recurring themes related to the research objectives. Key themes emerged, including the contribution of HSR to improving athlete mobility by reducing travel fatigue and enhancing accessibility to event locations [51]. Another significant theme highlighted the integration of HSR into event management logistics, showcasing its role in streamlining transportation and optimizing event operations [52]. Additionally, the

broader economic and tourism impacts of HSR in host cities were emphasized, illustrating how HSR helps attract visitors and supports local economies [53]. The synthesis of findings involved organizing the studies into thematic categories, providing a comprehensive understanding of how HSR impacts the targeted areas [54].

3. Results and discussion

This section presents the results of a systematic literature review (SLR) aimed at evaluating the role of high-speed rail (HSR) in enhancing athlete mobility, sport event management, and local economic development during major international sporting events. The findings not only address the research questions posed earlier but also highlight the complexities and benefits of HSR integration into large-scale event logistics, mobility solutions for athletes, and regional economic growth.

3.1. Key challenges in managing accessibility and efficiency for mega sporting events

High-speed rail (HSR) systems offer considerable potential to enhance transportation accessibility and operational efficiency during mega sporting events, improving the movement of participants, spectators, and officials. However, challenges remain in effectively leveraging HSR systems to optimize these benefits for large-scale events. This review highlights the critical challenges in managing accessibility and efficiency when high-speed rail is integrated with mega sporting events.

The uneven distribution of HSR benefits across different regions remains a significant challenge. While major cities and core regions benefit from improved connectivity, smaller and peripheral cities may face limitations in terms of access. This disparity in accessibility can limit the ability of spectators and participants from less-connected areas to reach event venues efficiently, potentially reducing the overall success of the event. Studies have indicated that HSR has a more significant positive impact on well-developed areas compared to peripheral or underdeveloped regions [55]. Additionally, international audiences may encounter barriers in accessing event locations, particularly if there is insufficient integration between HSR services and local transport systems [56].

Another critical challenge in managing HSR during mega sporting events is ensuring the operational efficiency of the system under peak demand. The influx of passengers attending events necessitates the optimization of train schedules and the management of train capacity. Efficient operation of HSR services, including timely departures and arrivals, must be coordinated with the scheduling of other event-related transportation. Real-time adjustments are often needed to account for unforeseen delays or changes in demand. Research indicates that advanced scheduling systems, including contingency plans, are essential to cope with the surge in passenger volumes and avoid operational bottlenecks [57]. This requires an integrated approach, optimizing both the number of trains and operational timetables to meet the needs of passengers [58].

While HSR is generally considered a sustainable mode of transport, the construction and operation of HSR infrastructure for mega sporting events can have

significant environmental impacts. Large-scale construction can disrupt local ecosystems and contribute to increased carbon emissions, particularly in the construction phase. Additionally, the operational energy consumption of HSR systems during mega events may put strain on the environment. To mitigate these impacts, the adoption of cleaner technologies, such as electric trains and sustainable construction practices, is essential. Studies emphasize the need for HSR projects to prioritize environmental sustainability, including the use of renewable energy and the reduction of greenhouse gas emissions [59].

The financing of HSR infrastructure, particularly in the context of mega sporting events, presents a significant challenge. Large-scale infrastructure projects, especially in developing regions or countries, require substantial investment. Securing funding often involves balancing public sector investment with private sector participation. Fiscal policies, such as subsidies or tax incentives, can help lower the financial barriers to investment and ensure that projects remain economically viable over the long term. Effective public-private partnerships can provide the necessary capital for the construction and maintenance of HSR systems designed to serve mega sporting events [60]. Moreover, ensuring financial sustainability and profitability post-event remains an ongoing concern [61].

HSR can significantly enhance accessibility and operational efficiency for mega sporting events; challenges related to unequal accessibility, operational efficiency under peak demand, environmental impacts, and financing need to be effectively addressed. Overcoming these barriers requires collaborative efforts between government agencies, private investors, and event organizers to ensure that HSR systems can meet the demands of large-scale sporting events while remaining sustainable and financially viable.

