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Managing logistics in sport: a comprehensive systematic literature review

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Abstract

Logistics and sport management are part of the globalized economy and interdisciplinary fields of science. Sporting events necessitate enormous logistical efforts by aiming to deliver certain tasks and materials at an exact time and a specific place in suitable quantity and quality. However, sport logistics not only is involved in the precise execution of events but deals with a wide range of topics. Sporting goods are transported along the supply chain to customers with economic objectives, stadium evacuation simulations are carried out using algorithms that originate in transportation logistics, and sport clubs are confronted with logistical issues both on their game days and during the rest of the year. A systematic literature review was undertaken to provide clarity regarding previous scientific endeavors and to offer orientation for interested practitioners. The authors propose a theoretical framework—the sport logistics triangle—that draws on the academic disciplines of logistics management and sport management and allows to classify all sport logistics activities. An in-depth categorization scheme and ten topic clusters illustrate how sport logistics has been studied thus far. Implications and research opportunities are elaborated for practitioners and scholars. The survey clearly underlines both the importance of sport logistics and its neglection in academics.

Keywords Management · Logistics · Sport · Supply chain · Operations

JEL Classification L83 · M10 · R40 · Z20 · Z21 · Z29

1 Introduction

For the 2012 London Olympic Games 1.2 billion dollars were invested to plan and provide its comprehensive logistics and transportation for 6.2 million spectators (Hendy 2013, p. 9; Kershaw 2012, p. 243). Hence, the importance of logistics in modern sport should not be surprising. It is worth noting that the logistical efforts

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(Sumner 2011, p. 55) of holding a hallmark event such as the FIFA World Cup or the Olympic Games (Ritchie 1984, p. 2) include more than public transport. At the 2008 Beijing Olympic Games, 104 hospitals were prepared for possible emergencies, and when the Games began, 400,000 volunteers were dispersed all over the city (BOCOG 2008, p. 21). Logistical considerations also play a role in the preparation of camps for athletes (Arnold et al. 2015, p. 12) and in all activities to deliver the necessary equipment to the venues (Minis et al. 2006a, b, p. 622). In July 2008, Beijing prepared 6,698,000 goods for the Games (BOCOG 2008, p. 150). The global sport market is estimated to be worth more than 600 billion dollars in 2023 (NPD Group 2019) and the revenue of the worldwide sport equipment market is expected to grow 27% between 2023 and 2027 (Statista Consumer Market Insights 2023). These figures lead to the conclusion that the demand for logistics in sport will continue to grow.

The potential consequences of poor logistics management in sport were on display, for instance, in 2019, when the Kansas City Chiefs were scheduled to play the New England Patriots. A container of player equipment had not been unloaded, and a defeat because of missing equipment was imminent (NBC 2019). Another example occurred in Formula One, where the Fédération Internationale de l'Automobile (FIA) has banned retrofitting of tires (BBC 2005b). After a devastating 150 mph accident in practice at the 2005 Indianapolis Grand Prix, Michelin pinpointed its tires as the source of the failure (Pfahl and Bates 2008, pp. 135–142). Had it been allowed to bring in new tires, it would have had to ship them from a warehouse in France to the racetrack in the United States (ESPN 2005). Consequently, all teams with Michelin tires had to withdraw from the race, leaving only six cars to finish (Pfahl and Bates 2008, p. 138) and resulting in major damage to the image of the FIA (Pfahl and Bates 2008) and a curious victory for Michael Schumacher (BBC 2005a). Due to the premise that "the consequences of operations failure have huge implications for the outcome of the on-field performance" (Bamford et al. 2015, p. 14), precise logistics operations are required to successfully orchestrate sporting events (Minis et al. 2006a, b, p. 622).

Both sport management (Brown et al. 2018, p. 75; Doherty 2013, p. 7) and logistics management (Haghani 1997, p. 250; Meng 2014, p. 137) are known as applied science disciplines. Despite the low tolerance for error in the management of large sporting events (Jones et al. 2015, p. 188), the fact that sport management researchers are entrusted with design issues related to competition venues (Slack 2014, p. 460) and the need for guidelines for successful implementation (Minis et al. 2006a, b, p. 622), researchers have been extremely reluctant to recognize the far-reaching importance of managing logistics in sport (Herold et al. 2019, p. 358). Therefore, a systematic literature review (SLR) rigorously collects all topic-related studies and provides groundwork for future regulations to which industry players can refer (Kitchenham et al. 2009, p. 8) and for the development of new research areas in management (Tranfield et al. 2003, p. 208).

Consequently, this paper defines the following leading research questions (RQ):

RQ1 What is the current state of the art in the field of sport logistics?
RQ2 Which directions for future research can be identified?

On the way to answering them, the following subordinate research questions (SRQ) are posed:

SRQ1 In which core areas of logistics and sport management does sports logistics research operate?
SRQ2 How can a framework for sport logistics look like that draws from both disciplines?
SRQ3 Which fundamental academic approaches are applied in sport logistics research?
SRQ4 Which topics does sport logistics deal with and how can the field be subdivided?

For a systematic overview of logistics management, researchers must consider intra-, extra- and interlogistical contexts (Gudehus and Kotzab 2012, pp. 439–440). Sport management must be reviewed with the understanding that its business "is not limited to leagues and competition" (Kauppi et al. 2013, p. 1369) while including its "commercial and not-for-profit forms" (Smith and Stewart 2010, p. 1). By employing the methodological procedure outlined by Kitchenham (2004, p. 3), this paper aims to facilitate the process of locating further research (Kitchenham and Brereton 2013, p. 2). Moreover, it intends to inspire researchers to further sport logistics management research.

Within the set parameters, the scope of the literature search had a range of 37 keywords, divided in accordance with the aforementioned research topic. More than 60,000 resulting publications were exported from ten scientific search engines and databases. The overall process of applying the content criteria and excluding nonfitting scientific works resulted in 202 final contributions to the categorization scheme. In the upcoming chapter, a comprehensive framework for sport logistics research is proposed and a delimitation from previous SLRs with reference to sport logistics is provided. Subsequently, the detailed review methodology is presented in chapter 3 and the results are analyzed in chapter 4. Chapter 5 discusses and outlines potential follow-up research opportunities. Finally, a conclusion that revisits the research questions is composed.

2 Theoretical background and differentiation from related surveys

In the first part of the chapter, the theoretical foundations of this paper are set by elaborating its theoretical background in the disciplines of logistics and sport management and proposing a framework for the management of logistics in sport: the sport logistics triangle. In the second part of the chapter the elaboration of this paper is distinguished from related works.

2.1 Theoretical background and the sport logistics triangle

Sport can be characterized as physical exercise determined by competition in a "nonhostile" manner (Wright 2009, p. 161). As the largest nonmilitary logistics event (Minis et al. 2006a, b, p. 621), the Summer Olympics contribute to the fact that sport has "emerged as an industrial sector in its own" with multifaceted obstacles for managerial practitioners (Chadwick 2009, p. 202). Although sport can be clearly distinguished from other sectors of the economy (Chadwick 2011, p. 122), sport management must nevertheless draw on other areas of management research in order to develop its own potential (Slack 2014, p. 462). In the current sport management literature, there is still a scarcity of contextual logistics research (Herold et al. 2019, p. 358). Logistics management has become important owing to its ability to create crucial benefits for organizations (Christopher 2016, p. 2), and an application to sport could create similar effects (Herold et al. 2019, p. 358).

Issues in sport logistics are manifold. They spread from planning car fleets (Minis et al. 2009) and forecasting transport demands (Dosunmu 2012) to the legacy of logistics infrastructures (Kassens-Noor 2013a). They include the coordination of athletes travel (Gupta et al. 2011) or spectator travel (Ceder and Perera 2014) to major events as well as its environmental impacts (Loewen & Wicker 2021) and supply chain emissions (Sampson et al. 2013). Issues of supply chain segmentation in the sporting goods industry (Roscoe & Baker 2014) are discussed from facility location (Pereira et al. 2017) to assort-packaging and distribution (Woong Sung et al. 2017). Consequently, this paper argues for a comprehensive view on sport logistics that is academically well-founded in the disciplines of logistics management and sport management. In the following, the key subjects of both disciplines will be discussed that lead to the key elements of our framework proposal that outlines the conceptual background for the systematic literature review: the sport logistics triangle (Fig. 1). Logistics management and sport management and their subfields form the professional and scientific foundation of sport logistics (gray triangle). Additionally, three triangle legs provide a classification scheme to contextualize any sport logistics activities.

As basic starting point for theory development, this elaboration regards supply chain management, which "encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities" (CSCMP 2013). Subsequently, a functional view is adopted which focuses on the core part of logistics management activities. Logistics, in a broad definition, is defined as the link between marketplace and supply base and managing logistic means to plan and coordinate all activities necessary to deliver logistics services (Christopher 2016, p. 11). The function of logistics management comprises integrative coordination as well as integrative service fulfillment inside and outside of organizations (Pfohl 2021, p. 3 ff.). The scope can be divided into four areas: procurement, operations, distribution, and reverse logistics (Arnold et al. 2008, p. 4; Christopher 2016, p. 11; Gudehus and Kotzab 2012, p. 6; Harrison et al. 2014, p. 11).

Procurement focuses the supply side of an organization and includes the sourcing and receipt of goods and services from suppliers. Procurement is also referred

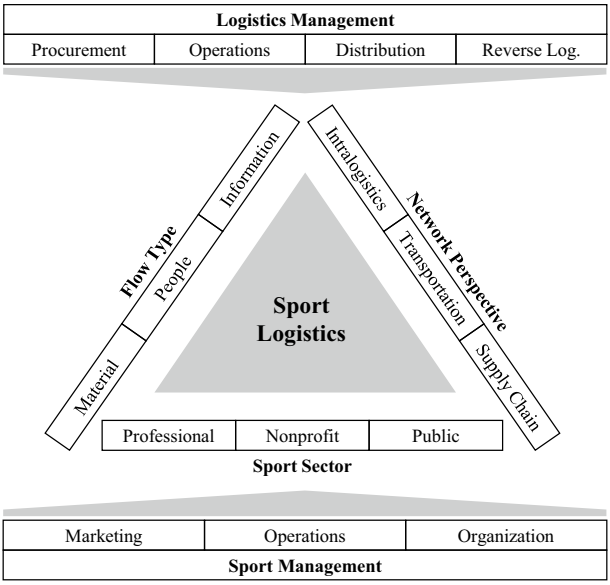

Fig. 1 The sport logistics triangle and its foundation in the disciplines of logistics management and sport management

to as inbound logistics or upstream. Operations focuses on the planning and control of flows within the boundaries of an organization. It is also referred to as internal logistics or production logistics (in the sense of producing a logistics service, e.g., order picking). Distribution is concerned with the delivery of products and services to customers. Distribution is also referred to as outbound logistics or downstream. Reverse logistics is the return of unwanted products, packaging or waste in the opposite direction, from the marketplace to the supply base. It is also referred to as returns or disposal management. (Arnold et al. 2008; Christopher 2016; Gudehus and Kotzab 2012; Harrison et al. 2014).

By the four areas of logistics management presented, all aspects of managing logistics in sport organizations can be described. Accordingly, a profound logistics management basis is provided for the sport logistics triangle.

The discipline of sport management comprises several areas of activities that are mainly derived from classic business management fields (Baker and Esherick 2013; Beech and Chadwick 2013; Bradbury and O'Boyle 2017; Covell et al. 2019; Gillentine and Crow 2009; Hoye and Parent 2017; Robinson 2012). Of these areas, marketing, operations, and organization have large intersections with logistics.

Marketing in sport comprises all activities for the production, pricing, promotion, and distribution of a sport product to meet the needs of customers (Pitts and Stotlar 2013, p. 82). Its link to logistics is most evident in the aspect of distribution, the distribution of sporting goods from the productions site to the point of sale or the distribution of promotional articles at sporting events being specific examples. Sport marketing logistics meets the customers' needs through purchasing and supply chain management (Schwarz and Hunter 2018, p. 166). Operations

in sport is a transformational process which creates, maintains and improves the delivery of sport products and services (Piekarz 2021, p. 11). It comprises, e.g., facility and building management, merchandising and retail, or event and venue management. Operations and logistics share the input-transformation-output paradigm, Mentzer et al. (2008) identify logistics as the part of operations responsible for the transformation of time and place. Organization in sport is concerned with the structure, processes, and design of organizations and their subunits (Byers et al. 2012, p. x). With the spread of Porter's value chain approach (Porter 1998), also sport organizations have taken direction to outsource activities. As a result, the significance of thinking in processes, which is also the very approach of logistics, increases. In particular the outsourcing of activities that touch the physical value-adding structures (i.e., the physical structure of facilities to move goods Aronsson 2000; Hoekstra and Romme 1992)), e.g., sporting goods manufacturing or event organization (Andreff and Andreff 2009; Burden and Li 2009), requires a holistic perspective on value creation, along the whole supply chain and with special attention to the interfaces of subprocesses and their integration (Houlihan 1985).

The three subjects described represent the central areas of sport management dealing with logistics challenges. As such they provide a profound sport management basis for the sport logistics triangle. After the foundation of sport logistics in the academic disciplines of logistics management and sport management was now built, the sport logistics triangle is outlined next. It is composed of three legs: flow type, network perspective, sport sector. Every sport logistics activity has an intersection with each of the three legs. On the basis of these three legs, the diverse logistical activities in sport organizations can be put into context.

The first leg, flow type, follows the flow-oriented definition of logistics, which states that logistics comprises all activities to efficiently manage all flows of material (goods), people and information from a source to a sink (Christopher 2011; CSCMP 2013; Pfohl 2018). While flowing, material, services and information are subject to different transformation processes with regard to time, space, quantity, type, composition, value, shape, and handling properties (Pfohl 2018; ten Hompel et al. 2018). Particular examples for each flow type are the production supply at sport equipment manufacturers (material), the coordination of spectator travel to major events (people), or order processing for fan shop sales (information).

Depending on where the flow takes place, intralogistics, transportation and supply chain are distinguished (Gudehus and Kotzab 2012). This network perspective represents the sport logistics triangle's second leg. Intralogistics comprises flows in one location (at one site) (Günther 2006). Transportation, in contrast, comprises flows outside of buildings, often using public infrastructure (Clausen and Geiger 2013). Supply chains combine intralogistics and transportation in intercompany logistics networks of several participants (CSCMP 2013; Klaus 2012). Particular examples for each network perspective are the storage of event equipment at a sport venue (intralogistics), the shipping of a race car to the racetrack (transportation), or the distribution of sporting equipment along a sales channel (supply chain).

The third leg of the sport logistics triangle attributes the logistics activity the sector of sport. In the professional sport sector, sport organizations as professional leagues, equipment manufacturers or event managers pursue commercial interests. In the nonprofit sector, activities are on a voluntary basis (Hoye et al. 2015, p. 7; Smith and Stewart 2015, p. 19 ff.). Community based sport clubs and governing associations provide competition and participation opportunities, regulate and manage sporting codes, organize championship events (Hoye et al. 2015, p. 7; Smith and Stewart 2015, p. 19 ff.). The public sector comprises governments as well as specialist agencies that develop sport policy, provide funding, and support specialist roles, e.g., elite athlete development or drug control (Hoye et al. 2015, p. 7; Smith and Stewart 2015, p. 19 ff.). Particular examples for sport logistics activities in each sector are picking for the production of a sport shoe (professional), inventory management in a local sport club, or the transport of drug test kits between laboratories (public).

In summary, the sport logistics triangle defines sport logistics as dedicated to the management of flows in sport organizations.

2.2 Differentiation from related surveys

A first possible systematization of sport logistics management was proposed by Herold et al. (2019) who divide the field into four key pillars: venue logistics management, fan/spectator logistics management, equipment logistics management and athlete logistics management. To get to this suggestion, they regard sport logistics as a subfunction of sport event management. They draw on three event categorizations (regional, major, and mega sport events) and six typical characteristics of sport events to derive the four sport logistics pillars. Based on the SCOR model they define and discuss logistics activities in the context of their framework. The strict focus on event management is a clear limitation of the paper. Rather than a sport logistics framework, Herold et al. (2019) elaborated a sport event logistics framework. It does not offer theoretical foundation for the entire field of sport logistics management which goes far beyond requirement for sport events, specific examples being the production and distribution of sporting goods or inventory management in local sport and fitness clubs. Furthermore, Herold et al. (2019) predominantly focus the professional sport sector. This becomes most evident with regard to the athletes logistics management pillar. The nonprofit and public sectors are neglected. A comprehensive picture of sport logistics management is, thus, not drawn.

Another previous SLR with links to the management of logistics in sport was performed by Kauppi et al. (2013) and focuses operations management in sport. The authors categorize the papers reviewed in nine topics of operations management. Based on these topic areas and under consideration of four analysis units (organization, league, sector, industry) they sketch a research agenda for sport operations management. As Herold et al. (2019) the authors have a focus on sport events, as

Table 1 Related SLRs

	Kauppi et al	Herold et al	Pott et al
Focus	OM in sports	Sport event logistics	Sport logistics
Method	Pittaway et al. (2004)	Durach et al. (2017)	Kitchenham (2004) and Tranfield et al. (2003)
Search period	Not defined	2000–mid-2019	2011–2021
Keywords	37 (9 sport-KW, 28 OM/SCSM-KW)	6 (1 sport-KW, 5 logistics-KW)	37 (20 sport-KW, 17 logistics-KW)
Search in	Abstract or limited number of words in the full text	Abstract	Abstract and title
Databases	3 (ProQuest, ScienceDirect, Web of Science)	2 (Business Source Complete, SSCI)	10
Included work	Journals	Journals	Journals and conference proceedings
Peer review	Not defined	Yes	Yes (journal papers)
Additional search	1. 59 sport-KW in 15 OM/SCM journals 2. 35 OM-KW in 5 sport management journals	/	/
Checked articles (with duplicates)	12,451	403	68,360

the reliance on the specific characteristics of sport reveals. Sport equipment manufacturing and retail are excluded from the scope of the paper as well as on-field performance. Considering the sport industry as part of the service industry leaves the handling of tangible goods by definition disregarded. With respect to the sport sectors the study is comprehensive and considers the commercial, nonprofit and public sport sectors alike. But even though operations management has many links to logistics, the paper's focus is not the management of flows, the movement and storage of goods, the provision of logistics services.

In summary, it can be stated that there is no SLR that creates a full picture of sport logistics management. Table 1 compares the approaches of both papers with the approach of this contribution in order to highlight the originality of this contribution.

