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Analysis of Security Risks and Countermeasures in Olympic Games: Lessons from Beijing, London, and Rio

Security management is a fundamental concern in large-scale international sporting events, as it directly affects personal safety, economic stability, and social order. The Olympic Games, as one of the most influential global sporting event, face complex and multifaceted security risks. This study conducts a comparative analysis of three Olympic Games—Beijing 2008, London 2012, and Rio 2016—to identify key security threats and evaluate the effectiveness of preventive measures. The results indicate that terrorism remains the most prevalent security threat, while challenges related to food safety, transportation security, and economic integrity also persist. In response, host cities have implemented a range of strategies, including the establishment of centralized security command systems, the deployment of multi-level monitoring networks, the integration of technological innovations, and the enhancement of interdepartmental coordination and public participation. In addition, context-specific approaches, such as regional epidemic control and emergency response planning, have been effectively applied. The study concludes that future Olympic Games should adopt a comprehensive and adaptive security management framework that integrates technological advancement, intergovernmental cooperation, and public engagement to strengthen resilience and minimize potential risks.

Keywords: Olympic Games, Security risk assessment, Risk management strategies, Terrorism prevention, Public safety, Event security governance

Introduction

Security is a major concern when major international events are held, especially large-scale sporting events that attract extensive media coverage and large crowds, such as the Olympic Games. However, the terrorism is the worst security issue throughout the Olympic Games. During the Beijing Olympic Games, several security incidents occurred, including stabbing attacks and terrorist bombings, some of which resulted in fatalities. Moreover, the Rio 2016 Olympic Games faced a significant terrorist threat following the attack in Nice on 14 July. All these severe terrorist threats endanger the security of participants in the Olympic Games. In Olympic history up to the 2016 Paralympic Games, 9 athletes died while completing or participating in their sports. In addition, 14 Olympic participants died due to other causes, including terrorism and other issues. Moreover, Olympic-related incidents have also resulted in fatalities among non-participants. For example, during the preparation for the Rio 2016 Olympic Games, 11 workers died while building Olympic facilities. According to Chen (2008), although China ranked first in the Olympic scoreboard, it was the Olympic security that still should be regarded as the "first gold medal" of the Beijing 2008 Games, emphasizing that without security, all other achievements lose their significance [1]. Therefore, the success of hosting the Olympic Games should not be measured solely by the number of medals won, but also by the host country's responsibility to minimize security risks and ensure the safety of all participants. Governments must effectively manage security risks to guarantee public safety. Consequently, evaluating the security risk

management measures of previous Olympic Games and drawing lessons for future Olympic security planning has become an important research focus.

Risk is unavoidable, and exists in peoples' daily lives and public events. Risk based on safety management usually is called risk management, which should be analysed concerning the natural hazard and help with risk prevention and control [2]. According to Toohey and Taylor (2008), it was not until the twentieth century that risk took on a more negative perspective related to "how to avoid genuine or perceived hazards" [3]. According to Silvers (2009), "risk is any condition or occurrence that might affect the outcome of an event or event activity and might expose an event organization to loss measured in terms of probability and consequences" [4]. Security risk does not belong to a specific type of risk, Liu and Jiang (2009) [5] divided the risk into political risks, economic risks, diastral risks, human risks, event operation risks, site equipment risks, technical risks and event risks in eight types, the security could be related to any type of risk [5]. Security is more likely to be listed under political risks because the extent of the involvement of a central government and its attitudes to an event such as the Olympic Games, for example, might determine levels of funding and support. Managing security risks at modern sporting events means trying to prevent the occurrence of security problems rather than responding to them after they have arisen.