3.2. Contribution of high-speed rail to improving accessibility and efficiency for mega sporting events

The contribution of high-speed rail (HSR) in enhancing accessibility and efficiency for major sporting events is a multifaceted topic that intersects various domains, including socio-cultural, political, environmental, and economic factors. This literature review synthesizes recent studies to elucidate the challenges and benefits associated with HSR in the context of major sporting events while also addressing the complexities of managing accessibility and efficiency.

High-speed rail systems have been recognized for their potential to significantly improve accessibility to major sporting events. The ability of HSR to reduce travel times and enhance connectivity between urban centers is well-documented. For instance, studies have shown that HSR can facilitate the movement of large crowds, thus alleviating congestion and improving the overall experience for attendees [62,63]. Furthermore, the integration of HSR with local transport systems can create a seamless travel experience, which is crucial for the success of large-scale events [64,65]. The efficiency of HSR not only benefits spectators but also supports the logistics of event management, including the transportation of athletes, officials, and equipment [66,67].

However, the implementation of HSR systems is not without challenges. One of the primary concerns is the significant financial investment required for the

development and maintenance of HSR infrastructure. This economic burden can lead to political contention, particularly in regions where public funds are limited [68,69]. Additionally, the environmental impact of constructing HSR lines can provoke local opposition, especially if it disrupts existing communities or natural habitats [70,71]. The socio-cultural implications of HSR development also warrant consideration, as the displacement of communities and changes to local economies can lead to social unrest and resistance [72,73].

The challenges associated with managing accessibility and efficiency for major sporting events can be classified into direct and indirect challenges. Direct challenges include logistical issues such as crowd management, transportation coordination, and the integration of HSR with other modes of transport [74,75]. Indirect challenges may arise from socio-political dynamics, such as public perception of HSR projects and the political will to support such initiatives [76,77]. Furthermore, the potential for HSR to exacerbate existing inequalities in access to sporting events must be acknowledged, as not all demographics may benefit equally from improved transport links [78,79].

In terms of contributions, HSR can play a pivotal role in promoting sustainable tourism and economic development in host cities. The influx of visitors for major sporting events can stimulate local economies, creating jobs and enhancing the visibility of the host city on a global scale [63,80]. Moreover, the environmental benefits of HSR, as a low-carbon alternative to air travel, align with the growing emphasis on sustainability in event planning [64,67]. The legacy of HSR investments can extend beyond the event itself, fostering long-term improvements in regional connectivity and economic resilience [77,81].

The socio-cultural benefits of HSR are also significant. By facilitating access to major sporting events, HSR can promote social cohesion and community engagement, as diverse groups come together to celebrate shared interests [82,83]. The role of HSR in enhancing the fan experience cannot be understated, as it allows for greater participation in events, which can lead to increased support for local teams and athletes [84,85]. Furthermore, the visibility of HSR can enhance the image of host cities, positioning them as modern and progressive destinations for future events [86,87].

Despite the numerous benefits, the challenges of integrating HSR into the fabric of major sporting events remain substantial. Effective planning and stakeholder engagement are essential to address the multifaceted issues that arise during the implementation phase [70,88]. Moreover, the need for comprehensive risk management strategies cannot be overlooked, particularly in light of recent global events that have highlighted vulnerabilities in event management systems [71,74]. The interplay between political, economic, and social factors necessitates a holistic approach to HSR development and its integration with major sporting events [66,75].

In conclusion, the contribution of high-speed rail to improving accessibility and efficiency for major sporting events is significant, yet complex. While HSR offers numerous advantages in terms of connectivity, sustainability, and economic development, the challenges associated with its implementation require careful consideration and strategic planning. Future research should focus on developing frameworks that address these challenges while maximizing the benefits of HSR in the context of major sporting events.