To map the planned scope, not only was the number of databases enlarged to 10, compared to Herold (2019) with two and Kauppi (2013) with three, but important topic-specific databases from the fields of sport management and logistics management, e.g., SportDiscus and Transport Research International Documentation (TRID), were also integrated for the first time. For multidisciplinary databases, the search areas were specially tailored where possible. Within this range of databases, in contrast to previous SLRs, conference proceedings were targeted in addition to journal papers, as recommended by Kitchenham et al. (2009). Due to the expansion of the research scope, the number of databases and the types of publications, the number of checked articles was remarkably higher. A keyword count of 37, divided into a sport and a logistics branch, further ensured the identification of all potentially relevant research. The research objective is implicit and is intended to clarify, as Denyer and Tranfield (2009) requested, what is and is not considered common knowledge about this particular management topic. From there, possible future research opportunities became recognizable.

In its analysis, unlike the previous SLRs, the paper not only offers a framework and builds topic clusters but also classifies the publications into classic fields of the sport management and logistics management disciplines and examines their scientific methodology. Moreover, not only are the findings described in writing, but the reader is also provided with visualizations (e.g., keyword cluster, word cloud) to deepen his or her understanding of the scope.

3 Methodology

The methodology used in this paper is based on the guidelines recommended for systematic reviews by Kitchenham (2004) and Kitchenham et al. (2009). Furthermore, the whole process of carrying out the research is aligned with the procedure of Tranfield et al. (2003) and Denyer and Tranfield (2009). The decision to use an SLR was made in the interest of the transparency and rigor of the research process (Fan et al. 2022, p. 4). Review planning, as Tranfield et al. (2003, p. 214) first put it, had already begun through differentiation from

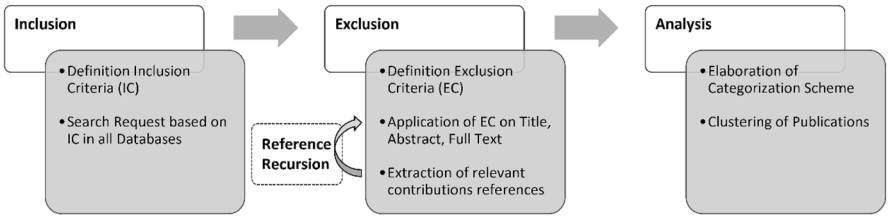

Fig. 2 Outline of the SLR process

other SLRs in sport, logistics and linked management research. Thus, mandatory scoping studies were conducted. A separation into four sections, namely, inclusion, exclusion (selection process), reference recursion and analysis, accompanied by seven inherent stages, took place. The method is shown in Fig. 2. When undertaking the systematic review, it was of great importance that only studies that complied with both the inclusion and exclusion criteria were considered (Tranfield et al. 2003, p. 215).

3.1 Inclusion criteria

At the beginning of the literature search, the criteria for inclusion were set (Table 2).

When searching in the above databases, it was determined that the results should contain at least one keyword from the world of sport and one keyword from the world of logistics. The selection of keywords was based on a consensus among more than 20 scientists collaborating with the authors. The final choice represents a series of important key terms in the two subject areas of sport and logistics. Thus, high accuracy in

Table 2 Inclusion criteria

Inclusion criteria	Description
Database	ACM, Bielefeld Academic Search Engine (Base), EconLit, IEEE Xplore, ProQuest, ScienceDirect, Scopus, SportDiscus, Transport Research International Documentation (TRID), Web of Science
Logistics keywords	Logistics, "supply chain", SCM, transport*, warehous*, distribut*, "material handling", procurement, production, ship*, inventor*, delivery, outsourc*, storage, "information flow", fulfillment, fulfilment
Sport keywords	Sport*, football, soccer, Olympic*, fitness, athlet*, arena, club, gym, stadium, tournament, championship, basketball, tennis, cricket, "Formula 1", baseball, boxing, golf, hockey
Excluded keywords	"Logistic regression"
Years of publication	2011–2021
Language	English
Source type	Peer-reviewed journals & conference proceedings

obtaining articles that dealt with an interrelation of the two areas was ensured. Per database, with the help of multiple operators, the search process was performed once in the title and once in the abstract with all possible combinations of the keywords at the same time. Special cases were Base and ScienceDirect. In the Bielefeld Academic Search Engine, the abstract search was not an available option, which led to an exchange of the abstract search with the publication-internal keyword search, while ScienceDirect automatically included title, abstract and publication-internal keywords in its search. An asterisk was used to include different word endings and spellings. The term "logistic regression" was excluded because it is a mathematical method for regression analysis and has no direct relation with logistics research.

A publication period of ten years was set up front for the included papers. Because the research was finalized 2022, the review horizon was expanded to a range of Jan 1, 2011, to Dec 31, 2021. This provided an up-to-date representation of the state of the art. The supplementary articles from the recursion process were not limited in terms of the publication period because it was assumed that the reference choices of an article concerned with sport logistics remained relevant further back in time. Other inclusion criteria still applied.

The articles had to be written in English. To ensure a certain level of quality and validity, the only accepted source types were conference papers and journals with peer-reviewed status. The chosen databases were selected in reference to Gusenbauer and Haddaway (2020), who evaluated 28 databases for their subject and for suitability when planning to carry out an SLR.

First, all databases that did not allow a bulk reference download were excluded due to the lack of suitability for an SLR. Second, the databases were chosen in accordance with their given subject; therefore, health, medicine, biomedicine, nursing, psychological and education study databases were not included. All chosen databases are listed in Table 3 alongside their subjects. A logistics-related database,

Table 3 Included databases and subjects

Database	Subjects	Note
ACM	Computer science	Database removes all search results above the count of 2000
Base	Multidisciplinary	Database removes all search results above the count of 1000
EconLit	Economics	/
IEEE Xplore	Computer science, electrical engineering, electronics	29 topics were excluded
ProQuest	Business, management	6 subdatabases were included
ScienceDirect	Multidisciplinary	/
Scopus	Multidisciplinary	19 topics were excluded
SportDiscus	Sport studies	/
TRID	Transportation studies	/
Web of Science	Multidisciplinary	47 topics were excluded

a sport-related database and databases with other potentially important disciplines for sport logistics, such as management, computer science and engineering, as well as several multidisciplinary databases were chosen.

In ProQuest, six subdatabases shown in appendix B were included. The subdatabases were selected according to their deposited subject areas, e.g., economics and social sciences, and the provided source type. If the databases allowed the option of excluding certain topics and refining the search by doing so, such actions were taken only if the categories were clearly not in line with the research aim. Categories such as biology, chemistry and agriculture were eliminated. A full list of excluded topics for the Web of Science, Scopus and ACM databases is shown in appendix A. Furthermore, Base showed no more than 1,000 hits per search. In the same manner, ACM omitted any results above 2,000 hits. The retroactively added year of 2021 did not affect the results. A thorough application of the inclusion criteria to the databases resulted in potentially relevant hits, which in turn filled the created list of all contributions with possible relevance. An automatic duplicate removal based on titles was performed. Then, the list was approved for the selection process.

3.2 Selection process

To decide whether an article met the criteria for the sport logistics topic, a content criterion consisting of a link between sport and logistics was provided. Each of the studies that initially matched the inclusion criteria was examined independently and sequentially in the selection process by the authors in the areas of title, abstract and full text. Those articles had to fulfill the content criterion in all three segments. If there was a contradiction, the contribution was excluded at that point. In the event of discrepancies, discussions were held by the research panel to refine the thematic boundaries. The content criterion is shown in Table 4.

Only if the examination of the contributions' full texts within the selection process manifested the link were they approved for the deeper literature analysis. The contributions approved for the literature analysis were searched afterward for further

Table 4 Content Criterion and Definitions

	Subject	Description
Content Criterion	Sport and logistics management	Content needs a link between sport and logistics
Definition	Logistics	"Planning, implementing and controlling the flow of information and goods from point of origin to consumption" (Giunipero and Brand 1996, p. 31)
Definition	Sport	"Regarded as physical activity that is competitive, requires skill and exertion and is governed by institutionalized rules" (Trenberth and Hassan 2011, p. 3)

references matching the topic and the inclusion criteria except for the set publication period of 2011–2021. The extension of the publication period for the references was justified previously by the fact that the references of the contributions that remained at the end of the selection process were possibly so closely related to the topic of logistics in sport that these contributions should be included even if they were outside the date range. An extension of the time period beforehand in the inclusion criteria would have led to a number of hits that would have exceeded the capacities of the search. Another duplicate removal was performed within the list of all references. The identified references also had to match in all three areas of the selection process.

3.3 Literature analysis

Starting with the fourth section, analysis, a final contributions list was compiled that contained all relevant studies identified in the selection process. Additional information for each study, such as title, abstract, author names, publication date, name of journal/conference, link, link date, digital object identifier (DOI) and APA citation, were added, as there had been no full extraction of information from all databases. In the final list, duplicates were removed, and publications without a DOI were eliminated.

The final contributions were now reread and analyzed. In addition, more data were extracted in terms of the main topic area and methodology. A categorization scheme was created with reasonable categories to classify the contributions. This scheme was continuously refined throughout the process. The final scheme is shown in Table 5. Subsequently, the classification of the literature into the previously created scheme took place.

The type of work category distinguished between literature review, research article and project report. A literature review can be part of a broader methodology or can be the methodology itself (Cooper 1998, pp. 3–4). A research article could therefore contain a literature review but might have a main objective in opposition to the literature review as a focus not only on reflecting the current

Table 5 Categorization Scheme

Category	Subcategory
Type of work	Literature review, research article, project report
Network perspective	Transportation, supply chain management (SCM), intralogistics
Flow type	Material flow, people flow, information flow
Sport sector	First (1st), second (2nd), third (3rd)
Type of sport	Team, single, undefined
Academic focus	Conceptual, technological, empirical
Type of research (1)	Descriptive, analytical
Type of research (2)	Qualitative, quantitative
Type of research (3)	Basic, applied

state of the art but also on establishing a new or more in-depth state of research. Various research methods, such as data collection, were used for this purpose (Gastel and Day 2016, p. 18). This could also be done in project reports, but these reports tended to be carried out "for operational reasons" (Perneger 2004, p. 191). In such cases, the authors were directly involved in the project described; i.e., they were on site.

The network perspective describes flows in form of networks that consist of nodes and edges. Depending on the considered section of the network three parts were distinguished (Gudehus and Kotzab 2012, pp. 439–440). Intralogistics takes place exclusively in one node and describes internal processes at one location. Extralogistics refers to transportation processes, or what happens on the edges between nodes, i.e., in channels. Interlogistics is an entire logistics network that combines the two previously mentioned disciplines and, in the form of supply chain management, refers to both nodes and edges. In addition, three types of flow could be distinguished: material flow, people flow, or information flow. Some contributions also looked at a combination.

The sport sectors were also trisected, creating a division into professional (commercial organizations, e.g., equipment manufacturers or franchises), nonprofit (e.g., community-based clubs or events), and public (e.g., government funded or related to drug control) (Hoye et al. 2015, pp. 7–8). From there, the categorization distinguished between teams and individual athletes. These types of sport were supplemented by the undefined category to cover scientific work that did not explicitly deal with a particular type of sport.

To classify the publications according to their academic focus, a three-part approach consisting of conceptual, technological, and empirical aspects was utilized. Conceptual papers do not necessarily have a practical focus and deal with the development of new concepts, some of which are abstract, or the extension of existing ones. If the focus is technological, the research centers on a technology that is explained and occasionally described in terms of its application. Empirical contributions rely on data collected, e.g., through observations or experiments, and therefore are often based on the researchers' own findings (Kothari 2004, p. 4).

Following Kothari (2004) once more regarding the research orientation of the final contributions, some complementary categories of the type of research were applied. The research objective could be descriptive if facts were sought in the past and present, which made the research "ex post facto" (Kothari 2004, p. 3). Analytical research has the objective of evaluating, analyzing and providing instructions for future processes or procedures. The methodology type can be qualitative, quantitative or both. The data of qualitative studies are mostly nonnumerical, while quantitative studies use numbers or convert data into numerical values. In conclusion, the type of research distinguished between basic research, in which new knowledge is added to existing theories, and applied research, in which the analysis of empirical data is used to find solutions to problems. The solutions thus refer to the application in a practical environment such as companies.

4 Analysis

Moving on from an overview of the categorization scheme, the following presents the SLR review outcome. First, the selection process across the individual process steps is presented and underpinned with numbers. This is followed by general facts about the publications that made it to the final list. The papers of the conclusive list are presented within the categorization scheme. The categories are utilized to gather information and help to draw conclusions regarding the state of the art of sport logistics research. When the follow-up literature analysis was conducted, it

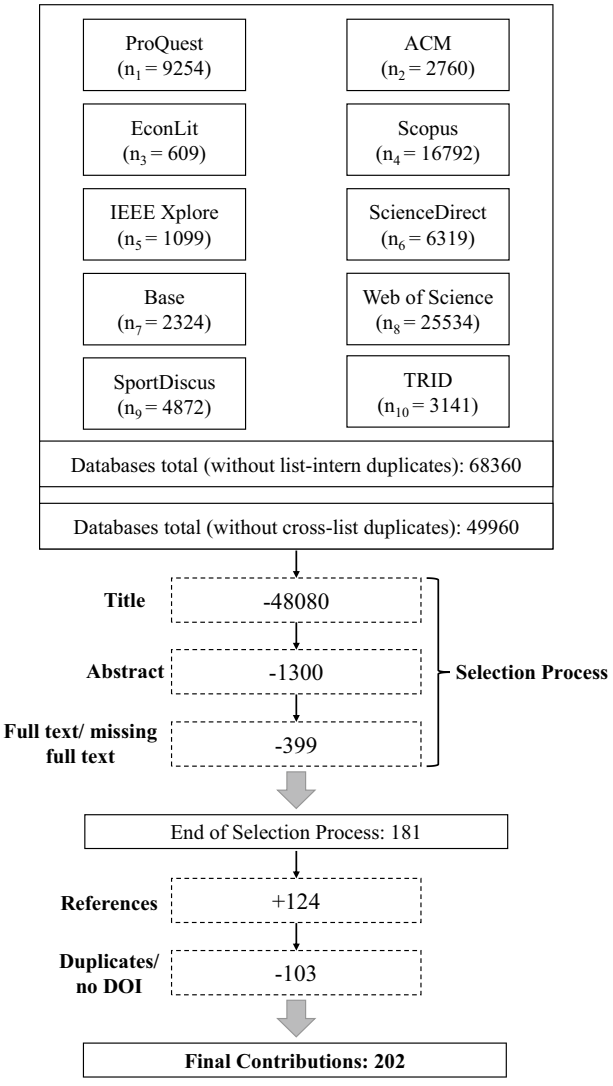

Fig. 3 Selection process with numbers

was consistent with the suggestions made by Tranfield et al. (2003, pp. 218–219) about how to report the studies: (i) descriptive statements are followed by (ii) thematic analysis. The authors present the emerging themes, and connections are drawn between them.

4.1 Reduction of publications during the selection process

Initially, the finalized selection process is described in its entirety (Fig. 3). As mentioned before, a systematic literature search was conducted in the ten databases. As a result, tables containing all exportable articles were created for each database. Up to this point, no exclusion of journal/conference papers was performed with regard to the predefined criterion. Moreover, the search results were not scanned for duplicates. Specifically, the preliminary blocks/lists ($n_1 \ldots n_{10}$) contained the raw data of the initial database searches with a total of 72,704 papers.

After an intralist search for duplicates and the deletion of duplicates, a merged list of 68,360 papers resulted. The lists from all the databases were then merged, and a second duplicate removal took place, which decreased the outcome to 49,960 contributions that became the focal point of the systematic review. The lack of combined coverage of sport and logistics led to an exclusion of 44,362 publications on the basis of the title alone. Then, the participating researchers excluded 1,300 papers on the basis of their abstracts by using the same content criterion (also see (3.2) Selection Process). A total of 399 papers were not considered further because of the missing link between sport and logistics in the full text of 329, and the remaining 70 were excluded because there was no available full text. Ultimately, 181 papers remained. The recursion process for those added another 124 papers to the final entries. A final duplicate removal and an exclusion for the absence of a DOI were performed. The definitive list for the literature analysis then consisted of 202 publications. It contains the authors cited in APA citation style, the year of publication, a classification in the previously created categorization scheme and a topic cluster (Table 6).