According to Fuller and Drawer (2004), a certain level of risk always occurs in the sports management process, even when reasonable precautions have been implemented [6]. Besides that, security risks are now crucial and increasing terrorist threats and security is a vital aspect of organizing major sports events with escalating costs it is also important for protection of personal safety. According by Liu and Jiang (2009), the security risks exist in the process of a sport event, relating to every participant not only the players. Therefore, finding the appropriate security risk management strategy is essential to ensure the security of all those involved in the events; competitors, spectators and the personnel involved in managing the event [5]. Mentioned in the study of Silvers (2009), "Security management covers the sourcing, selection and deployment of the personnel and equipment to be used to provide protective services and support for the event project, and the implementation and supervision of the appropriate command and control systems to ensure its efficiency" [4]. Security risk does not have a clear definition and can relate to health, personal safety, financial security, and other areas. Security risks can be categorized into terrorism and political threats, public transportation and venue security, equipment and food safety, and other related issues. This paper examines security risks, including terrorism, as well as security incidents that occurred during the Olympic Games, affecting athletes and other stakeholders involved in the event.

According to Liu and Jiang (2009), the term *risk management* first appeared in Gallagher's report, *Risk Management: New Phase of Cost Control*, published in 1950 [5]. According to Silvers (2009), the process of risk management for the events is defined as a deliberate and planned process to adjust to the change of the surroundings and environment [4]. In order to apply risk management effectively, it is vital to understand the dynamics of risks, including identifying, analysing, assessing or evaluating, treating or managing, and monitoring and reviewing risks [2]. The first step in risk management is to identify risks, that is, risk identification [5]. Risk identification is the process of determining which factors could prevent the completion of a project, event, or business objectives. Risk assessment is based on the analysis of all uncertainties and risk factors, to assess and predict the probability of occurrence of risks and the magnitude of the loss, so as to identify the key risks and determine the overall risk level [7]. And the treating reviewing process is to use effective measurements to react and minimize them.

Shone and Parry (2004) classified the events into four different levels based on their sensitivity: low risk events, medium risk events, high risk events and higher levels of risks [8]. The low risks events are usually indoors, and are based at only one venue, making security easier to monitor; for instance, an indoor tennis event. Events, such as annual sports events or festivals, are considered as medium risk events. The high-risk events such as the Olympic Games have increased participants and venues compared with small sports events (*ibid.*). Therefore, the nature and scope of the event dictate differing levels of risks. According to Leopkey and Parent (2009), an expanded definition of risk management for sports events was proposed: "a proactive process that involves assessing all possible risks to the events and its stakeholders by strategically anticipating, preventing, minimizing, and planning responses to mitigate those identified risks", as the findings show the importance and pervasiveness of risk management throughout the preparation and hosting of a major sporting event [9]. Mentioned in the study of Liu and Jiang (2009), safety is not only the minimum requirement of holding an Olympic Games successfully, but also a criterion to test whether the games were

successful or not [5]. Thus, it is very important to make pre-caution measurements on controlling the occurrences of those risks in the Olympics.

The reason for focusing on the Beijing, London, and Rio Olympic Games is that, in many ways, they serve as case studies for future Olympics, particularly in how they responded to post-9/11 terrorism. These were three past Olympic Games that were hosted in Asia, Europe, and South America. They share some common and different security problems with different reacting methods in hosting the Olympic Games, these cases can be used as meaningful references and they are useful and crucial to summarize a general security risk management mode for the future Olympic Games.

Some researchers have focused on the risk management for meetings and events but not on specific sports events, which did not deal with the comparison between different sports risks and lack of setting up a sports management mechanism. Ammon and Blair (2004) emphasized the need for a sports facility management and they based his view on the plan of those sports revenues to avoid the occurrences of the risks [10]. In addition, Spengler, *et al.* (2006) analysed the risk management in sports and recreations but they did not concentrate on domestic and international sports events and their case studies [11]. Some Chinese researchers included the risk management of large-sports events in their papers [12, 13]. Liu and Jiang (2009) made a general analysis of risk control and risk avoidance [5]. However, all of them are in Chinese which will take significant efforts to translate.