3.3. Benefits of integrating high-speed rail with sport event management for mega sporting events

The integration of high-speed rail (HSR) systems with sport event management for mega sporting events presents a multifaceted opportunity to enhance accessibility, efficiency, and overall experience for attendees. This literature review synthesizes recent studies to explore the benefits and challenges associated with this integration, categorizing them into direct and indirect, core and potential challenges, as well as socio-cultural, political, environmental, and economic factors.

High-speed rail systems can significantly improve accessibility to mega sporting events, which is crucial for maximizing attendance and participation. According to Lu et al. [89], improving access to sports venues, particularly for persons with disabilities (PWD), can enhance interest in sports and participation rates. This aligns with findings by Singh et al. [90], who emphasize the importance of regional strategies that prioritize accessibility in the development of the sports industry. The integration of HSR can facilitate easier access to venues, thus potentially increasing attendance and participation in sporting events, as noted by Sönmez and Öztürk [91], who discusses the importance of risk management in ensuring safe and efficient transportation for attendees.

However, the integration of HSR with sport event management is not without challenges. Wang et al. [92] highlight that resilience in managing international sports events is essential, particularly in the face of crises such as natural disasters or security threats. These challenges can be classified as direct, such as logistical issues related to transportation and crowd management, and indirect, including socio-cultural resistance to changes in transportation infrastructure. Furthermore, Wenner and Thierstein [93] discuss ambush marketing risks that can arise during major sporting events, complicating the management of accessibility and efficiency. These risks can be exacerbated by inadequate transportation options, which may deter potential attendees.

The socio-cultural implications of integrating HSR with sport event management are significant. As noted by Yun et al. [94], corporate social responsibility (CSR) plays a crucial role in shaping public perceptions of sporting events. The integration of HSR can enhance the CSR profile of event organizers by promoting sustainable transportation options, thereby improving community relations and public support for events. However, this requires careful planning and execution, as highlighted by Zhang [95], who emphasize the importance of thorough planning in successful event management.

Political factors also play a critical role in the integration of HSR with sport event management. Chen et al. [96] discuss how service quality impacts participant satisfaction, which can be influenced by government policies regarding transportation infrastructure. Effective collaboration between governmental bodies and event organizers is essential to ensure that HSR services meet the needs of attendees. This collaboration can help mitigate challenges related to funding and resource allocation, as noted by Chen et al. [97], who emphasizes the importance of long-term planning for sporting events.

Environmental considerations are increasingly relevant in the context of mega sporting events. Kang et al. [98] argue that integrating sustainable practices into event management, including the use of HSR, can significantly reduce the environmental footprint of such events. This is particularly important as public awareness of climate change grows, and stakeholders demand more sustainable practices. The implementation of HSR can facilitate lower emissions compared to traditional transportation methods, thus enhancing the overall sustainability of mega sporting events.

Economic factors also influence the integration of HSR with sport event management. Liu [99] propose a framework for sports logistics management that emphasizes the economic benefits of efficient transportation systems. By reducing travel times and costs for attendees, HSR can enhance the economic viability of mega sporting events, attracting more spectators and generating higher revenues for organizers. However, this requires significant investment in infrastructure, which can be a barrier to implementation, as noted by Wu [100].

The challenges associated with integrating HSR into sport event management can be further categorized into core and potential challenges. Core challenges include logistical issues, such as ensuring timely arrivals and departures for attendees, while potential challenges may involve unforeseen circumstances, such as natural disasters or political unrest. The COVID-19 pandemic has highlighted the importance of crisis management in event planning, as discussed by Hakim [101], who call for a more sophisticated approach to managing crises in the context of international sporting events.

Moreover, the digitalization of event management processes, as explored by Zhang et al. [102], can enhance the efficiency of integrating HSR with sport event management. The use of technology, such as mobile applications for ticketing and real-time updates on transportation services, can improve the overall experience for attendees and streamline logistics. This aligns with the findings of Zhang [103], who emphasize the role of technology in optimizing sports event management systems.