Table 6 Categorization scheme and topic clusters

General information	Type of work			Network perspective			Flow type			Sport sector			Type of sport			Academic focus			Type of research 1		Type of research 2		Type of research 3		Topic cluster
References	Literature review	Research article	Project report	Transportation	SCM	Intralogistics	Material flow	People flow	Info. flow	Public	Non-profit	Professional	Team	Single	Unspecified	Conceptual	Technological	Empirical	Qualitative	Quantitative	Basic	Applied	Descriptive	Analytical	
Agha and Dixon (2021)	x				x			x	x			x	x			x			x		x		x		10
Aguilera (2020)		x			x		x					x			x			x		x	x		x		5
Andreff and Andreff (2009)		x			x		x					x			x			x		x	x		x		5
Appelqvist et al. (2013)		x			x		x		x			x			x			x		x		x	x		5
Appelqvist et al. (2016)		x			x		x		x			x			x			x		x	x			x	5
Arnold et al. (2015)		x				x		x				x			x	x			x			x		x	1
Arnold et al. (2016)		x		x				x			x				x			x		x	x		x		7
Asian et al. (2020)		x			x		x		x			x			x			x		x		x	x		5
Bao et al. (2017)		x		x				x				x			x			x		x		x		x	1
Bateman and Majumdar (2018)		x				x		x				x			x	x			x			x	x		9
Beis et al. (2006)		x			x			x		x					x		x			x		x		x	1
Brady and Davies (2014)		x			x		x		x			x			x			x	x			x		x	2

Table 6 (continued)

General information	Type of work			Network perspective			Flow type			Sport sector			Type of sport			Academic focus			Type of research 1		Type of research 2		Type of research 3		Topic cluster
References	Literature review	Research article	Project report	Transportation	SCM	Intralogistics	Material flow	People flow	Info. flow	Public	Non-profit	Professional	Team	Single	Unspecified	Conceptual	Technological	Empirical	Qualitative	Quantitative	Basic	Applied	Descriptive	Analytical	
Browne et al. (2014)		x		x			x	x				x			x			x		x	x			x	1
Bunds et al. (2018)		x		x				x			x		x					x		x	x			x	7
Burke and Woolcock (2009)	x			x				x		x					x	x				x	x		x		10
Cai et al. (2018)		x			x		x		x			x			x			x		x		x		x	1
Ceder and Perera (2014)		x		x				x		x					x	x				x		x	x		2
Chelladurai et al. (1987)		x				x	x					x		x				x		x	x		x		7
Chen and Notteboom, (2012)		x		x			x					x			x	x			x		x			x	5
Chen et al. (2020)		x		x				x	x	x					x		x			x	x			x	1
Cheng and Song (2021)		x			x		x		x			x			x		x			x	x		x		6
Cheng et al. (2020)		x		x				x		x					x			x		x		x		x	1
Chersulich Tomino et al. (2020)	x			x				x				x			x	x				x	x		x		3
Cho et al. (2019)			x		x				x		x		x					x	x		x		x		7
Cieslinski et al. (2016)		x		x			x	x	x			x			x		x		x			x		x	6

Table 6 (continued)

General information	Type of work			Network perspective			Flow type			Sport sector			Type of sport			Academic focus			Type of research 1		Type of research 2		Type of research 3		Topic cluster
References	Literature review	Research article	Project report	Transportation	SCM	Intralogistics	Material flow	People flow	Info. flow	Public	Non-profit	Professional	Team	Single	Unspecified	Conceptual	Technological	Empirical	Qualitative	Quantitative	Basic	Applied	Descriptive	Analytical	
Clikeman (2012)		x			x				x			x			x	x			x		x		x		10
Collins et al. (2012)		x		x				x			x			x				x		x		x			x	8
Consoli et al. (2013)			x	x				x	x	x					x			x	x		x		x			2
Currie and Delbosc (2011)	x			x				x		x					x	x				x	x		x			2
Currie and Shalaby (2012)	x			x				x				x			x			x	x			x	x			1
Currie et al. (2014)	x			x				x	x	x					x			x	x		x				x	2
Darcy (2003)	x			x				x				x			x			x	x		x		x			2
Denicol et al. (2021)		x			x		x	x	x			x			x			x	x			x			x	2
Desbordes (2001)		x			x		x		x			x		x				x	x		x				x	10
Desbordes (2002)		x			x		x		x			x			x			x		x	x		x			4
Dolf and Teehan (2015)		x		x				x			x		x					x		x	x		x			8
Dong et al. (2012)		x		x				x	x	x					x		x			x		x	x			1
Dosumu et al. (2017)		x		x				x			x		x					x		x	x		x			8

Table 6 (continued)

General information	Type of work			Network perspective			Flow type			Sport sector			Type of sport			Academic focus			Type of research 1		Type of research 2		Type of research 3		Topic cluster
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Dosunmu (2012)			x	x				x		x					x		x		x		x		x		1
Earl et al. (2014)			x		x		x		x	x			x					x		x	x		x		2
Elbery et al. (2019a, b)		x		x				x	x	x					x			x		x		x	x		6
Elbery et al. (2019a, b)		x		x				x	x	x			x					x		x		x	x		6
Emmerson (2012)			x	x				x		x					x			x		x	x		x		2
Enock and Jacobs (2008)	x				x			x	x	x					x	x			x		x			x	1
Fang et al. (2011a, b)		x				x		x	x			x			x			x		x		x		x	9
Fang et al. (2011a, b)		x				x		x				x			x			x		x		x		x	9
Ferranti et al. (2020)		x		x				x		x					x			x	x		x			x	2
Gallucci and Petersen (2017)		x				x	x				x				x			x		x	x		x		7
Gerke (2016)		x			x		x		x			x		x				x	x		x			x	10
Gerke and Dalla Pria (2018)		x			x		x		x			x		x				x	x		x			x	10
Gerke et al. (2018)		x			x		x		x			x			x			x	x			x		x	10

Table 6 (continued)

General information	Type of work			Network perspective			Flow type			Sport sector			Type of sport			Academic focus			Type of research 1		Type of research 2		Type of research 3		Topic cluster
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Gerke et al. (2015)		x			x		x		x			x		x				x	x		x			x	10
Gerke et al. (2020)			x		x		x		x			x	x					x	x		x		x		10
Ghaffar et al. (2011)		x			x		x	x	x			x			x	x			x			x	x		2
Giuliano (1988)		x		x				x	x	x					x			x		x		x		x	2
Gupta et al. (2011			x	x				x		x			x			x				x		x		x	7
Gutierrez et al. (2021)	x			x				x		x			x			x			x		x			x	10
Han et al. (2018)			x	x				x		x					x			x		x		x	x		3
Harvey and Saint-Germain (2001)		x			x		x		x			x			x			x		x	x		x		5
Hecox (2013)	x				x		x		x			x		x		x			x		x			x	10
Henao and Marshall (2013)		x		x				x	x			x			x			x		x	x		x		2
Hensher and Brewer (2002)		x		x				x		x					x			x		x	x		x		2
Herold et al. (2021)			x		x		x	x	x			x	x					x	x			x	x		2

Table 6 (continued)

General information	Type of work			Network perspective			Flow type			Sport sector			Type of sport			Academic focus			Type of research 1		Type of research 2		Type of research 3		Topic cluster
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Herold et al. (2019)	x				x		x	x	x			x			x	x				x	x		x		2
Humphreys (2017)		x		x			x				x			x				x	x		x			x	10
Jiang (2008)			x	x				x		x					x			x		x	x		x		2
Jingmeng et al. (2013)		x			x		x		x			x	x					x		x	x			x	4
Johnson et al. (2016)			x	x				x		x					x			x		x		x	x		1
Jones and Woolley (2019)		x		x				x		x					x			x	x		x		x		2
Jones et al. (2015)		x		x				x	x	x					x			x	x		x			x	2
Judge et al. (2014)		x				x	x				x		x					x		x	x		x		7
Karaköprü and Kabadurmuş (2019)		x		x				x			x		x					x		x		x		x	7
Kassens-Noor (2010)		x		x				x		x					x			x	x		x			x	3
Kassens-Noor (2013a, b)		x		x				x		x					x	x			x		x		x		3
Kassens-Noor (2019)	x			x				x		x					x			x	x		x		x		1

Table 6 (continued)

General information	Type of work			Network perspective			Flow type			Sport sector			Type of sport			Academic focus			Type of research 1		Type of research 2		Type of research 3		Topic cluster
References	Literature review	Research article	Project report	Transportation	SCM	Intralogistics	Material flow	People flow	Info. flow	Public	Non-profit	Professional	Team	Single	Unspecified	Conceptual	Technological	Empirical	Qualitative	Quantitative	Basic	Applied	Descriptive	Analytical	
Kassens-Noor and Fukushige (2018)	x			x				x	x			x			x	x			x			x	x		6
Kassens-Noor and Kayal (2016)		x		x				x		x					x			x	x		x			x	3
Kassens-Noor et al. (2018)			x	x				x		x					x			x	x		x		x		3
Kauppi et al. (2013)	x				x		x	x	x			x			x	x				x	x		x		10
Kendall et al. (2010)	x				x				x			x			x	x			x		x		x		10
Kershaw (2012)			x	x				x		x					x			x	x		x		x		2
Khara and Lund-Thomsen (2012)		x			x		x					x	x			x			x		x			x	4
Klauser (2013)		x			x			x				x	x					x	x		x			x	9
Kovacs-Gyori et al. (2018)		x		x				x	x		x				x			x		x	x		x		1
Kristiansen et al. (2016)			x		x			x				x			x			x	x		x			x	3
Kubler et al. (2017)		x			x			x	x	x					x		x		x			x		x	6
Kumar et al. (2021)		x				x	x		x			x			x			x	x			x		x	4

Table 6 (continued)

General information	Type of work			Network perspective			Flow type			Sport sector			Type of sport			Academic focus			Type of research 1		Type of research 2		Type of research 3		Topic cluster
References	Literature review	Research article	Project report	Transportation	SCM	Intralogistics	Material flow	People flow	Info. flow	Public	Non-profit	Professional	Team	Single	Unspecified	Conceptual	Technological	Empirical	Qualitative	Quantitative	Basic	Applied	Descriptive	Analytical	
Kwoczek et al. (2014)		x		x				x		x					x			x		x		x		x	1
Lassacher et al. (2009)		x		x				x	x	x					x			x		x		x		x	2
Leilei et al. (2012)		x		x				x		x					x	x				x	x		x		2
Li et al. (2019)	x				x		x		x			x			x	x				x		x	x		1
Li et al. (2013)		x		x				x		x					x			x		x		x	x		3
Lindau et al. (2016)			x	x				x		x					x			x		x	x			x	1
Lindsay (2013)		x		x				x		x					x			x	x			x		x	2
Liu et al. (2008a, b)		x		x				x				x			x			x		x	x			x	3
Liu et al. (2008b, b)		x		x				x	x	x					x			x		x	x		x		2
Locke (2007)		x				x	x					x			x			x		x		x		x	4
Loewen and Wicker (2021)		x		x				x			x		x					x		x		x		x	8
Luitzen et al. (2015)	x				x		x		x		x			x		x			x		x		x		10
Lund et al. (2011)	x				x		x	x	x		x				x	x			x		x			x	1
Lund-Thomsen (2013)		x			x		x					x	x					x	x			x	x		4

Table 6 (continued)

General information	Type of work			Network perspective			Flow type			Sport sector			Type of sport			Academic focus			Type of research 1		Type of research 2		Type of research 3		Topic cluster
References	Literature review	Research article	Project report	Transportation	SCM	Intralogistics	Material flow	People flow	Info. flow	Public	Non-profit	Professional	Team	Single	Unspecified	Conceptual	Technological	Empirical	Qualitative	Quantitative	Basic	Applied	Descriptive	Analytical	
MacIntosh et al. (2016)		x			x		x				x				x			x		x	x		x		7
Mahmudzadeh et al. (2020)		x				x		x				x	x					x		x		x		x	9
Malfas et al. (2004)	x				x			x	x	x					x	x			x		x			x	3
Malhado and Rothfuss (2013)		x		x				x		x					x			x		x	x			x	2
Mamic (2005)		x			x		x		x			x			x	x			x			x		x	5
Manzenreiter (2013)		x			x		x					x			x			x		x	x			x	4
McGuinness (2013)			x	x				x	x			x			x		x			x		x	x		6
Meier et al. (2019)		x				x	x					x			x			x	x		x			x	4
Memari et al. (2021)		x			x		x					x	x					x	x		x		x		7
Merk (2011)	x				x		x					x			x	x			x		x			x	4
Middleditch and Bradbury (2014)		x			x				x			x			x			x	x			x		x	2
Millstein and Campbell (2018)			x			x			x			x	x					x		x		x		x	10

Table 6 (continued)

General information	Type of work			Network perspective			Flow type			Sport sector			Type of sport			Academic focus			Type of research 1		Type of research 2		Type of research 3		Topic cluster
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Minis and Tsamboulas (2008)		x		x				x				x			x			x		x		x	x		1
Minis et al. (2006a, b)		x		x				x				x			x			x		x		x	x		1
Minis et al. (2006a, b)		x			x		x		x			x			x			x		x	x		x		1
Minis et al. (2009)		x		x				x	x			x			x	x				x		x	x		2
Mirehie et al. (2021)		x		x				x			x		x					x	x		x		x		10
Mosadeghi et al. (2020)		x		x				x	x	x					x		x		x		x		x		2
Motla et al. (2021)		x			x		x					x		x				x		x		x		x	10
Mountjoy et al. (2015)			x		x		x	x		x					x			x	x		x		x		2
Mountjoy et al. (2021)	x				x		x	x	x			x			x	x			x			x		x	1
Mulley and Moutou (2015)		x		x				x		x					x	x			x			x		x	3
Nadvi (2011)	x				x		x					x	x					x		x		x		x	4
Nadvi et al. (2011)	x				x		x					x	x			x			x		x			x	4

Table 6 (continued)

General information	Type of work			Network perspective			Flow type			Sport sector			Type of sport			Academic focus			Type of research 1		Type of research 2		Type of research 3		Topic cluster
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Naz and Bögenhold (2020)		x			x		x					x	x					x	x		x		x		4
Odoni et al. (2009)		x				x		x	x	x					x			x	x		x		x		1
Palmieri et al. (2021)	x				x		x					x	x			x			x		x		x		6
Parent (2008)		x			x		x					x			x	x			x			x	x		1
Parkes et al. (2016)		x		x				x		x					x			x		x	x		x		2
Peng et al. (2013)		x		x			x	x		x					x	x				x		x		x	2
Liu and Gao (2013)	x				x		x	x	x			x			x	x			x			x		x	1
Pereira (2018)		x		x				x		x					x			x		x	x			x	3
Pereira et al. (2017)		x				x			x			x	x					x		x		x		x	10
Puangmanee and Saearlee (2020)			x		x		x				x			x				x	x		x		x		10
Pulugurtha et al. (2020)		x		x				x		x					x	x				x	x			x	1
Rabadi et al. (2015)	x				x			x	x			x			x	x				x	x			x	1
Radicchi (2014)	x				x		x					x	x					x	x		x		x		10
Ramadan et al. (2020)		x		x				x		x			x				x			x		x		x	6

Table 6 (continued)

General information	Type of work			Network perspective			Flow type			Sport sector			Type of sport			Academic focus			Type of research 1		Type of research 2		Type of research 3		Topic cluster
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Ratnatunga and Muthaly (2000)		x			x		x	x	x			x			x	x			x			x		x	1
Raza (2016)		x				x	x					x	x				x			x		x		x	6
Razavi (2014)		x			x		x		x			x			x			x		x	x			x	4
Ren et al. (2021)		x			x		x		x			x			x		x		x			x		x	6
Ribeiro and Almeida (2020)		x		x				x		x					x			x		x	x		x		3
Ribeiro and Cunha de Almeida (2021)		x		x				x		x					x			x		x	x		x		2
Ribeiro et al. (2021)		x			x		x	x	x			x			x	x			x		x			x	2
Richter and Ruhl (2013)			x	x				x		x					x			x	x			x		x	2
Robbins et al. (2007)	x			x				x				x			x	x			x		x			x	1
Roscoe and Baker (2014)		x			x		x		x			x			x			x	x		x			x	5
Rozhdestvenskaya et al. (2021)	x				x		x			x			x			x			x			x		x	10
Rutten et al. (2021)		x				x		x				x	x					x		x	x			x	2

Table 6 (continued)

General information	Type of work			Network perspective			Flow type			Sport sector			Type of sport			Academic focus			Type of research 1		Type of research 2		Type of research 3		Topic cluster
References	Literature review	Research article	Project report	Transportation	SCM	Intralogistics	Material flow	People flow	Info. flow	Public	Non-profit	Professional	Team	Single	Unspecified	Conceptual	Technological	Empirical	Qualitative	Quantitative	Basic	Applied	Descriptive	Analytical	
Rutty et al. (2015)	x				x			x			x				x	x			x		x		x		2
Sampson et al. (2013)		x			x		x	x				x			x			x		x		x		x	8
Sarasua et al. (2016)		x		x				x	x			x			x		x			x		x		x	6
Sattayhatewa and Smith (2003)		x		x				x	x			x			x			x		x		x		x	1
Savić et al. (2018)	x				x		x		x			x			x	x			x		x		x		10
Scur and Kolososki (2019)		x			x		x					x			x			x	x		x			x	5
Serrano et al. (2019a, b)		x			x		x		x			x	x					x	x			x	x		10
Serrano et al. (2019a, b)		x			x		x		x			x	x					x	x		x			x	10
Shi et al. (2020)	x				x		x	x	x			x			x	x			x			x	x		2
Shilbury (2000)	x				x		x		x			x			x	x			x		x			x	10
Simms et al. (2021)		x		x				x	x			x			x			x		x	x			x	7
Slack (2014)	x				x		x		x			x	x			x			x			x	x		10
Smith and Smith (2008)	x					x			x			x	x			x			x		x		x		10

Table 6 (continued)

General information	Type of work			Network perspective			Flow type			Sport sector			Type of sport			Academic focus			Type of research 1		Type of research 2		Type of research 3		Topic cluster
References	Literature review	Research article	Project report	Transportation	SCM	Intralogistics	Material flow	People flow	Info. flow	Public	Non-profit	Professional	Team	Single	Unspecified	Conceptual	Technological	Empirical	Qualitative	Quantitative	Basic	Applied	Descriptive	Analytical	
Somabutr et al. (2020)			x		x		x		x			x		x				x	x		x		x		7
Spector (2017)		x		x				x			x			x				x	x		x			x	8
Sroka (2021)	x			x				x		x					x			x	x		x			x	3
Stewart et al. (2008)			x		x		x		x			x		x				x	x		x			x	10
Su et al. (2009)		x		x				x	x	x					x			x		x	x		x		2
Subic et al. (2012)			x			x	x					x			x			x	x			x		x	4
Sumner (2011)			x	x				x		x					x			x	x		x		x		2
Sumner (2012)			x	x				x		x					x			x		x	x		x		3
Sun et al. (2021)		x			x			x	x		x			x				x		x		x		x	2
Szymoszowskyj et al. (2016)		x			x		x					x	x			x			x		x		x		7
Thomsen and Nadvi (2010)		x			x		x					x	x					x	x		x		x		10
Tóffano Pereira et al. (2019)		x		x				x				x	x					x		x	x			x	8
Triantafyllidis and Davakos (2019)		x		x				x		x				x				x		x	x		x		8
Triantafyllidis et al. (2018)			x	x				x			x		x					x		x	x		x		8
Villiers et al. (2019)		x		x				x	x	x					x			x		x	x			x	2

Table 6 (continued)

General information	Type of work			Network perspective			Flow type			Sport sector			Type of sport			Academic focus			Type of research 1		Type of research 2		Type of research 3		Topic cluster
References	Literature review	Research article	Project report	Transportation	SCM	Intralogistics	Material flow	People flow	Info. flow	Public	Non-profit	Professional	Team	Single	Unspecified	Conceptual	Technological	Empirical	Qualitative	Quantitative	Basic	Applied	Descriptive	Analytical	
Vouillamoz et al. (2009)		x		x			x		x	x			x					x		x	x		x		2
Wen et al. (2008)		x		x				x	x	x					x			x		x	x		x		2
Wicker (2018)		x		x				x			x			x				x		x	x			x	8
Wise et al. (2019)			x		x		x		x		x			x				x	x			x		x	10
Wiśniewski (2021)		x			x		x				x		x					x	x		x		x		7
Wojtowicz and Wallace (2010)		x		x				x	x	x					x		x			x	x			x	2
Wood (2019)	x			x				x		x			x			x				x	x			x	3
Woong Sung et al. (2017)			x		x		x					x			x			x	x			x		x	5
Wu and Li (2016)		x				x		x	x			x			x		x		x		x			x	6
Xie et al. (2017)		x				x		x				x			x			x		x		x		x	9
Xiong et al. (2013)			x	x				x	x	x					x		x			x	x			x	2
Xiong et al. (2012)			x	x				x	x	x					x		x		x		x		x		2
Xiong et al. (2010)			x	x				x	x	x					x		x		x		x		x		2

Table 6 (continued)

General information	Type of work			Network perspective			Flow type			Sport sector			Type of sport			Academic focus			Type of research 1		Type of research 2		Type of research 3		Topic cluster
References	Literature review	Research article	Project report	Transportation	SCM	Intralogistics	Material flow	People flow	Info. flow	Public	Non-profit	Professional	Team	Single	Unspecified	Conceptual	Technological	Empirical	Qualitative	Quantitative	Basic	Applied	Descriptive	Analytical	
Xu and González (2017)		x		x				x	x	x					x			x		x		x	x		6
Yamawaki et al. (2020		x		x				x		x					x			x		x	x			x	3
Yan et al. (2010)		x		x				x	x	x					x			x		x	x			x	2
Yu and Duan (2021)		x			x		x		x			x			x		x			x		x		x	6
Zeller (2015)		x		x				x		x			x					x		x	x			x	10
Zhang et al. (2018)		x				x		x	x			x	x			x				x		x		x	9
Zhang et al. (2021a, b)		x		x				x	x			x	x				x		x			x		x	6
Zhang et al. (2021a, b)		x		x				x	x			x	x				x		x			x		x	6
Zhou et al. (2021)		x			x				x		x				x			x	x		x		x		2
Zoghi et al. (2009)	x			x				x		x					x	x				x		x		x	3
Σ	38	133	31	97	87	18	82	128	95	72	25	105	47	18	137	51	21	130	100	102	126	76	95	107	—

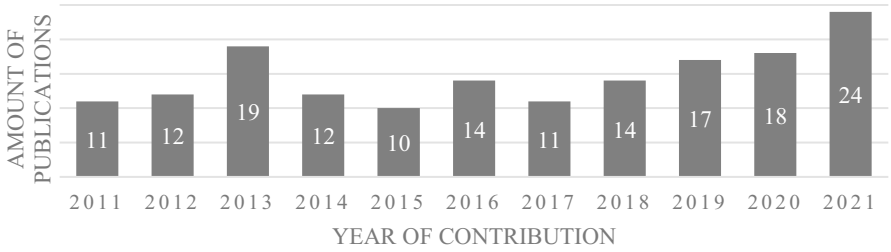

Fig. 4 Sport logistics publications since 2011

4.2 General publications analysis

4.2.1 Publication year

Beginning with (i) the descriptive statements as a preparation for (ii) the thematic analysis, the 202 selected scientific papers showed that there had been no crucial increase in publications relating to a combination of sport and logistics management topics over the previous decade (Fig. 4). The releases were almost evenly distributed over the time horizon, with a peak of 24 articles in 2021. Whether managing logistics in sport will receive intensified interest from researchers and businesses can be determined only by watching future years and expanding the research period.

4.2.2 Country of origin

Based on the affiliation of the first author, statistics were collected on the country of origin of each publication. Figure 5 gives an overview on all countries with more than five publications. Countries with four publications or less are subsumed under "others".

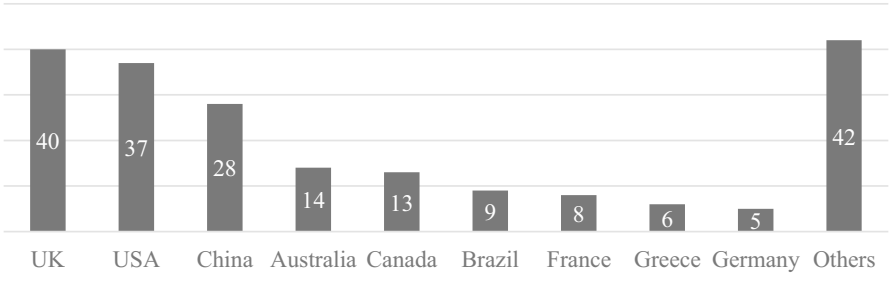

Fig. 5 Countries of origin of the publications

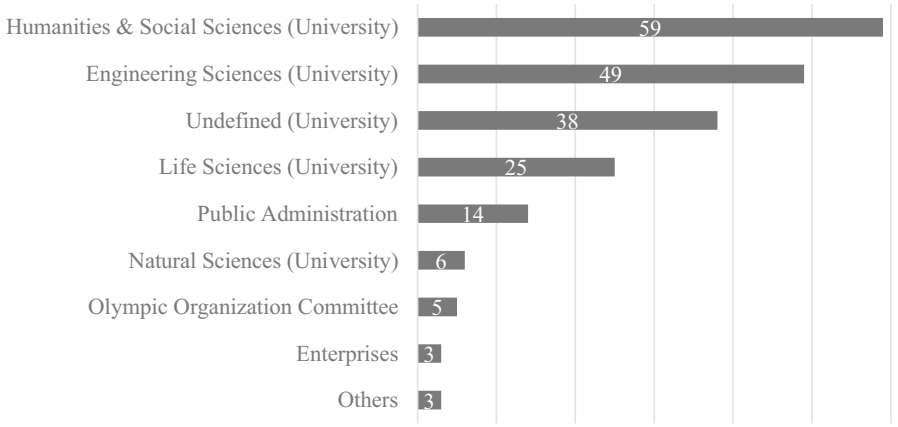

Fig. 6 Professional background of Authors

4.2.3 Authors' professional background

The professional background of the first author was analyzed based on his affiliation (Fig. 6). The vast majority of authors conducted their research at a university. Where their department/faculty affiliation was given, a distinction was made into publications from humanities and social sciences, engineering sciences, life sciences, and natural sciences. Professional backgrounds other than universities were public administrations, Olympic organization committees, or enterprises.

4.2.4 Subject areas of publications

From the publications examined, 85 could clearly be assigned to either the subject area of logistics or of sport. On the side of the journals, 40 publication were found in journals of logistics management such as International Journal of Logistics Management or International Journal of Physical Distribution & Logistics Management. From the 42 publications found in sport journals, 18 were released in sport management journals as Sport Management Review or European Sport Management Quarterly, and 24 were released in general sport journals such as Sport in Society or Journal of Sport and Tourism. On the side of the conference, three contributions are from logistics specific conventions (e.g., International IEEE Conference on Intelligent Transportation Systems), none from sport management specific conventions.

4.2.5 Leading authors and journals

The included publications were written by 547 different authors. Eva Kassens-Noor had the largest impact on the final list, with six published articles that showed a link between sport and logistics management. The journals European Sport Management Quarterly with 5 and Transportation Research Record: Journal

of the Transportation Research Board with 7 articles each contributed the most to the final list. In total, 23 different conferences and 180 journals were included.

4.2.6 Type of work

As mentioned before, the type of work refers to the central research methodology. Mostly, the contributions could be classified as research articles. In some of those research articles, the authors used a literature review (Somabutr et al. 2020) to obtain a picture of the state of the art in the corresponding research area. A few of the contributions included in the final list contained a literature review as their main methodology (Savić et al. 2018). When the authors were on site and their results were based on observation of sport logistical processes, they were categorized in the project report category (Puangmanee and Saearlee 2020).

4.3 Analysis of titles and keywords

The previous look into the categorization scheme (Table 6) provided an extensive overview of research fields and research methods within sport logistics. The final list comprised 202 papers. A text-based description of all papers in detail would go beyond the scope of this study. Nevertheless, by utilizing a full title and keyword analysis, far-reaching statements about the content are possible. Following

Fig. 7 Qualitative title word cloud

(Tranfield et al. 2003) once more, (i) the descriptive statements are ended, and (ii) the thematic analysis is now introduced in the wake of the reporting. It is based on the results of the title and keywords analysis.

The qualitative output for the title analysis is displayed in a word cloud (Fig. 7). The frequency of terms occurring in the titles is represented by the size ratio. Prepositions, connectors, and verbs as well as words such as "based", "perceived" or "new", which do not reveal the content of the works, were not incorporated. The word cloud reveals what topics are important when managing logistics in sport. It puts the management of events in the center of attention, namely the Olympics and games. From a sport management point of view especially football stands out as a sport and stadium as venue where sport is performed. Keywords sticking out from a logistics management point of view are transport, traffic, or delivery. They indicate that a major focus of the research is transportation, though not exclusively as they are accompanied by keywords such as logistics, supply, or chain which suggest further focal points.

On the basis of the keywords that the authors and publishers of the individual publications set themselves, far-reaching statements can be made in regard to the contents. The results of the keyword analysis are presented in Fig. 8. It was carried out using VOSViewer (visualization of similarities) (van Eck and Waltman 2010). Only keywords that occurred at least twice were considered, and 104

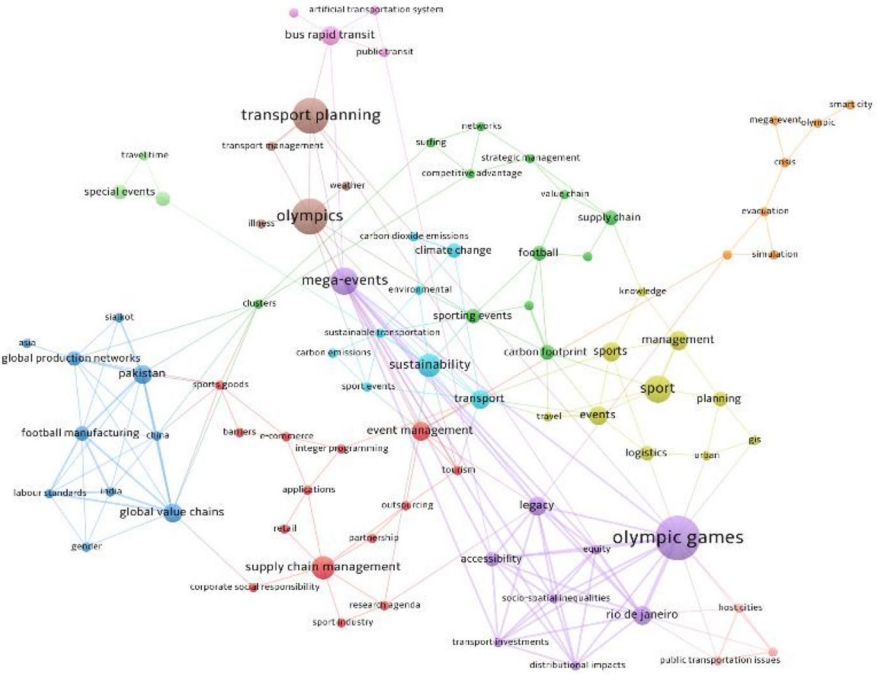

Fig. 8 Keyword clusters arising from publication analysis

keywords were thus identified. The distance between the keywords is an indicator of their proximity to each other. This means two publications with several joint keywords will be close to each other. The same applies to a group of publications with keywords that carry many cross connections. It is different for a paper that has only the minimum number of two connections via a single keyword in the overall cluster. All other keywords of this publication will be slightly offset from the others. The software identified a cluster that had the most connected keywords overall. Of the 104 keywords, not all had any connection to the defined main cluster. The software then offered to hide keywords or publications that were not connected. After this function was used, 87 connected keywords remained as the main cluster. The frequency of keyword occurrence is determined by the size of the spheres. The thickness of the lines indicates how often keywords occur together. The colors are another indicator of multiple co-occurrences of keywords, resulting in the formation of further clusters. The keyword clusters support the indication of the word cloud as the central and biggest clusters form around the Olympic Games, mega-events and the planning of its transportation. The topics of events and transportation also reoccur in a couple of smaller clusters, e.g. in the context of sustainability and public transport management. Two clusters stand out thematically: the blue cluster's focus is on production, the red cluster's focus is on supply chain management. Their points of connection are global value chains and sporting goods. They comprehend aspects such as manufacturing and labor standards as well as e-commerce, retail and outsourcing. By the size of the clusters, these sport logistics fields seem to be academically less developed than sport events and transportation.

4.4 Sport sector and type of sport

The classification of sport sectors was not always clear-cut in the papers examined. For a deterministic assignment, a fixation on the sport sector that was the central focus was used. The public sector primarily included transportation papers, which could be traced back to public transportation (Ceder and Perera 2014) and infrastructure around large sporting events. Pre-event planning (Kassens-Noor 2019) and the evaluation of the postevent impacts on the host country in terms of transportation (Hensher and Brewer 2002; Sroka 2021) and economics (Li et al. 2013) were described.

Only limited allocations to the nonprofit sector could be made. The main topics within this sector were sport tourism and spectator travel (Humphreys 2017; Wicker 2018; Wise et al. 2019); community sport, which included sport for development (MacIntosh et al. 2016); and college sport (Gallucci and Petersen 2017).

A wide range of content was selected for the professional sector. With an intersection of 68 papers on material flow, it is hardly surprising that many publications focused on production (Kumar et al. 2021), innovation in the sport equipment business (Desbordes 2001, 2002) or trade (Aguilera 2020; Roscoe and Baker 2014). In contrast to the nonprofit sector, the management of sport events in terms of monetary value was considered (Currie and Shalaby 2012; Sarasua et al. 2011; Sattayhatewa

and Smith 2003). Additionally, management around and in stadiums was located in the professional sector (Henao and Marshall 2013; Klauser 2013; Zhang et al. 2018). The emphasis on professionalization led to the assignment of research on the management of big sport clubs (Memari et al. 2021; Szymoszowskyj et al. 2016) to the same sector.

The category type of sport was divided into team, single and undefined. The team sport category included mainly soccer (Earl et al. 2014; Vouillamoz et al. 2009) and American football (Herold et al. 2021; Judge et al. 2014), but some other team sport (Dolf and Teehan 2015) was also addressed. The focus was on team travel (Gupta et al. 2011) or more general supply chain management considerations (Serrano et al. 2019a, b). No clear pattern was discernible in individual sport. The sport here was wide-ranging, from aquatics (Gerke 2016; Gerke et al. 2015) to skiing (Spector 2017; Wise et al. 2019) to golf (Humphreys 2017). Additionally, some publications did not deal with a specific sport (Clikeman 2012), or the paper included both team and individual sport (Hensher and Brewer 2002).

4.5 Network perspective and flow type

The classification of the network perspective shows a clear preponderance of interlogistics and transportation research. Central research topics of recent transportation studies were the XXX. Summer Olympics in London 2012 (Currie et al. 2014; Dosunmu 2012; Parkes et al. 2016; Sumner 2011) and the XXIV. Summer Olympics in Beijing (Jiang 2008; Liu et al. 2008a, b; Zoghi et al. 2009) as well as major events such as the World Cup (Malhado and Rothfuss 2013; Wood 2019) and other game-day-related work (Dosumu et al. 2017; Loewen and Wicker 2021; Tóffano Pereira et al. 2019).

Intralogistics papers are either related to sport clubs and their facilities (Chelladurai et al. 1987; Gallucci and Petersen 2017) or have a connection to production logistics (Kumar et al. 2021; Meier et al. 2019; Subic et al. 2012), preparation (Arnold et al. 2015; Odoni et al. 2009), technology services (Wu and Li 2016) and evacuation (Bateman and Majumdar 2018; Mahmudzadeh et al. 2020) of stadiums or other sport event-related locations.

One of the core issues of SCM (interlogistics) is global value chains (Appelqvist et al. 2013; Mamic 2005). These included papers about the distribution of sporting goods (Asian et al. 2020; Harvey and Saint-Germain 2001) and case studies on sport equipment brands, such as Reebok (Hecox 2013). Papers on events described management and logistics with all involved entities (Kristiansen et al. 2016).

The logistical focus was nearly balanced among publications related to people flow and those related to material flow. In contrast to the other categories, a listing in more than one of the flow types was regarded a possibility for the reason that flows of materials and people always lead to information exchange. If one of the flow types stood out in particular, a deterministic approach was taken, as in the other categories.

The material flow was often recorded from the point of view of producers (Razavi et al. 2014). As a result, many of these material flow-related papers featured the

handling of sport equipment along the supply chain (Andreff and Andreff 2009; Chen and Notteboom 2012; Woong Sung et al. 2017) but missed out on the opportunity to engage with sport equipment logistics in providing for athletes, as was partly done by Herold et al. (2021). However, there were also publications that illuminated the event-related supply of material (Brady and Davies 2014) and food (Li et al. 2019). What was evident was the fact that the supply chain management and material flow categories with 69 shared papers had a high degree of overlap.

Another overlap was noticeable between the transportation category and people flow, with 95 joint papers. As with the transportation category, the people flow papers were primarily about the 2012 London Olympics (Browne et al. 2014; Jones and Woolley 2019; Lindsay 2013), other Olympic Games (Minis et al. 2009; Mulley and Moutou 2015), football games (Elbery et al. 2019b) or different sport events (Han et al. 2018; Mosadeghi et al. 2020). Not mentioned before in the transportation category but still not to be overlooked was the number of papers concerned with the environment and so-called carbon footprint during sport events (Dolf and Teehan 2015; Sampson et al. 2013; Triantafyllidis et al. 2018).

In eight cases, even the flow of information was considered solely with reference to sport and logistics and without physical flows. Here, the findings revolved around facility location problems (Millstein and Campbell 2018; Pereira et al. 2017; Smith and Smith 2008), as observed in intralogistics, new technologies and planning processes (Kendall et al. 2010).

If the term sport logistics or related terms were deliberately coined (Herold et al. 2019, 2021; Liu and Gao 2013; Ribeiro and Almeida 2020), all three categories were attributed since these papers chose a fully holistic approach. If information flows and all physical flows were considered for the Olympic Games and the tasks of logistics management were analyzed (Denicol et al. 2021; Ribeiro et al. 2021), the papers also received three crosses.

4.6 Academic focus and type of research

In the vast majority of the research articles, the academic focus was empirical in nature. Here, different approaches were taken with interviews (Arnold et al. 2016) or the production of the authors' own research data (Rutten et al. 2021) through simulation (Fang et al. 2011a, b) or via the conduction of a project report (Jiang 2008). Some of the contributions were only conceptual, meaning they considered the work of others by conducting a literature review and following it with a built-on framework or other concept (Robbins et al. 2007). Technological papers often included an empirical aspect because technology was often used to produce the authors' own results (Ramadan et al. 2020).

In the type of research category, qualitative research often used interviews (Bateman and Majumdar 2018; Szymoszowskyj et al. 2016) or literature reviews (Luitzen et al. 2015). Sixty-eight papers from the qualitative category were assigned to the basic type of research, which illustrates the frequency of a joint occurrence. Quantitative research often relied on statistical analysis (Mahmudzadeh et al. 2020; Razavi et al. 2014), which was applied in 44 cases. Quantitative

data ranged from survey results to simulations of traffic (Ramadan et al. 2020) or crowds (Xie et al. 2017). Some papers explicitly chose mixed methods. In mixed-methods papers, the authors ascertained the more significant method.