The integration of high-speed rail with sport event management for mega sporting events offers numerous benefits, including improved accessibility, enhanced sustainability, and economic viability. However, it also presents a range of challenges that must be addressed through careful planning, collaboration, and the implementation of technology. By understanding and addressing these challenges, stakeholders can leverage the benefits of HSR to create more successful and sustainable mega sporting events.

3.4. Potential drawbacks or limitations of using high-speed rail for mega sporting events

One of the primary challenges of HSR in the context of mega sporting events is accessibility. High-speed rail systems, while designed to connect major urban centers, often neglect peripheral areas, leading to disparities in access for potential attendees. Research indicates that the opening of HSR can exacerbate inequalities in intercity accessibility, particularly in regions where infrastructure development is unevenly distributed [104]. This phenomenon can create a situation where only those in close

proximity to HSR stations benefit from the reduced travel times, while individuals in less accessible areas face increased travel burdens. Such disparities can limit the inclusivity of mega sporting events, as individuals from marginalized communities may find it difficult to attend due to transportation barriers [105].

Moreover, the operational efficiency of HSR during peak times, such as major sporting events, poses significant challenges. The influx of passengers can overwhelm existing infrastructure, leading to congestion and delays. Studies have shown that the demand for HSR services can surge dramatically during events, necessitating careful planning and resource allocation to ensure smooth operations [106]. Without adequate measures in place, the efficiency of HSR can be compromised, resulting in a negative experience for attendees who rely on this mode of transport. This operational strain is compounded by the need for real-time data and communication systems to manage passenger flow effectively, which may not always be available [107].

In addition to accessibility and efficiency, socio-cultural factors play a crucial role in the challenges associated with HSR and mega sporting events. The perception of HSR as a modern and efficient transport option may not resonate equally across different demographic groups. Research suggests that public opinion regarding HSR can vary significantly based on political affiliation, socioeconomic status, and cultural background [108]. This divergence in perception can influence the willingness of individuals to utilize HSR for attending sporting events, potentially limiting the reach of such events to a broader audience. Furthermore, cultural attitudes towards travel and transportation can affect how different communities engage with HSR, which may necessitate targeted outreach and education efforts to promote its use [105].

Political factors also contribute to the complexities surrounding HSR and mega sporting events. The planning and implementation of HSR projects often involve significant political considerations, including funding, regulatory approvals, and stakeholder engagement. Political opposition can delay or derail HSR projects, impacting their availability for major events [109]. Additionally, the prioritization of HSR development in certain regions over others can lead to tensions and perceptions of inequity among communities, further complicating the landscape of accessibility for sporting events [110].

Environmental considerations are another critical aspect of the HSR discourse. While HSR is often promoted as a more environmentally friendly alternative to air travel and road transport, the construction and operation of HSR lines can have significant ecological impacts. Studies have highlighted that the environmental benefits of HSR can be overshadowed by the ecological footprint of construction activities, which may disrupt local ecosystems and contribute to pollution [111]. Furthermore, the long-term sustainability of HSR operations must be evaluated in the context of their overall environmental impact, particularly as mega sporting events often emphasize sustainability as a core value [112].

Economic factors are equally important when assessing the limitations of HSR in the context of mega sporting events. While HSR can stimulate local economies by increasing tourism and facilitating business travel, the economic benefits are not uniformly distributed. Research indicates that the economic impacts of HSR can vary significantly between urban centers and peripheral areas, with core cities often reaping the majority of the benefits [113]. This uneven economic development can lead to

tensions between regions and may necessitate policies aimed at redistributing the economic gains associated with HSR [114].

Moreover, the high costs associated with HSR infrastructure development and maintenance can strain public finances, particularly in regions where funding for other essential services is already limited. The financial viability of HSR projects must be carefully assessed, especially in the context of mega sporting events that require substantial investment in infrastructure and services [109].

While high-speed rail presents significant opportunities for enhancing accessibility and efficiency for mega sporting events, it is essential to recognize and address the myriad challenges it poses. These challenges encompass direct and indirect factors, as well as socio-cultural, political, environmental, and economic dimensions. A comprehensive understanding of these limitations is crucial for stakeholders involved in the planning and execution of mega sporting events, ensuring that HSR can be leveraged effectively to maximize participation and inclusivity.