Many of the literature reviews fell into the basic type of research. Of the 30 literature reviews with a conceptual academic focus, 22 were basic research. The applied papers mostly had an economic focus (Lund-Thomsen 2013; Raza 2016), with 50 of the 76 papers being assigned to the third sector of sport.

Analytical papers nearly created an equilibrium by choosing a basic research approach in 50 cases and an applied research approach in 57 cases. Most descriptive papers were also basic research, with a congruency of 69 papers.

4.7 Topic clusters

In conducting (ii) the thematic analysis, topic clusters were formed (Fig. 9) that represent the central topics that occur across the board (Tranfield et al. 2003, p. 219).

Following the preceding statements about events and the final list, the authors concluded at this point that the management of logistics in sport was most prevalent in the event context. The research panel sorted 100 of the 202 final papers into event operations research. From there, a discussion led to the three central topics *event operations planning* with 30, *event operations management* with 49 and *event operations legacy* with 18 papers. The choice of a threefold partition was made because planning papers comprise primarily studies about future events or how former events were prepared, management papers include analysis of the management process during events and the general time horizon during or shortly after events and legacy papers evaluate persisting transport systems and infrastructure after events on the one hand and the perceptions of involved stakeholders or residents on the other.

The next central topic is sporting goods. Here, 14 papers were regarded as dealing with production, while 11 analyzed supply distribution. *Sporting goods production*

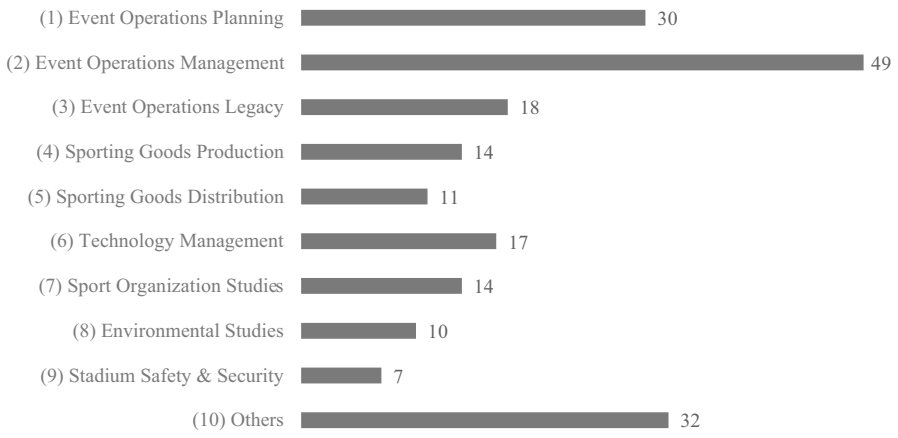

Fig. 9 Overview of the topic clusters and their frequency

papers were concerned with labor conditions, performance measurement or innovating processes. *Sporting goods distribution* mostly revolved around the supply chain from a trade perspective or its risks of disruption or focused on a specific company.

Next was *technology management*, to which 17 papers were distributed. These related primarily to new technologies such as the internet of things (IoT), artificial intelligence and big data or infrastructure planning with GIS. Security planning with specific technologies for upcoming events was also represented. The subsequent central topic was dealing with *sport organization studies*. Fourteen studies matched this topic. Those papers presented research on sport clubs, community sports, facility management or athlete management with travel and organizational stressors. *Environmental studies* as another central topic included 10 papers, mostly involving carbon dioxide emissions measured with the carbon footprint at football matches or events. With 7 papers *stadium safety and security* represents the smallest category. It deals with space management and crowd flow in stadiums, especially in evacuation and emergency scenarios.

There were 30 publications on peripheral themes that did not justify a central topic of their own (*others*). Ten of the publications dealt with the sport industry in very general terms, while seven focused on sport clusters. Further topics included a facility location problem, sport tourism, marketing, reverse logistics, sport history, accounting and sport management in general.

In the final list (Table 6), the central topics were represented by the upcoming numbers: *event operations planning* (1), *event operations management* (2), *event operations legacy* (3), *sporting goods production* (4), *sporting goods distribution* (5), *technology management* (6), *sport organization studies* (7), *environmental studies* (8), *stadium safety and security* (9), and *others* (10).

5 Discussion and research agenda

After the previous chapter comprehensively analyzed the current body of knowledge in the field of sport logistics management, this chapter discusses the implications for both practitioners and scholars, and derives future challenges. A detailed agenda for future research is derived from the analysis by classifying the upcoming research topics depending on the sport logistics triangle.

5.1 Implications and research opportunities for practitioners

In an ever growing sport industry, the need for and value of professional logistics services is continuously increasing, quantitatively as well as qualitatively. Logistics services are operations in the supply environment of systems. In sport, such systems can be enterprises, non-profit organizations, events, sporting facilities, traffic etc. These systems require physical supplies to exist.

In quantitative terms, practitioners face the need to establish new and extend existing logistics services in sport due to, e.g., increasing sport equipment sales, ever new and bigger sport events, growing sport tourism. In qualitative terms, the

Table 7 Research opportunities for practitioners

Research opportunity	Triangle fields
The design of transportation/traffic (management) systems for spectators travelling to events, using public or private transport means (e.g., subway, car)	Peo | Tra | Pro, Non, Pub
The prediction of demand for transportation	Mat, Peo, Inf | Tra | Pro, Non, Pub
The development of visitor moving patterns at sport venues (in and around sport arenas)	Peo | Int | Pro, Non, Pub
The horizontal and vertical supply chain integration of sport organizations (incl. arrangement of interorganizational partnerships)	Mat | Sup | Pro, Non
The determination of the location of logistics centers of sport organizations (e.g., sport equipment manufacturer) or of events (e.g., Olympic Games)	Mat, Inf | Tra, Sup | Pro, Non, Pub
The outsourcing of logistics services (third party management)	Mat, Peo, Inf | Sup | Pro, Non, Pub
The design and management of multi-channel sales chains for sporting goods (B2B, B2C, e-commerce)	Mat | Sup | Pro
The routing of people flows to, at, from sport events	Peo | Int, Tra | Pro, Non, Pub
The planning of resources to fulfill logistics requirements in sport organizations or at sport events (e.g., labor, transport capacity, storage conditions)	Mat, Peo, Inf | Int, Tra, Sup | Pro, Non, Pub
The development of key guidelines for operations strategies at sport events	Mat, Peo, Inf | Int, Tra, Sup | Pro, Non, Pub
The development of logistics services levels in sport organizations	Mat, Peo, Inf | Int, Tra, Sup | Pro, Non, Pub
The integration of monitoring systems to track logistics services and evaluate service levels	Mat, Peo, Inf | Int, Tra, Sup | Pro, Non, Pub

practitioners' aim is to continuously improve existing logistics services in sport. This usually means the increase of the logistics performance, e.g., by reducing the delivery time, increasing the delivery capacity, increasing the delivery quality, increasing the delivery flexibility.

The topic clusters event operations planning, event operations management, sporting goods production, sporting goods distribution, and stadium safety and security can be regarded as cumulating mainly issues of special interest for practitioners. Table 7 outlines developments and potentials of logistics in sport that were identified in the literature for practitioners and classifies them on the basis of the sport logistics triangle (flow type: material (Mat), people (Peo), information (Inf); network perspective: intralogistics (Int), transportation (Tra), supply chain (Sup); sport sector: professional (Pro), nonprofit (Non), public (Pub)), listing the triangle fields in the center of attention.

5.2 Implications and research opportunities for scholars

As stated in the introduction, sport logistics management is a heavily under-researched field. It offers broad research opportunities in manifold directions. In particular, project

Table 8 Research opportunities for scholars

Research opportunity	Triangle fields
The development of simulation models for transportation planning of people (e.g., spectators) and goods (e.g., catering in stadiums)	Mat, Peo, Inf | Tra | Pro, Non, Pub
The development of routing algorithms to optimize flow rates in sport logistics scenarios (e.g., travel schedule of a racing series)	Mat | Tra | Pro, Pub
The location determination and design of logistics facilities (e.g., warehousing structure for sport mega events or sport equipment retailers)	Mat, Inf | Int, Tra, Sup | Pro, Non, Pub
The management of equipment and its provision to athletes (athlete-centered logistics)	Mat, Inf | Int, Tra | Pro, Non
The usage of technology (e.g., geographic information system (GIS), video detection, Bluetooth low energy beacons) in sport logistics planning and operations	Mat, Peo, Inf | Int, Tra, Sup | Pro, Non, Pub
The management of sport logistics knowledge: recording of successful implementations and transfer for future implementations (e.g., from Olympics held to future Olympics)	Mat, Peo, Inf | Int, Tra, Sup | Pro, Non, Pub
The description and analysis of typical sport logistics characteristics (e.g., fields of activity, tasks, processes, components, resources, responsibilities) to derive a comprehensive scientific foundation of logistics in sport	Mat, Peo, Inf | Int, Tra, Sup | Pro, Non, Pub
The development of archetypes of organizational structures depending on the sport logistics tasks to be carried out	Mat, Peo, Inf | Int, Tra, Sup | Pro, Non, Pub
The development of key performance indicators (KPI) to evaluate sport logistics success	Mat, Peo, Inf | Int, Tra, Sup | Pro, Non, Pub
The resilience of supply chains in sport (incl. integration of partners, sharing of information, optimal decision-making)	Mat, Peo, Inf | Sup | Pro, Non, Pub
The management of public–private partnerships in sport logistics	Mat, Peo, Inf | Int, Tra, Sup | Pro, Non, Pub
Logistics as supporting factor for sporting success	Mat, Peo, Inf | Int, Tra, Sup | Pro, Non, Pub

reports, the second sector of sport, single sport, and intralogistics (see Table 6) are underrepresented in publications with sport logistics focus. Based on the findings and analyses in this review, Table 8 suggests research areas that need further attention and investigation and classifies them on the basis of the sport logistics triangle (flow type: material (Mat), people (Peo), information (Inf); network perspective: intralogistics (Int), transportation (Tra), supply chain (Sup); sport sector: professional (Pro), nonprofit (Non), public (Pub)), listing the triangle fields in the center of attention.

5.3 Superior/general future challenges

In addition to the specific aspects of the previous two sections, there are more general, superordinate future challenges affecting logistics in sport—practitioners and researchers alike.

Sustainability has arrived at the center of society. The sport industry increasingly recognizes the need to align its activities sustainably. Logistics can make a contribution in all three dimensions of sustainability: a good partner integration along the supply chain leads to economic sustainability, considering legacy usage when planning new transportation networks for mega events (e.g., new subway stations) leads to social sustainability, sourcing local for the production of sport equipment leads to environmental sustainability.

The growing globalization of sport is constantly raising the demands on logistics. Sporting equipment for Western markets is manufactured Far East. North American NFL teams play official matches in Europe, European soccer teams spend their preseasons for marketing tours through North America and Asia playing local teams. Racing series as the Formula One or the World Rally Championship travel back and forth between different continents in the course of a season. Amateur athletes in search of particular sporting challenges as well as fans following their teams around the world have turned sport tourism into a mass movement. From the logistics perspective, these globalization developments go hand in hand with a series of challenges. Most obvious is the need for significantly more transport capacity. In particular, demand is increasing along international air and shipping routes that are already heavily utilized, which requires good planning in advance to reserve the capacity needed, at a reasonable price. International transportation also is subject to customs restrictions. All material sent to other economic regions goes along with special requirements for packaging, labeling and registration. Due to the administrative processes, preparation and execution of the transport are more time-consuming and take longer. The complex processes of international supply chains have more imponderables, making their resilience particularly important.

Professional logistics, and international logistics chains in particular, goes hand in hand with an international division of labor. To successfully manage it, documentation and provision of information is key. In other words: material or people flows have to be accompanied by the right flow of information. A challenge that can only be adequately met with IT support. However, the realization of digital workflows for logistics in sport organizations still lags behind. Digitization stays one of the crucial challenges of sport logistics.

To this day, most sport logistics managers started their jobs as job as a logistician without sport education, as a sport manager without logistics education, or as a career changer. Neither is logistics management a subject in sport management curricula, nor is sport management a subject in logistics management curricula. There are not even further education programs or certificate programs to become a sport logistics manager. The establishment of education programs for sport logistics management is to be understood as a key piece of the puzzle towards further professionalization of sport logistics management. To raise awareness for the special remit of sport logistics has to become a mission for every sport logistics manager.

6 Conclusion

The motivation of the authors originated from their conviction of the undeniable pertinence of the management of logistics in sport. The underlying objective of this contribution was to elaborate a comprehensive image of the state of the art in sport logistics. To this intend, a new framework for sport logistics was developed, recent literature was reviewed, and an agenda for future research was established.

The sport logistics triangle draws from the academic disciplines of logistics management and sport management (SRQ 2): procurement, operations, distribution, and reverse logistics build its logistics management foundations, marketing, operations, and organization build its sport management foundations. The sport logistics triangle is composed of three legs: flow type, network perspective, sport sector. They allow a structured classification and contextualization of the diverse logistical activities in sport organizations. Every sport logistics activity has an intersection with each of the three legs.

To gain the most comprehensive insights, a systematic literature review was carried out and an extensive number of scientific papers was evaluated. In the interest of the inclusivity of the SLR, the authors decided to cover not only journal articles but also conference papers. A transparent four-section process of inclusion, exclusion, reference recursion and analysis resulted in the final list of 202 papers which were analyzed in content to represent the status quo of current research in sport logistics. The reader was introduced to developments in the research around the management of logistics in sport through a dichotomy of descriptive elements and thematic content. In doing so and to ensure increased transparency, the reader was provided with a comprehensible bridge between the documented information and the conclusions drawn from it. To allow the SLR to have an explanatory nature, studies were evaluated in a categorization scheme regarding their sport and logistics focuses as well as their methodological frame. Here, conclusions can be drawn about the state of the research. The numerical distributions of the type of work, type of research and the logistics and sport-related classifications (see SRQ 1 & 3) indicate the sophistication of the research and where there is still room for progress, e.g., investigations on the second sport sector, single sport, or intralogistics, especially in the form of project reports.

To complement this, the titles and keywords established by the authors were evaluated and presented in a chart. The keyword cluster indicated a hotchpotch of research. Work is being done in many areas, but not in a unified manner, which makes it much more difficult to base new research on past efforts. This publication is intended to contribute to a profound expansion of theory via the sport logistics triangle framework and to trigger a joint discourse at the interface of logistics management and sport management as the overall state of the art can be characterized as heterogenic, diffuse, and shallow (RQ 1).

Based on the evaluation of key words and titles and the content analysis, the research panel built nine topic clusters: event operations (planning, management and legacy), sporting goods (production and distribution), technology management, sport organization studies, environmental studies, and stadium safety and security

(SRQ 4) that can serve as key starting points for further research on the management of logistics in sport. In the discussion chapter, more specific research opportunities, e.g., the outsourcing of logistics services in sport organizations, the location determination and design of sport logistics facilities, or the management of equipment and its provision to athletes derived from the papers examined were given and classified on the basis of the sport logistics triangle. Practitioners and researchers were addressed separately. On a global scale, general future challenges of sport logistics management were named, i.e. sustainability, globalization, digitization, education programs (RQ 2).

The paper showed that a comprehensive conceptional umbrella for sport logistics management as the intersection of logistics management and sport management is still missing. Hence, the authors call on logistics and sport management scholars alike to engage in the manifold research opportunities of managing logistics in sport.

Appendix A

See Table 9.

Table 9 Topics excluded in web of science, scopus and IEEE xplore

Database	Excluded topics
Web of Science	All biology, all chemistry, all physics, all agriculture, all psychology, Energy fuels, Education educational research, Food science technology, Entomology, Neurosciences, Geosciences multidisciplinary, Meteorology atmospheric sciences, Agronomy, Orthopedics, Medicine general internal, Water resources, Veterinary sciences, Nutrition dietetics, Oceanography, Nanoscience nanotechnology, Oncology, Thermodynamics, Horticulture, Optics, Surgery, Fisheries, Clinical neurology, Toxicology, Health care sciences services
Scopus	Medicine, Agricultural and Biological Sciences, Biochemistry, Genetics and Molecular Biology, Health Professions, Immunology and Microbiology, Physics and Astronomy, Psychology, Earth and Planetary Sciences, Energy, Arts and Humanities, Neuroscience, Nursing, Chemistry, Pharmacology, Toxicology and Pharmaceutics, Chemical Engineering, Veterinary, Dentistry
IEEE Xplore	Internet, feature extraction, learning (artificial intelligence), security of data, cryptography, public domain software, Gaussian distribution, distributed power generation, mobile computing, power grid, statistical distributions, video signal processing, Gaussian processes, genetic algorithms, object detection, evolutionary computation, search problems, neural nets, particle swarm optimization, probability, image classification, wireless sensor networks, pattern clustering, statistical analysis, image segmentation, regression analysis, remote sensing, finite element analysis, graph theory

Appendix B

See Table 10.

Table 10 Subdatabases used in proquest

Database	Topics	Description
International bibliography of the social sciences (IBSS)	Economics, social sciences	Anthropology, economics, political science and sociology—journal articles, books, reviews
PAIS index	Social sciences	Public affairs, public and social policy, international relations—journal articles, books, government documents, statistics, gray literature, research reports, conference papers, microfiche, internet material
Periodicals archive online	Literature and language, social sciences, history, art	Arts, humanities and social sciences—scientific journal archive
Periodicals index online	Literature and language, social sciences, history, art	Arts, humanities and social sciences
Publicly available content database	Not assigned	Developed to complement other databases and collections, this database brings together or links to full texts for publicly available content from a range of different sources from around the world
Sports medicine & education index	Science and technology, social sciences, health and medicine	Physical fitness, health, sports medicine

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Declarations

Conflict of interest The authors have no competing interests to declare that are relevant to the content of this article.

References

Agha N, Dixon JC (2021) the uniqueness of spectator sport from a strategic management perspective: the case for spectatoritis. J Glob Sport Manag 6(1):7–29. https://doi.org/10.1080/24704067.2019.1641830

Aguilera MB (2020) Global horse trade in the United States: 1981–2013. Soc Anim 29(1):63–85. https://doi.org/10.1163/15685306-00001446

Andreff M, Andreff W (2009) Global trade in sports goods: international specialisation of major trading countries. Eur Sport Manag Q 9(3):259–294. https://doi.org/10.1080/16184740903024029

Appelqvist P, Chavez-Demoulin V, Hameri A, Heikkilä J, Wauters V (2013) Turnaround across diverse global supply chains using shared metrics and change methodology: the case of Amer Sports Corporation. Int J Oper Prod Manag 33(5):622–647. https://doi.org/10.1108/01443571311322742

Appelqvist P, Babongo F, Chavez-Demoulin V, Hameri A-P, Niemi T (2016) Weather and supply chain performance in sport goods distribution. Int J Retail Distrib Manag 44(2):178–202. https://doi.org/10.1108/IJRDM-08-2015-0113

Arnold D, Isermann H, Kuhn A, Tempelmeier H, Furmans K (eds) (2008) Handbuch logistik. Springer, Berlin Heidelberg. https://doi.org/10.1007/978-3-540-72929-7

Arnold R, Hewton E, Fletcher D (2015) Preparing our greatest team: the design and delivery of a preparation camp for the London 2012 Olympic Games. Sport Bus Manag Int J 5(4):386–407. https://doi.org/10.1108/SBM-01-2014-0003

Arnold R, Fletcher D, Daniels K (2016) Demographic differences in sport performers' experiences of organizational stressors: demographic differences in stressors. Scand J Med Sci Sports 26(3):348–358. https://doi.org/10.1111/sms.12439

Aronsson, H. (2000). Three perspectives on supply chain design. Department of Management and Economics, Linköping Institute of Technology.

Asian S, Wang J, Dickson G (2020) Trade disruptions, behavioral biases, and social influences: can luxury sporting goods supply chains be immunized? Transp Res Part E Logist Transp Rev 143:102064. https://doi.org/10.1016/j.tre.2020.102064

Baker RE, Esherick C (2013) Fundamentals of sport management. Human Kinetics, Champaign

Bamford D, Moxham C, Kauppi K, Dehe B (2015) Going the distance: Sport operations management in the public and third sectors. In: Public Sector Operations Management,Routledge, pp 13–29

Bao D, Gu J, Jia J (2017) Bilevel traffic evacuation model and algorithm design for large-scale activities. Math Probl Eng 2017:1–13. https://doi.org/10.1155/2017/5049657

Bateman G, Majumdar A (2018). An assessment of the simulation of emergency evacuations in sports stadiums. In: Transportation research board 97th annual meeting. Doi: https://doi.org/10.13140/RG.2.2.18371.91682

BBC (2005a) Schumacher claims farcical US win. http://news.bbc.co.uk/sport2/hi/motorsport/formula_one/4109556.stm

BBC (2005b) Seven teams boycott US Grand Prix. http://news.bbc.co.uk/sport2/hi/motorsport/formula_one/4109292.stm

Beech JG, Chadwick S (eds) (2013) The business of sport management, 2nd edn. Pearson Education Limited, New York City

Beis DA, Loucopoulos P, Pyrgiotis Y, Zografos KG (2006) PLATO helps athens win gold: olympic games knowledge modeling for organizational change and resource management. Interfaces 36(1):26–42. https://doi.org/10.1287/inte.1060.0189

BOCOG (2008) Official report of the Bejing 2008 Olympic Games, Vol. 1–3. Beijing Organising Committee for the Games of the XXIX Olympiad.

Bradbury T, O'Boyle I (eds) (2017) Understanding sport management: international perspectives. Routledge, Taylor & Francis Group, New York

Brady T, Davies A (2014) Managing structural and dynamic complexity: a tale of two projects. Proj Manag J 45(4):21–38. https://doi.org/10.1002/pmj.21434

Brent Ritchie JR (1984) Bamf. J Travel Res 23(1):2–11. https://doi.org/10.1177/004728758402300101

Brown C, Willett J, Goldfine R, Goldfine B (2018) Sport management internships: recommendations for improving upon experiential learning. J Hosp Leis Sport Tour Educ 22:75–81. https://doi.org/10.1016/j.jhlste.2018.02.001

Browne M, Allen J, Wainwright I, Palmer A, Williams I (2014) London 2012: changing delivery patterns in response to the impact of the Games on traffic flows. Int J Urban Sci 18(2):244–261. https://doi.org/10.1080/12265934.2014.929508

Bunds KS, Kanters MA, Venditti RA, Rajagopalan N, Casper JM, Carlton TA (2018) Organized youth sports and commuting behavior: the environmental impact of decentralized community sport facilities. Transp Res Part D Transp Environ 65:387–395. https://doi.org/10.1016/j.trd.2018.08.017

Burden W, Li M (2009) Minor League Baseball: exploring the growing interest in outsourced sport marketing. Sport Mark Q 18(3):139

Burke M, Woolcock G (2009) Getting to the game: travel to sports stadia in the era of transit-oriented development. Sport Soc 12(7):890–909. https://doi.org/10.1080/17430430903053158

Byers T, Slack T, Parent MM (2012) Key concepts in sport management. SAGE Publications Limited, London

Cai Y, Lin Z, Liu L, Wang Y (2018) Demand forecast for winter olympic games food cold chain logistics with carbon emissions consideration. In: Proceedings of the 2018 10th international conference on information management and engineering - ICIME, pp. 177–182. https://doi.org/10.1145/3285957.3285983

Ceder AA, Perera S (2014) Detecting and improving public-transit connectivity with case studies of two world sport events. Transp Policy 33:96–109. https://doi.org/10.1016/j.tranpol.2014.03.001

Chadwick S (2009) From outside lane to inside track: sport management research in the twenty-first century. Manag Decis 47(1):191–203. https://doi.org/10.1108/00251740910929786

Chadwick S (2011) Editorial: the distinctiveness of sport: opportunities for research in the field. Sport Bus Manag 1(2):120–123. https://doi.org/10.1108/20426781111146727

Chelladurai P, Scott FL, Haywood-Farmer J (1987) Dimensions of fitness services: development of a model. J Sport Manag 1(2):159–172. https://doi.org/10.1123/jsm.1.2.159

Chen L, Notteboom T (2012) Determinants For assigning value-added logistics services to logistics centers within a supply chain configuration. J Int Logist Trade 10(1):3–41. https://doi.org/10.24006/jilt.2012.10.1.3

Chen E, Ye Z, Wang C, Xu M (2020) Subway passenger flow prediction for special events using smart card data. IEEE Trans Intell Transp Syst 21(3):1109–1120. https://doi.org/10.1109/TITS.2019.2902405

Cheng Y, Song Y (2021) Sports big data analysis based on cloud platform and its impact on sports economy. Math Probl Eng 2021:1–12. https://doi.org/10.1155/2021/6610000

Cheng Z, Lu J, Zhao Y (2020) Pedestrian evacuation risk assessment of subway station under large-scale sport activity. Int J Environ Res Public Health 17(11):3844. https://doi.org/10.3390/ijerph17113844

Chersulich Tomino A, Perić M, Wise N (2020) Assessing and considering the wider impacts of sport-tourism events: a research agenda review of sustainability and strategic planning elements. Sustainability 12(11):4473. https://doi.org/10.3390/su12114473

Cho A, Tsaasan AM, Steinkuehler C (2019) The building blocks of an educational esports league: lessons from year one in orange county high schools. In: Proceedings of the 14th international conference on the foundations of digital games, pp. 1–11. Doi: https://doi.org/10.1145/3337722.3337738

Christopher M (2011) Logistics and supply chain management: creating value-adding networks. Financial Times Prentice Hall, Harlow

Christopher M (2016) Logistics & supply chain management, 5th edn. Pearson Education, London

Cieslinski WB, Witkowski K, Piepiora Z, Piepiora PA, Bernat P (2016) The safety engineering of mass sports events—the model of emergency management of logistics processes with using of advanced technologies (Augmented Reality, GPS i ICT). In: Proceedings of the 2016 international conference on intelligent control and computer application (ICCA 2016). Zhengzhou, China. Doi: https://doi.org/10.2991/icca-16.2016.114

Clausen U, Geiger C (eds) (2013) Verkehrs- und transportlogistik. Springer, Berlin Heidelberg

Clikeman PM (2012) J&K fitness supply company: auditing inventory. Acc Educ 21(2):161–170. https://doi.org/10.1080/09639284.2011.604162

Collins A, Munday M, Roberts A (2012) Environmental consequences of tourism consumption at major events: an analysis of the UK Stages of the 2007 Tour de France. J Travel Res 51(5):577–590. https://doi.org/10.1177/0047287511434113

Consoli FA, Rogers J, Al-Deek H, Tatari O, Alomari A (2013) Smart event traffic management: impact on the central Florida regional transportation network and lessons learned. Transp Res Rec J Transp Res Board 2396(1):107–116. https://doi.org/10.3141/2396-12

Cooper HM (1998) Synthesizing research: a guide for literature reviews, 3rd edn. Sage Publications, Thousand Oaks
Covell D, Walker S, Hamakawa C (2019) Managing sport organizations: responsibility for performance, 4th edn. Routledge, London
CSCMP (2013) Supply chain management terms and glossary. Council of Supply Chain Management Professionals.
Currie G, Delbosc A (2011) Assessing travel demand management for the summer Olympic Games. Transp Res Rec J Transp Res Board 2245(1):36–48. https://doi.org/10.3141/2245-05
Currie G, Shalaby A (2012) Synthesis of transport planning approaches for the world's largest events. Transp Rev 32(1):113–136. https://doi.org/10.1080/01441647.2011.601352
Currie G, Jones A, Woolley J (2014) Travel demand management and the big scare: impacts and lessons on travel in london during the 2012 Summer olympic Games. Transp Res Rec J Transp Res Board 2469(1):11–22. https://doi.org/10.3141/2469-02
Darcy S (2003) The politics of disability and access: the Sydney 2000 games experience. Disabil Soc 18(6):737–757. https://doi.org/10.1080/0968759032000119497
Denicol J, Davies A, Pryke S (2021) The organisational architecture of megaprojects. Int J Project Manag 39(4):339–350. https://doi.org/10.1016/j.ijproman.2021.02.002
Denyer D, Tranfield D (2009) Producing a systematic review. In: Buchanan DA, Bryman A (eds) The SAGE handbook of organizational research methods. SAGE, Thousand Oaks, pp 671–689
Desbordes M (2001) Innovation management in the sports industry: lessons from the Salomon case. Eur Sport Manag Q 1(2):124–149. https://doi.org/10.1080/16184740108721892
Desbordes M (2002) Empirical analysis of the innovation phenomena in the sports equipment industry. Technol Anal Strateg Manag 14(4):481–498. https://doi.org/10.1080/0953732022000028764
Doherty A (2013) Investing in sport management: the value of good theory. Sport Manag Rev 16(1):5–11. https://doi.org/10.1016/j.smr.2011.12.006
Dolf M, Teehan P (2015) Reducing the carbon footprint of spectator and team travel at the University of British Columbia's varsity sports events. Sport Manag Rev 18(2):244–255. https://doi.org/10.1016/j.smr.2014.06.003
Dong X, Xiong G, Fan D, Zhu F, Lv Y (2012) Parallel public transport management and control system for Guangzhou Asian Games. In: Proceedings of 2012 9th IEEE international conference on networking, sensing and control, pp. 16–21. https://doi.org/10.1109/ICNSC.2012.6204884
Dosumu A, Colbeck I, Bragg R (2017) Greenhouse gas emissions as a result of spectators travelling to football in England. Sci Rep 7(1):6986. https://doi.org/10.1038/s41598-017-06141-y
Dosunmu B (2012) Delivering London 2012: transport demand forecasting. Proc Inst Civ Eng Transp 165(4):257–266. https://doi.org/10.1680/tran.12.00039
Durach CF, Kembro J, Wieland A (2017) A new paradigm for systematic literature reviews in supply chain management. J Supply Chain Manage 53(4):67–85
Earl M, Vouillamoz M, Kwiatkowska D, Turek-Lepa E, Pokrywka A, Saugy M, Baume N, Gmeiner G (2014) The UEFA EURO 2012 anti-doping programme – scientific review. Biol Sport 31(2):85–93. https://doi.org/10.5604/20831862.1096037
Elbery A, Hassanein HS, Zorba N, Rakha HA (2019a) VANET-based smart navigation for emergency evacuation and special events. In: 2019a IEEE 24th international workshop on computer aided modeling and design of communication links and networks (CAMAD), pp. 1–6. Doi: https://doi.org/10.1109/CAMAD.2019.8858502
Elbery A, Hassanein HS, Zorba N, Rakha HA (2019b) VANET-based smart navigation for vehicle crowds: FIFA World Cup 2022 case study. In: 2019b IEEE global communications conference (GLOBECOM), pp. 1–6. https://doi.org/10.1109/GLOBECOM38437.2019.9014183
Emmerson D (2012) Delivering London 2012: transport operations delivery. Proc Inst Civ Eng Transp 165(4):249–255. https://doi.org/10.1680/tran.12.00040
Enock KE, Jacobs J (2008) The Olympic and Paralympic games 2012: literature review of the logistical planning and operational challenges for public health. Public Health 122(11):1229–1238. https://doi.org/10.1016/j.puhe.2008.04.016
ESPN (2005) Michelin tells teams not to use tires in Grand Prix. https://www.espn.com/racing/news/story?series=f1&id=2089760
Fan D, Breslin D, Callahan JL, Iszatt-White M (2022) Advancing literature review methodology through rigour, generativity, scope and transparency. Int J Manag Rev. https://doi.org/10.1111/ijmr.12291

Fang Z, Li Q, Li Q, Han LD, Wang D (2011a) A proposed pedestrian waiting-time model for improving space–time use efficiency in stadium evacuation scenarios. Build Environ 46(9):1774–1784. https://doi.org/10.1016/j.buildenv.2011.02.005

Fang Z, Zong X, Li Q, Li Q, Xiong S (2011b) Hierarchical multi-objective evacuation routing in stadium using ant colony optimization approach. J Transp Geogr 19(3):443–451. https://doi.org/10.1016/j.jtrangeo.2010.10.001

Ferranti E, Andres L, Denoon-Stevens SP, Melgaço L, Oberling D, Quinn A (2020) Operational challenges and mega sporting events legacy: the case of BRT systems in the global south. Sustainability 12(4):1609. https://doi.org/10.3390/su12041609

Gallucci AR, Petersen JC (2017) The size and scope of collegiate athletic training facilities and staffing. J Athl Train 52(8):785–794. https://doi.org/10.4085/1062-6050-52.3.16

Gastel B, Day RA (2016) How to write and publish a scientific paper, 5 th ed. Hendy, Santa Barbara, CA

Gerke A (2016) Towards a network model of innovation in sport—the case of product innovation in nautical sport clusters. Innovation 18(3):270–288. https://doi.org/10.1080/14479338.2016.1237306

Gerke A, Dalla Pria Y (2018) Cluster concept: lessons for the sport sector? Toward a two-step model of sport cluster development based on socioeconomic proximity. J Sport Manag 32(3):211–226. https://doi.org/10.1123/jsm.2016-0338

Gerke A, Desbordes M, Dickson G (2015) Towards a sport cluster model: the ocean racing cluster in Brittany. Eur Sport Manag Q 15(3):343–363. https://doi.org/10.1080/16184742.2015.1019535

Gerke A, Babiak K, Dickson G, Desbordes M (2018) Developmental processes and motivations for linkages in cross-sectoral sport clusters. Sport Manag Rev 21(2):133–146. https://doi.org/10.1016/j.smr.2017.05.005

Gerke A, Woratschek H, Dickson G (2020) The sport cluster concept as middle-range theory for the sport value framework. Sport Manag Rev 23(2):200–214. https://doi.org/10.1016/j.smr.2018.12.004

Ghaffar ARA, Beydoun G, Shen J, Tibben W (2011) Towards knowledge management in sports event management: context analysis of Malaysian biannual games with CommonKADS. In: Proceedings of the 6th international conference on software and database technologies, pp. 377–383. https://doi.org/10.5220/0003497003770383

Gillentine A, Crow RB (2009) Foundations of sport management. Fitness Information Technology, Morgantown, WV

Giuliano G (1988) Testing the limits of TSM: the 1984 Los angeles summer olympics. Transportation 15(3):143–161. https://doi.org/10.1007/BF00837579

Giunipero LC, Brand RR (1996) Purchasing's role in supply chain management. Int J Logist Manag 7(1):29–38. https://doi.org/10.1108/09574099610805412

Gudehus T, Kotzab H (2012) Comprehensive logistics. Springer, Berlin Heidelberg. https://doi.org/10.1007/978-3-642-24367-7

Günther P (2006) Intralogistik—Eine starke Branche stellt sich vor. In: Arnold D (ed) Intralogistik: Potentiale, Perspektiven, Prognosen. Springer, Berlin, pp 5–16

Gupta G, Goodchild A, Hansen M (2011) A competitive, charter air-service planning model for student athlete travel. Transp Res Part B Methodol 45(1):128–149. https://doi.org/10.1016/j.trb.2010.06.002

Gusenbauer M, Haddaway NR (2020) Which academic search systems are suitable for systematic reviews or meta-analyses? Evaluating retrieval qualities of Google Scholar, PubMed, and 26 other resources. Res Synth Methods 11(2):181–217. https://doi.org/10.1002/jrsm.1378

Gutierrez DM, Bettine M, García B (2021) The railway and the ball, the spread of football in São Paulo State. Sport Hist 41(3):309–332. https://doi.org/10.1080/17460263.2020.1816565

Haghani S-COA (1997) Testing and evaluation of a multi-commodity multi-modal network flow model for disaster relief management. J Adv Transp 31(3):249–282. https://doi.org/10.1002/atr.5670310304

Han AF, Wong KI, Ho SN (2018) Residents' perceptions on the traffic impact of a special event: a case of the Macau Grand Prix. Asia Pac J Tour Res 23(1):42–55. https://doi.org/10.1080/10941665.2017.1399916

Harrison A, van Hoek RI, Skipworth H (2014) Logistics management and strategy: competing through the supply chain, 5th edn. Pearson, New York City

Harvey J, Saint-Germain M (2001) Sporting goods trade, international division of labor, and the unequal hierarchy of Nations. Sociol Sport J 18(2):231–246. https://doi.org/10.1123/ssj.18.2.231

Hecox M (2013) Sport licensing and internationalization: a case analysis of the reebok bike business. Case Stud Sport Manag 2(1):45–56. https://doi.org/10.1123/cssm.2.1.45