3.5. Environmental benefits and economic implications of HSR for mega sporting events

High-speed rail has been recognized as a transformative mode of transportation that enhances accessibility to major sporting events, thereby influencing travel behavior and patterns. Yang et al. [115] conducted a study that highlights the factors affecting travel mode choice between HSR and traditional road transport, revealing that HSR's efficiency and comfort significantly sway passenger preferences. This is particularly relevant for mega sporting events where large crowds necessitate efficient transport solutions. The research indicates that HSR can reduce travel time and increase the likelihood of attendance at such events, thus amplifying their economic impact [115].

Moreover, the economic implications of HSR extend beyond mere transportation efficiency. Ren and Ding [116] explored the regional economic effects of HSR in China, noting that improved accessibility leads to increased tourism and investment opportunities, which are crucial for hosting mega sporting events. The authors employed an Analytic Hierarchy Process (AHP) to quantify these benefits, demonstrating that HSR can significantly enhance regional economic dynamics by facilitating greater intercity connectivity. This aligns with findings from Zhang et al. [117], who quantified the substitutability between HSR and air transport, indicating that HSR can effectively complement air travel, particularly for short to medium distances, thus optimizing travel options for event attendees.

However, the integration of HSR into the framework of mega sporting events is not without challenges. These challenges can be classified into direct and indirect categories, as well as core and potential challenges. Direct challenges include the need for substantial investment in infrastructure and the management of increased passenger volumes during peak event times. For instance, Pan et al. [118] developed an integrated risk assessment method for mega construction projects, which can be applied to HSR projects associated with sporting events. Their findings underscore the importance of proactive risk management strategies to mitigate potential disruptions and ensure seamless operations during events.

Indirect challenges, on the other hand, often stem from socio-cultural and political factors. Johnson [119] analyzed public opinion regarding HSR, revealing that societal acceptance is crucial for the successful implementation of HSR projects. This is particularly pertinent in the context of mega sporting events, where public sentiment can influence attendance and participation. Furthermore, the socio-cultural dynamics surrounding such events can affect the perceived value of HSR as a transportation option, as highlighted by Kim et al. [120], who examined the influence of risk perceptions on travel intentions to mega sporting event destinations.

Environmental considerations also play a pivotal role in the discourse surrounding HSR and mega sporting events. The opening of HSR lines has been associated with reduced emissions and improved air quality, as evidenced by Yan's [121] analysis of SO_2 emissions in cities connected by HSR. This environmental benefit is particularly significant when considering the sustainability goals of mega sporting events, which increasingly prioritize eco-friendly practices. The findings from Chen [122] further support this notion, indicating that HSR can contribute to lower environmental pollution levels, thus enhancing the overall sustainability of mega events.

In terms of economic contributions, HSR facilitates urban growth and development, which are essential for the successful hosting of mega sporting events. Ou et al. [123] conducted a county-level analysis of HSR's impact on economic development, revealing that businesses are more likely to relocate to areas with HSR access, thereby stimulating local economies. This economic revitalization is critical for cities hosting major sporting events, as it can lead to increased investment in infrastructure and services that enhance the overall event experience.

The interplay between HSR and urban consumption patterns is also noteworthy. Cai et al. [124] explored the impact of HSR on urban consumption, emphasizing that improved accessibility leads to increased consumer spending in urban areas. This is particularly relevant for mega sporting events, where heightened consumer activity can translate into significant economic benefits for local businesses and the broader economy.

Despite the numerous benefits associated with HSR, challenges related to accessibility and efficiency remain prominent. The need for effective interface management in HSR construction projects is crucial, as highlighted by Han [125], who developed a modeling framework to address interface management risks. This is particularly relevant during mega sporting events, where the coordination of various transport modes is essential for ensuring smooth operations and minimizing disruptions.

Furthermore, the socio-political landscape can significantly influence the success of HSR projects. Heuermann and Schmieder [126] examined the effects of infrastructure on worker mobility, highlighting that political support and public acceptance are critical for the successful implementation of HSR systems. This is particularly relevant in the context of mega sporting events, where political will can determine the extent of investment in HSR infrastructure.

The literature indicates that HSR presents substantial environmental benefits and economic implications for mega sporting events. The integration of HSR enhances accessibility, promotes economic growth, and contributes to sustainability goals.

However, challenges related to infrastructure investment, public acceptance, and effective management of transport systems must be addressed to fully realize the potential benefits of HSR in the context of mega sporting events. Future research should continue to explore these dynamics, particularly in the context of evolving socio-political landscapes and environmental considerations.

3.6. Theoretical and managerial implications

From a theoretical standpoint, this study contributes to the literature on transportation infrastructure, sport event management, and regional development by highlighting the role of HSR in addressing key logistical and economic challenges associated with mega sporting events. By focusing on the intersection of HSR and sport event management, this research expands existing frameworks on event logistics and mobility, offering a comprehensive understanding of how HSR can enhance event outcomes and regional economies. The integration of HSR into transport systems requires a shift in the understanding of transportation not just as a service but as a strategic tool for sustainable urban planning and regional integration.

Managerially, the findings underscore the need for event organizers, policymakers, and transport authorities to integrate HSR planning into the long-term infrastructure development strategies for host cities. From a managerial perspective, the benefits of HSR extend beyond event management and can influence broader city development, tourism, and regional economic integration. Planners must focus on ensuring equitable distribution of transportation infrastructure and invest in complementary transport solutions to manage peak demand. Effective collaboration between local, regional, and national authorities is essential to fully leverage the potential of HSR for global sporting events, ensuring that the advantages of improved accessibility reach all sectors of society.

4. Conclusion

This study aims to address several key questions regarding the role of high-speed rail (HSR) in the management of mega sporting events, focusing on athlete mobility, logistical efficiency, and the impact on local tourism. The research was conducted using a systematic literature review (SLR), analyzing existing studies on the use of HSR in the context of major sporting events.

Based on the findings, several key challenges in managing accessibility and efficiency for mega sporting events were identified in the literature. These include the unequal distribution of HSR benefits, where major cities directly connected to HSR networks tend to reap the majority of the advantages, while smaller peripheral regions miss out. Addressing this disparity is crucial to ensuring that all regions can benefit from the opportunities that HSR provides. Regarding the contribution of HSR to enhancing athlete mobility and improving logistical efficiency, existing studies emphasize that HSR significantly reduces travel times, alleviates athlete fatigue, and improves overall event management efficiency. Additionally, it facilitates better mobility for spectators and participants, further enhancing the experience of mega sporting events.

The literature also highlights several benefits associated with integrating HSR into sport event management. These include reduced transportation costs, improved accessibility, and the positive impact on local economies through increased tourism. However, the research also points to some limitations, such as the overburdening of HSR infrastructure during peak demand periods and the exclusion of areas not connected to HSR networks. From an environmental and economic perspective, HSR provides substantial benefits, such as reduced carbon emissions and increased economic activity in regions with direct HSR access. However, the literature also underscores the need for balanced infrastructure development to ensure equitable economic growth across both connected and non-connected regions. Theoretical implications from this study highlight the importance of addressing the uneven distribution of HSR benefits, while managerial implications stress the need for policymakers and event organizers to develop inclusive transportation strategies. This includes expanding HSR networks to ensure that smaller regions can access the benefits of faster, more sustainable transportation.

The limitations of this study include its focus on articles indexed in SCOPUS, which may not provide a comprehensive view of all relevant studies. Future research could explore other data sources and further examine the long-term impacts of HSR on local economies and the sustainability of global sporting events. This study provides valuable insights into the integration of HSR into the logistics of mega sporting events, offering practical recommendations for policymakers and event organizers. It also contributes to the academic discourse on how HSR can help achieve more efficient, sustainable, and equitable transportation systems for global sporting events.

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