Henao A, Marshall WE (2013) Parking at sporting event stadiums in Denver, Colorado. Transp Res Rec J Transp Res Board 2359(1):17–26. https://doi.org/10.3141/2359-03
Hendy P (2013) The outcomes of transport planning for the 2012 Olympic and Paralympic games. J Urban Regener Renew 7(1):9–20
Hensher DA, Brewer AM (2002) Going for gold at the Sydney Olympics: how did transport perform? Transp Rev 22(4):381–399. https://doi.org/10.1080/01441640110121112
Herold DM, Breitbarth T, Schulenkorf N, Kummer S (2019) Sport logistics research: reviewing and line marking of a new field. Int J Logist Manag 31(2):357–379. https://doi.org/10.1108/IJLM-02-2019-0066
Herold DM, Schulenkorf N, Breitbarth T, Bongiovanni I (2021) An application of the sports logistics framework: the case of the Dallas Cowboys. J Conv Event Tour 22(2):155–176. https://doi.org/10.1080/15470148.2020.1852991
Hoekstra S, Romme J (1992) Integral logistic structures: developing customer-oriented goods flow. Industrial Press Inc., New York
Houlihan JB (1985) International supply chain management. Int J Phys Distrib Mater Manag 15:22–38
Hoye R, Parent MM (2017) The SAGE handbook of sport management. SAGE Publications Ltd., Thousand Oaks. https://doi.org/10.4135/9781473957961
Hoye R, Smith ACT, Nicholson M, Stewart B (eds) (2015) Sport management: principles and applications, 4th edn. Routledge, London
Humphreys C (2017) Travelling with golf clubs: the influence of baggage on the trip decision-making process. J Sport Tour 21(1):49–63. https://doi.org/10.1080/14775085.2016.1249017
Jiang Y (2008) Analysis on Beijing subway flows during the 29th Olympics. J Transp Syst Eng Inf Technol 8(6):46–51. https://doi.org/10.1016/S1570-6672(09)60004-0
Jingmeng S, Hongtao Y, Caihong X (2013) Supply chain knowledge innovation analysis in Chinese service-oriented manufacturing industry: based on outdoor sports club. In: 2013 10th international conference on service systems and service management, pp. 850–856. https://doi.org/10.1109/ICSSSM.2013.6602558
Johnson A, Zhao Y, Xu X (2016) Transportation Planning and Scheduling for the 2014 Special Olympics USA games. Interfaces 46(3):218–230. https://doi.org/10.1287/inte.2016.0845
Jones A, Woolley J (2019) The role of businesses in facilitating voluntary travel behaviour change—insights from the London 2012 Olympic Games. Transp Res Interdiscip Perspect 2:100040. https://doi.org/10.1016/j.trip.2019.100040
Jones A, Woolley J, Currie G (2015) The London summer 2012 Olympic Games: threat of disruption and business reaction. Event Manag 19(2):187–210. https://doi.org/10.3727/152599515X14297053839610
Judge LW, Petersen JC, Bellar DM, Craig BW, Cottingham MP, Gilreath EL (2014) The current state of NCAA division I collegiate strength facilities: size, equipment, budget, staffing, and Football status. J Strength Cond Res 28(8):2253–2261. https://doi.org/10.1519/JSC.0000000000000368
Karaköprü UO, Kabadurmuş Ö (2019) Using multi-criteria decision making methods to make logistics decisions in sports clubs. Alphanumer J. https://doi.org/10.17093/alphanumeric.425766
Kassens-Noor E (2010) Sustaining the momentum: olympics as potential catalyst for enhancing urban transport. Transp Res Rec J Transp Res Board 2187(1):106–113. https://doi.org/10.3141/2187-14
Kassens-Noor E (2013) Transport legacy of the Olympic games, 1992–2012. J Urban Aff 35(4):4. https://doi.org/10.1111/j.1467-9906.2012.00626.x
Kassens-Noor E (2013b) Transport legacy of the Olympic games, 1992–2012. J Urban Aff 35(4):393–416. https://doi.org/10.1111/j.1467-9906.2012.00626.x
Kassens-Noor E (2019) Transportation planning and policy in the pursuit of mega-events: Boston's 2024 Olympic bid. Transp Policy 74:239–245. https://doi.org/10.1016/j.tranpol.2018.12.005
Kassens-Noor E, Fukushige T (2018) Olympic technologies: Tokyo 2020 and Beyond: the urban technology metropolis. J Urban Technol 25(3):83–104. https://doi.org/10.1080/10630732.2016.1157949
Kassens-Noor E, Kayal P (2016) India's new globalization strategy and its consequences for urban development: the impact of the 2010 commonwealth games on Delhi's transport system. Int Plan Stud 21(1):34–49. https://doi.org/10.1080/13563475.2015.1114448
Kassens-Noor E, Gaffney C, Messina J, Phillips E (2018) Olympic transport legacies: Rio de Janeiro's bus rapid transit system. J Plan Educ Res 38(1):13–24. https://doi.org/10.1177/0739456X16683228
Kauppi K, Moxham C, Bamford D (2013) Should we try out for the major leagues? a call for research in sport operations management. Int J Oper Prod Manag 33(10):1368–1399. https://doi.org/10.1108/IJOPM-11-2011-0418

Kendall G, Knust S, Ribeiro CC, Urrutia S (2010) Scheduling in sports: an annotated bibliography. Comput Oper Res 37(1):1–19. https://doi.org/10.1016/j.cor.2009.05.013
Kershaw S (2012) Delivering London 2012: transport programme assurance. Proc Inst Civ Eng Transp 165(4):241–248. https://doi.org/10.1680/tran.12.00042
Khara N, Lund-Thomsen P (2012) Value chain restructuring, work organization and labour outcomes in football manufacturing in India. Compet Chang 16(4):261–280. https://doi.org/10.1179/102452941 2Z.00000000017
Kitchenham B, Brereton OP, Budgen D, Turner M, Bailey J, Linkman S (2009) Systematic literature reviews in software engineering—a systematic literature review. Inf Softw Technol. https://doi.org/10.1016/j.infsof.2008.09.009
Kitchenham B, Brereton P (2013) A systematic review of systematic review process research in software engineering. Inf Softw Technol 55(12):2049–2075
Kitchenham B (2004) Procedures for performing systematic reviews, vol 33. Keele, UK, Keele University, p 1–26
Klaus P (2012) Supply chain management. In: Klaus P, Krieger W, Krupp M (eds) Gabler Lexikon Logistik. Gabler Verlag, Wiesbaden, pp 554–562
Klauser F (2013) Spatialities of security and surveillance: managing spaces, separations and circulations at sport mega events. Geoforum 49:289–298. https://doi.org/10.1016/j.geoforum.2012.11.011
Kothari CR (2004) Research methodology: methods and techniques. New Age International Pvt. Ltd., Publishers, New Delhi
Kovacs-Gyori A, Ristea A, Havas C, Resch B, Cabrera-Barona P (2018) #London2012: towards citizen-contributed urban planning through sentiment analysis of Twitter data. Urban Plan 3(1):75–99. https://doi.org/10.17645/up.v3i1.1287
Kristiansen E, Strittmatter A-M, Skirstad B (2016) Stakeholders, challenges and issues at a co-hosted youth olympic event: lessons learned from the European Youth Olympic festival in 2015. Int J Hist Sport 33(10):1152–1168. https://doi.org/10.1080/09523367.2016.1238822
Kubler S, Robert J, Hefnawy A, Framling K, Cherifi C, Bouras A (2017) Open IoT ecosystem for sporting event management. IEEE Access 5:7064–7079. https://doi.org/10.1109/ACCESS.2017.2692247
Kumar S, Gupta M, Suhaib M, Asjad M (2021) Current status, enablers and barriers of implementing cellular manufacturing system in sports industry through ISM. Int J Syst Assur Eng Manag 12(3):345–360. https://doi.org/10.1007/s13198-021-01052-8
Kwoczek S, Di Martino S, Nejdl W (2014) Predicting and visualizing traffic congestion in the presence of planned special events. J Vis Lang Comput 25(6):973–980. https://doi.org/10.1016/j.jvlc.2014.10.028
Lassacher S, Veneziano D, Albert S, Ye Z (2009) Traffic management of special events in small communities. Transp Res Rec J Transp Res Board 2099(1):85–93. https://doi.org/10.3141/2099-10
Leilei D, Zheng-liang S, Jin-gang G, Hong-tong Q (2012) Study on traffic organization and management strategies for large special events. In: 2012 International conference on system science and engineering (ICSSE), pp. 432–436. https://doi.org/10.1109/ICSSE.2012.6257222
Li S, Blake A, Thomas R (2013) Modelling the economic impact of sports events: the case of the Beijing Olympics. Econ Model 30:235–244. https://doi.org/10.1016/j.econmod.2012.09.013
Li P, Lan H, Chen Y (2019) Building a food cold chain logistics network of large sports event: a multi-dimensional conceptual framework. In: Proceedings of the 2019 2nd international conference on information management and management sciences IMMS, pp. 1–6. Doi: https://doi.org/10.1145/3357292.3357293
Lindau LA, Petzhold G, Tavares VB, Facchini D (2016) Mega events and the transformation of Rio de Janeiro into a mass-transit city. Res Transp Econ 59:196–203. https://doi.org/10.1016/j.retrec.2016.07.024
Lindsay I (2013) London 2012: securing urban olympic delivery. Sport Soc 16(2):223–238. https://doi.org/10.1080/17430437.2013.776253
Liu M, Mao B, Huang Y, Zhang J, Chen S (2008a) Comparison of pre- & post-olympic traffic: a case study of several roads in Beijing. J Transp Syst Eng Inf Technol 8(6):67–72. https://doi.org/10.1016/S1570-6672(09)60006-4
Liu X, Guo J, Sun Z (2008b) Traffic operation with comments during Beijing Olympic games. J Transp Syst Eng Inf Technol 8(6):16–24. https://doi.org/10.1016/S1570-6672(09)60001-5
Liu P, Gao L (2013) Demand analysis and framework of theory about chinese events sports logistics. In: Qi E, Shen J, Dou R (Eds.) The 19th international conference on industrial engineering and

engineering management, pp. 159–168. Springer, Berlin Heidelberg. https://doi.org/10.1007/978-3-642-37270-4_15
Locke RM, Qin F, Brause A (2007) Does monitoring improve labor standards? lessons from nike. Ind Labor Relat Rev 61(1):3–31
Loewen C, Wicker P (2021) Travelling to Bundesliga matches: the carbon footprint of football fans. J Sport Tour 25(3):253–272. https://doi.org/10.1080/14775085.2021.1932562
Luitzen J, Bollerman T, Delheye P (2015) Playing on the field of social and technical innovation: the impact of the sale of Lawn Tennis sets in the Netherlands, 1874–1887. Int J Hist Sport 32(9):1181–1204. https://doi.org/10.1080/09523367.2015.1071356
Lund A, Gutman SJ, Turris SA (2011) Mass gathering medicine: a practical means of enhancing disaster preparedness in Canada. CJEM 13(04):231–236. https://doi.org/10.2310/8000.2011.110305
Lund-Thomsen P (2013) Labor agency in the football manufacturing industry of Sialkot, Pakistan. Geoforum 44:71–81. https://doi.org/10.1016/j.geoforum.2012.04.007
MacIntosh E, Arellano A, Forneris T (2016) Exploring the community and external-agency partnership in sport-for-development programming. Eur Sport Manag Q 16(1):38–57. https://doi.org/10.1080/16184742.2015.1092564
Mahmudzadeh A, Ghorbani M, Hakimelahi A (2020) Providing an emergency evacuation model for the stadium. Transp Res Proced 48:620–631. https://doi.org/10.1016/j.trpro.2020.08.064
Malfas M, Theodoraki E, Houlihan B (2004) Impacts of the Olympic games as mega-events. Proc Inst Civ Eng Munic Eng 157(3):209–220. https://doi.org/10.1680/muen.2004.157.3.209
Malhado ACM, Rothfuss R (2013) Transporting 2014 FIFA World Cup to sustainability: exploring residents' and tourists' attitudes and behaviours. J Policy Res Tour Leis Events 5(3):252–269. https://doi.org/10.1080/19407963.2013.801159
Mamic I (2005) Managing global supply chain: the sports footwear, apparel and retail sectors. J Bus Eth 59(1–2):81–100. https://doi.org/10.1007/s10551-005-3415-y
Manzenreiter W (2013) Global sports commodity Chains and Asia's new interregional division of labour. Int J Hist Sport 30(11):1299–1314. https://doi.org/10.1080/09523367.2013.793178
McGuinness IM (2013) Using GIS to understand and prioritise worker movements during the 2012 London Olympics. In: The international archives of the photogrammetry, remote sensing and spatial information sciences, XL-4/W1, 31–36. https://doi.org/10.5194/isprsarchives-XL-4-W1-31-2013
Meier M, Tan KH, Lim MK, Chung L (2019) Unlocking innovation in the sport industry through additive manufacturing. Bus Process Manag J 25(3):456–475. https://doi.org/10.1108/BPMJ-10-2017-0285
Memari Z, Rezaei Pandari A, Ehsani M, Mahmudi S (2021) Business management in the football industry from a supply chain management perspective. Int J Sports Mark Spons 22(4):737–763. https://doi.org/10.1108/IJSMS-02-2020-0025
Meng F (2014) Research on talents training mode of applied logistics management. In: 2014 International conference on global economy, finance and humanities research (GEFHR 2014), Tianjin, China. https://doi.org/10.2991/gefhr-14.2014.39
Mentzer JT, Stank TP, Esper TL (2008) Supply chain management and its relationship to logistics, marketing, production, and operations management. J Bus Logist 29(1):1. https://doi.org/10.1002/j.2158-1592.2008.tb00067.x
Merk J (2011) Production beyond the horizon of consumption: spatial fixes and anti-sweatshop struggles in the global athletic footwear industry. Glob Soc 25(1):73–95. https://doi.org/10.1080/13600826.2010.522984
Middleditch L, Bradbury T (2014) World masters games 2017: organisational delivery models. Int J Event Festiv Manag 5(3):263–278. https://doi.org/10.1108/IJEFM-01-2014-0002
Millstein MA, Campbell JF (2018) Total hockey optimizes omnichannel facility locations. Interfaces 48(4):340–356. https://doi.org/10.1287/inte.2018.0942
Minis I, Tsamboulas DA (2008) Contingency planning and war gaming for the transport operations of the Athens 2004 Olympic games. Transp Rev 28(2):259–280. https://doi.org/10.1080/01441640701628685
Minis I, Keys E, Athanasopoulos T (2006a) Contribution to the design of the athletes bus network during the Athens 2004 Olympic games. Transp Res Part A Policy Pract 40(9):776–791. https://doi.org/10.1016/j.tra.2005.12.009
Minis I, Paraschi M, Tzimourtas A (2006b) The design of logistics operations for the Olympic games. Int J Phys Distrib Logist Manag 36(8):621–642. https://doi.org/10.1108/09600030610702899

Minis I, Angelopoulos J, Kyrioglou G (2009) Car fleet planning and management models for large event transport: the Athens 2004 Olympic games. Transp Plan Technol 32(2):135–161. https://doi.org/10.1080/03081060902861319

Mirehie M, Gibson HJ, Buning RJ, Coble C, Flaherty M (2021) Towards an understanding of family travel decision-making processes in the context of youth sport tourism. J Destin Mark Manag 21:100644. https://doi.org/10.1016/j.jdmm.2021.100644

Mosadeghi R, Barr D, Moller R (2020) The use of GIS in major sport events management; the Host City's lessons learned from gold coast 2018, commonwealth games. Appl Spat Anal Policy 13(1):51–67. https://doi.org/10.1007/s12061-018-9289-z

Motla R, Kumar A, Singh SR, Saxena N (2021) A fuzzy integrated inventory system with end of life treatment: a possibility in sports industry. Opsearch 58(4):869–888. https://doi.org/10.1007/s12597-020-00492-3

Mountjoy M, Akef N, Budgett R, Greinig S, Li G, Manikavasagam J, Soligard T, Haiming X, Yang X (2015) A novel antidoping and medical care delivery model at the 2nd summer youth Olympic Games (2014), Nanjing China. Br J Sports Med 49(13):887–892. https://doi.org/10.1136/bjsports-2014-094424

Mountjoy M, Moran J, Ahmed H, Bermon S, Bigard X, Doerr D, Lacoste A, Miller S, Weber A, Foster J, Budgett R, Engebretsen L, Burke LM, Gouttebarge V, Grant M-E, McCloskey B, Piccininni P, Racinais S, Stuart M, Zideman D (2021) Athlete health and safety at large sporting events: the development of consensus-driven guidelines. Br J Sports Med 55(4):191–197. https://doi.org/10.1136/bjsports-2020-102771

Mulley C, Moutou CJ (2015) Not too late to learn from the Sydney Olympics experience: opportunities offered by multimodality in current transport policy. Cities 45:117–122. https://doi.org/10.1016/j.cities.2014.10.004

Nadvi K (2011) Labour standards and technological upgrading: Competitive challenges in the global football industry. Int J Technol Learn Innov Dev 4:235. https://doi.org/10.1504/IJTLID.2011.041906

Nadvi K, Lund-Thomsen P, Xue H, Khara N (2011) Playing against China: global value chains and labour standards in the international sports goods industry. Glob Netw 11(3):334–354. https://doi.org/10.1111/j.1471-0374.2011.00329.x

Naz F, Bögenhold D (2020) Understanding labour processes in global production networks: a case study of the football industry in Pakistan. Globalizations 17(6):917–934. https://doi.org/10.1080/14747731.2019.1708658

NBC (2019) Kansas City Chiefs equipment reportedly sent to wrong state, risking forfeit to Patriots. https://www.nbcnews.com/news/sports/kansas-city-chiefs-equipment-reportedly-sent-wrong-state-risking-forfeit-n1097831

NPD Group (2019) Run the numbers: here's how much the global sports market could be worth by 2023. https://footwearnews.com/2019/business/retail/global-sports-market-2019-statistics-1202804732/

Odoni A, Stamatopoulos M, Kassens E, Metsovitis J (2009) Preparing an airport for the Olympic games: Athens. J Infrastruct Syst 15(1):50–59. https://doi.org/10.1061/(ASCE)1076-0342(2009)15:1(50)

Palmieri S, Righi A, Bisson M, Ianniello A (2021) A sport project and its future applications: how to implement speculative design to fulfill users' needs. In: 2021 5th international conference on artificial intelligence and virtual reality (AIVR), pp. 46–52. https://doi.org/10.1145/3480433.3480439

Parent MM (2008) Evolution and issue patterns for major-sport-event organizing committees and their stakeholders. J Sport Manag 22(2):135–164. https://doi.org/10.1123/jsm.22.2.135

Parkes SD, Jopson A, Marsden G (2016) Understanding travel behaviour change during mega-events: Lessons from the London 2012 games. Transp Res Part A Policy Pract 92:104–119. https://doi.org/10.1016/j.tra.2016.07.006

Peng W, Che A, Feng C (2013) A quantum evolutionary algorithm for lane reservation problem. In: 2013 10th IEEE international conference on networking, sensing and control (ICNSC), pp. 264–268. Doi: https://doi.org/10.1109/ICNSC.2013.6548748

Pereira RHM (2018) Transport legacy of mega-events and the redistribution of accessibility to urban destinations. Cities 81:45–60. https://doi.org/10.1016/j.cities.2018.03.013

Pereira RPT, Camara MVO, Ribeiro GM, Filimonau V (2017) Applying the facility location problem model for selection of more climate benign mega sporting event hosts: a case of the FIFA World Cups. J Clean Prod 159:147–157. https://doi.org/10.1016/j.jclepro.2017.05.053

Perneger TV (2004) Writing a research article: advice to beginners. Int J Qual Health Care 16(3):191–192. https://doi.org/10.1093/intqhc/mzh053
Pfahl ME, Bates BR (2008) This is not a race, this is a farce: formula one and the Indianapolis Motor Speedway tire crisis. Public Relat Rev 34(2):135–144. https://doi.org/10.1016/j.pubrev.2008.03.019
Pfohl H-C (2018) Logistiksysteme. Springer, Berlin Heidelberg. https://doi.org/10.1007/978-3-662-56228-4
Pfohl H-C (2021) Logistikmanagement: Konzeption und Funktionen, 4th edn. Springer Vieweg, Berlin
Piekarz M (2021) Sport operations management and development: an applied approach, 1st edn. Routledge, London
Pittaway L, Robertson M, Munir K, Denyer D, Neely A (2004) Networking and innovation: a systematic review of the evidence. Int J Manage Rev 5(3–4):137–168
Pitts BG, Stotlar DK (2013) Fundamentals of sport marketing, 4th ed. Fitness Information Technology, Morgantown, WV
Porter ME (1998) Competitive advantage: creating and sustaining superior performance: with a new introduction, 1st edn. Free Press, Washington, D.C
Puangmanee S, Saearlee M (2020) Solid waste management at an international full-marathon running event in Southern Thailand, pp. 35–45. https://doi.org/10.2495/WM200041
Pulugurtha SS, Duddu VR, Venigalla M (2020) Evaluating spatial and temporal effects of planned special events on travel time performance measures. Transp Res Interdiscip Perspect 6:100168. https://doi.org/10.1016/j.trip.2020.100168
Rabadi G, Khallouli W, Salem MA, Ghoniem A (2015) Planning and management of major sporting events: a survey. Int J Plan Sched 2(2):154. https://doi.org/10.1504/IJPS.2015.072122
Radicchi E (2014) Sports sponsorship evolution in the economic recession: analytical evidence from empirical cases. Phys Culture Sport Stud Res 61(1):51–64. https://doi.org/10.2478/pcssr-2014-0005
Ramadan A, Elbery A, Zorba N, Hassanein HS (2020) Traffic forecasting using temporal line graph convolutional network: case study. In: ICC 2020 - 2020 IEEE international conference on communications (ICC), pp. 1–6. https://doi.org/10.1109/ICC40277.2020.9149233
Ratnatunga J, Muthaly SK (2000) Lessons from the Atlanta Olympics: marketing and organisational considerations for Sydney 2000. Int J Sports Mark Spons 2(3):60–78. https://doi.org/10.1108/IJSMS-02-03-2000-B006
Raza T (2016) Measuring technology differences across football manufacturers in Sialkot. Lahore J Econ 21:237–251. https://doi.org/10.35536/lje.2016.v21.isp.a10
Razavi SG, Hosseini SE, Razavi SMH (2014) Determination of barriers to E-commerce in companies producing sports equipment and goods: the perspective of sport managers in Iran. Ann Appl Sport Sci 2(4):55–66. https://doi.org/10.18869/acadpub.aassjournal.2.4.55
Ren P, Nie M, Ming H (2021) Optimization of sports good recycling management system based on internet of things. Wirel Commun Mob Comput 2021:1–11. https://doi.org/10.1155/2021/6415136
Ribeiro T, Almeida V (2020) The Rio's transport legacy: pre- and post-games resident perceptions. Int J Sports Mark Spons 22(1):32–52. https://doi.org/10.1108/IJSMS-04-2020-0073
Ribeiro T, Cunha de Almeida VM (2021) Host city transportation issues: conceptualization, scale development, and validation. Sport Bus Manag Int J 11(3):321–339. https://doi.org/10.1108/SBM-09-2020-0088
Ribeiro T, Correia A, Biscaia R, Bason T (2021) Organizational issues in Olympic games: a systematic review. Event Manag 25(2):135–154. https://doi.org/10.3727/152599519X15506259856570
Richter T, Ruhl S (2013) The integration of intelligent transport systems in urban transport. WIT Trans Built Environ 2:29–240. https://doi.org/10.2495/UT130181
Robbins D, Dickinson J, Calver S (2007) Planning transport for special events: a conceptual framework and future agenda for research. Int J Tour Res 9(5):303–314. https://doi.org/10.1002/jtr.639
Robinson L (ed) (2012) Routledge handbook of sport management. Routledge, London
Roscoe S, Baker P (2014) Supply chain segmentation in the sporting goods industry. Int J Log Res Appl 17(2):136–155. https://doi.org/10.1080/13675567.2013.837869
Rozhdestvenskaya L, Cherednichenko L, Malchugova K, Korotenko V (2021) Development of a sustainable environmentally friendly waste management system at large mass and sports events (2023 WJC in Novosibirsk). In: E3S Web of conferences, 296, 02010. https://doi.org/10.1051/e3sconf/202129602010

Rutten P, Lees MH, Klous S, Sloot PMA (2021) Intermittent and persistent movement patterns of dance event visitors in large sporting venues. Phys A Stat Mech Appl 563:125448. https://doi.org/10.1016/j.physa.2020.125448

Rutty M, Scott D, Steiger R, Johnson P (2015) Weather risk management at the Olympic winter games. Curr Issue Tour 18(10):931–946. https://doi.org/10.1080/13683500.2014.887665

Sampson J, Biesta M, Crapper M, Hall I, Shepherd A (2013) Carbon dioxide accounting: 2014 commonwealth games athletes' village. Proc Inst Civ Eng Eng Sustain 166(3):150–160. https://doi.org/10.1680/ensu.11.00024

Sarasua WA, Malisetty P, Chowdhury M (2011) Using a GIS-based, Hitchcock algorithm to optimize parking allocations for special events. Appl GIS 7(2):1–13. https://doi.org/10.4225/03/57E1D2A712C8D

Sattayhatewa P, Smith RL (2003) Development of parking choice models for special events. Transp Res Rec J Transp Res Board 1858(1):31–38. https://doi.org/10.3141/1858-05

Savić Z, Ranđelović N, Stojanović N, Stanković V, Šiljak V (2018) The sports industry and achieving top sports results. Facta Univ Ser Phys Educ Sport 15(3):513. https://doi.org/10.22190/FUPES170351 3S

Schwarz EC, Hunter JD (2018) Advanced theory and practice in sport marketing, 3rd edn. Routledge, London

Scur G, Kolososki C (2019) Outsourcing and supplier development: capability development process in the Brazilian sports apparel industry. Gestão & Produção 26(2):e2761. https://doi.org/10.1590/0104-530x-2761

Serrano R, Lacerda DP, Cassel RA, Dresch A, Morandi MIWM (2019a) Structure and analyze the football value chain in Brazil. Int J Sports Mark Spons 20(2):258–275. https://doi.org/10.1108/IJSMS-02-2017-0013

Serrano R, Lacerda DP, Cassel RA, Soares PF, Piran FS (2019b) An exploration into the understanding of football value chain in south of Brazil. Int J Organ Anal 27(3):644–665. https://doi.org/10.1108/IJOA-12-2017-1311

Shi L, Li X, Cao R, Zhang X (2020) Research on innovative strategy of sporting event logistics management in Coastal Cities. J Coast Res. https://doi.org/10.2112/JCR-SI111-055.1

Shilbury D (2000) Considering future sport delivery systems. Sport Manag Rev 3(2):199–221. https://doi.org/10.1016/S1441-3523(00)70086-6

Simms M, Arnold R, Turner JE, Hays K (2021) A repeated-measures examination of organizational stressors, perceived psychological and physical health, and perceived performance in semi-elite athletes. J Sports Sci 39(1):64–77. https://doi.org/10.1080/02640414.2020.1804801

Slack T (2014) The social and commercial impact of sport, the role of sport management. Eur Sport Manag Q 14(5):454–463. https://doi.org/10.1080/16184742.2014.974311

Smith AD, Smith AA (2008) Exploring the service location strategies behind super bowl venue selection. Serv Mark Q 29(4):66–84. https://doi.org/10.1080/15332960802218778

Smith ACT, Stewart B (2010) The special features of sport: a critical revisit. Sport Manag Rev 13(1):1–13. https://doi.org/10.1016/j.smr.2009.07.002

Smith A, Stewart B (2015) Introduction to sport marketing, 2nd edn. Routledge, London

Somabutr S, Pandian S, Roh S (2020) The configuration structure of service supply chain management. In: Proceedings of the 2020 the 3rd international conference on computers in management and business, pp. 301–305. https://doi.org/10.1145/3383845.3383892

Spector S (2017) Environmental communications in New Zealand's skiing industry: building social legitimacy without addressing non-local transport. J Sport Tour 21(3):159–177. https://doi.org/10.1080/14775085.2017.1298461

Sroka R (2021) Mega-events and rapid transit: evaluating the Canada line 10 years after vancouver 2010. Public Works Manag Policy 26(3):220–238. https://doi.org/10.1177/1087724X211003099

Statista Consumer Market Insights (2023) Revenue of the sports equipment market worldwide from 2014 to 2027. https://www.statista.com/statistics/1000592/sports-equipment-market-size-worldwide/

Stewart B, Skinner J, Edwards A (2008) Cluster theory and competitive advantage: the Torquay surfing experience. Int J Sport Manag Mark 3(3):201. https://doi.org/10.1504/IJSMM.2008.017189

Su Y, Lu L, Yao D, Zhang Y, Li Z, Zhang Z, Yangmeng W (2009) Transportation demand management for Beijing 2008 Olympic games. In: 2009 12th international IEEE conference on intelligent transportation systems, pp. 1–6. https://doi.org/10.1109/ITSC.2009.5309858

Subic A, Shabani B, Hedayati M, Crossin E (2012) Capability framework for sustainable manufacturing of sports apparel and footwear. Sustainability 4(9):2127–2145. https://doi.org/10.3390/su4092127

Sumner H (2011) Delivering London 2012: spectator transport. Proc Inst Civ Eng Civ Eng 164(5):55–61. https://doi.org/10.1680/cien.2011.164.5.55
Sumner H (2012) Delivering London 2012: Transport legacy. Proc Inst Civ Eng Transp 165(4):267–275. https://doi.org/10.1680/tran.12.00041
Sun C-I, Chang K-S, Huang J-T (2021) Rescue notification system with accurate location estimation for injuries in city Marathons. J Locat Based Serv 15(2):142–168. https://doi.org/10.1080/17489725.2021.1890845
Szymoszowskyj A, Winand M, Kolyperas D, Sparks L (2016) Professional football clubs retail branding strategies. Sport Bus Manag Int J 6(5):579–598. https://doi.org/10.1108/SBM-09-2016-0048
ten Hompel M, Schmidt T, Dregger J (2018) Materialflusssysteme: Förder- und Lagertechnik. Springer, Berlin Heidelberg. https://doi.org/10.1007/978-3-662-56181-2
ThomsenNadvi PLK (2010) Clusters, chains and compliance: corporate social responsibility and governance in football manufacturing in South Asia. J Bus Eth 93:201–222
Tóffano Pereira RP, Filimonau V, Ribeiro GM (2019) Score a goal for climate: assessing the carbon footprint of travel patterns of the English Premier League clubs. J Clean Prod 227:167–177. https://doi.org/10.1016/j.jclepro.2019.04.138
Tranfield D, Denyer D, Smart P (2003) Towards a methodology for developing evidence-informed management knowledge by means of systematic review. Br J Manag 14(3):207–222. https://doi.org/10.1111/1467-8551.00375
Trenberth L, Hassan D (eds) (2011) Managing sport business: an introduction. Routledge, London
Triantafyllidis S, Davakos H (2019) Growing cities and mass participant sport events: traveling behaviors and carbon dioxide emissions. C 5(3):49. https://doi.org/10.3390/c5030049
Triantafyllidis S, Ries R, Kaplanidou K (2018) Carbon dioxide emissions of spectators' transportation in collegiate sporting events: comparing on-campus and off-campus stadium locations. Sustainability 10(1):241. https://doi.org/10.3390/su10010241
van Eck NJ, Waltman L (2010) Software survey: VOSviewer, a computer program for bibliometric mapping. Scientometrics 84(2):523–538. https://doi.org/10.1007/s11192-009-0146-3
Villiers C, Nguyen LD, Zalewski J (2019) Evaluation of traffic management strategies for special events using probe data. Transp Res Interdiscip Perspect 2:100052. https://doi.org/10.1016/j.trip.2019.100052
Vouillamoz M, Thom C, Grisdale R, Saugy M, Giraud S, Robinson N, Gmeiner G, Geisendorfer T (2009) Anti-doping testing at the 2008 European football championship. Drug Test Anal 1(11–12):485–493. https://doi.org/10.1002/dta.105
Wen H, Hu Z, Guo J, Zhu L, Sun J (2008) Operational analysis on Beijing road network during the Olympic games. J Transp Syst Eng Inf Technol 8(6):32–37. https://doi.org/10.1016/S1570-6672(09)60003-9
Wicker P (2018) The carbon footprint of active sport tourists: an empirical analysis of skiers and boarders. J Sport Tour 22(2):151–171. https://doi.org/10.1080/14775085.2017.1313706
Wise N, Perić M, Đurkin J (2019) Benchmarking service delivery for sports tourism and events: lessons for Gorski Kotar, Croatia from Pokljuka, Slovenia. Eur J Tour Res 22:107–128. https://doi.org/10.54055/ejtr.v22i.378
Wiśniewski A (2021) Sport club business model. J Phys Educ Sport. https://doi.org/10.7752/jpes.2021.s2124
Wojtowicz J, Wallace WA (2010) Traffic management for planned special events using traffic microsimulation modeling and tabletop exercises. J Transp Saf Secur 2(2):102–121. https://doi.org/10.1080/19439962.2010.487635
Wood A (2019) Advancing development projects through mega-events: the 2010 football World Cup and bus rapid transit in South Africa. Urban Geogr 40(4):428–444. https://doi.org/10.1080/02723638.2017.1395604
Woong Sung S, Jang YJ, Hoon Kim J, Lee J (2017) Business analytics for streamlined assort packing and distribution of fashion goods at Kolon sport. Interfaces 47(6):555–573. https://doi.org/10.1287/inte.2017.0904
Wright MB (2009) 50 years of OR in sport. J Oper Res Soc 60(sup1):S161–S168. https://doi.org/10.1057/jors.2008.170
Wu G, Li Z (2016) Research on WebGIS-based stadium intelligent service system. Int J Grid Distrib Comput 9(12):191–202. https://doi.org/10.14257/ijgdc.2016.9.12.17

Xie H, Weerasekara NN, Issa RRA (2017) Improved system for modeling and simulating stadium evacuation plans. J Comput Civ Eng 31(3):04016065. https://doi.org/10.1061/(ASCE)CP.1943-5487.0000634

Xiong G, Wang K, Zhu F, Cheng C, An X, Xie Z (2010) Parallel traffic management for the 2010 Asian games. IEEE Intell Syst 25(3):81–85. https://doi.org/10.1109/MIS.2010.87

Xiong G, Liu S, Dong X, Zhu F, Hu B, Fan D, Zhang Z (2012) Parallel traffic management system helps 16th Asian games. IEEE Intell Syst 27(3):74–78. https://doi.org/10.1109/MIS.2012.60

Xiong G, Dong X, Fan D, Zhu F, Wang K, Lv Y (2013) Parallel traffic management system and its application to the 2010 Asian games. IEEE Trans Intell Transp Syst 14(1):225–235. https://doi.org/10.1109/TITS.2012.2210883

Xu Y, González MC (2017) Collective benefits in traffic during mega events via the use of information technologies. J R Soc Interface 14(129):20161041. https://doi.org/10.1098/rsif.2016.1041

Yamawaki Y, Castro Filho FM, Costa GE (2020) Mega-event transport legacy in a developing country: the case of Rio 2016 Olympic games and its Transolímpica BRT corridor. J Transp Geogr 88:102858. https://doi.org/10.1016/j.jtrangeo.2020.102858

Yan LC, Yang SS, Fu GJ (2010) Travel demand model for Beijing 2008 Olympic games. J Transp Eng 136(6):537–544. https://doi.org/10.1061/(ASCE)TE.1943-5436.0000105

Yu L, Duan B (2021) Optimization of IoT-based sporting goods consumer service management system. Complexity 2021:1–13. https://doi.org/10.1155/2021/2914629

Zeller L (2015) Potential changes in transportation patterns of New York Islanders fans due to stadium relocation. Transportation 42(6):951–966. https://doi.org/10.1007/s11116-015-9652-8

Zhang R, Sun W, Tsai S-B (2021a) Simulation of sports venue based on ant colony algorithm and artificial intelligence. Wirel Commun Mob Comput 2021:1–11. https://doi.org/10.1155/2021/5729881

Zhang Y, Zhao X, Shen J, Shi K, Yu Y (2021b) Optimization of sports event management system based on wireless sensor network. J Sens 2021:1–11. https://doi.org/10.1155/2021/1174351

Zhang W, Terrier V, Fei X, Markov A, Duncan S, Balchanos M, Sung WJ, Mavris DN, Loper ML, Whitaker E, Riley M (2018) Agent-based modeling of a stadium evacuation in a smart city. In: 2018 winter simulation conference (WSC), pp. 2803–2814. https://doi.org/10.1109/WSC.2018.8632176

Zhou R, Ross WJ, Pu H, Kim C, Kim J, Kaplanidou K, Leopkey R (2021) Exploring partnerships in sport event delivery. Event Manag 25(5):425–444. https://doi.org/10.3727/152599519X15506259856363

Zoghi H, Siamardi K, Tolouei M (2009) Impact of 2008 Olympic games on urban transportation and it's development strategies in Beijing. In: 2009 international conference on computer and automation engineering, pp. 252–258. https://doi.org/10.1109/ICCAE.2009.49

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