In this research, the materials mentioned above will be used as references to analyze the Beijing 2008, London 2012, and Rio 2016 Olympic Games. The study aims to identify the similar security risks they faced and how they responded, as well as the different risks that occurred in each country. It also seeks to propose mechanisms to defend against security risks in future Olympic Games. Therefore, this research will help fill gaps in the current literature on risk management in sports.

Methods and materials

The main research strategy of this project is case study. Thornhill *et al*. (2012) defines that the case study is one way of exploring a research topic or phenomenon within its context or within many real-life contexts [14]. Beijing 2008, London 2012 and Rio 2016 Olympic Games were used as case studies to analyse the risks and the management models. The three past Olympic Games were successful and represented different sporting cultures from the East and the West. As a result, they faced different conditions and adopted different measures to manage security risks. This study uses these three Olympic Games as case studies to develop a mature and comprehensive risk management model that can be applied to future Olympic Games. The case study approach is an excellent way of testing if existing approaches are effective in a practical situation in the future.

Qualitative research is a critical research approach, which consists of different opinions and standpoints. It is an inductive view of the relationship between theory and research [15]. Risks are everywhere and the types are multiple. Management models vary and people's evaluations of those risks are different. Therefore, qualitative comparisons of different sports events were analysed and different roles of people's opinions on one specific sports event were conducted critically in order to analyse the risk management in these three Olympics.

In this study, a total of 7 participants (one British researcher and the others Chinese) contributed 11 interview samples, 5 of whom provided information about the Beijing Olympic Games, 3 about London, and 3 about Rio. Depending on participants' availability, some individuals related to the respective Olympic Games were selected as interviewees, while others were researchers studying the risks associated with mega-sport events. In this circumstance, participants might provide detailed information based on their experience, involvement, and studies that could not be collected from previous data and literature.

The areas with which they were familiar included:

- Security issues that occurred during the Olympic Games
- Preventive measures addressing security risks implemented by the host governments
- A summary of security risk management and suggestions for future Olympic Games risk management.

The interviewees were chosen because some were direct participants in the events, while others were experts in this field of study. Therefore, their experiences, research, and feedback provided valuable insights into the risk management strategies deployed at major sporting events. These insights can be used in the development of risk management models for future events such as the Olympic Games.

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In this project, apart from one face-to-face semi-structured interview conducted in English with the British interviewee, all other interviews were conducted online in Chinese and were later translated into English. Fylan (2005) defines a semi-structured interview as a simple conversation in which the researcher has a clear idea of what they want to find out, allowing interviewees to express their ideas freely [16]. Compared with structured interviews, semi-structured interviews balance pre-planned questions with greater flexibility [17].

The semi-structured online interview has unique advantages, particularly when compared with the geographical limitations of a face-to-face interview. According to Gurber et al. (2008), online interviews are cheaper as they save money on travel, venue hire and accommodation costs [18]. However, online interviews also have some limitations. For example, it can be difficult to arrange a convenient time with interviewees due to time differences between countries. They require internet access and electronic devices with video platforms and cameras, which are not as convenient as face-to-face interviews. Therefore, based on the strengths and weaknesses of the semi-structured interview, all the interviews with Chinese participants in this project were conducted via QQ or WeChat, which are widely used in China for long-distance communication and have functions similar to Skype. The interviews were conducted in Chinese to facilitate understanding for the interviewees. Thus, they were able to respond immediately. Apart from the online interviews mentioned above, the following interview processes were used.

- Preparations

As mentioned by DiCicco-Bloom and Crabtree (2006), researchers should first explain the purpose of the interviews and the significance of participants' involvement in the research, in relation to the research background and objectives [19]. Both semi-structured interviews begin with general, open-ended questions designed in advance, but the interviewer has the freedom to ask additional questions during the interview to gain a deeper understanding of the participants' perspectives [20]. To ensure a smooth interview process, a pre-test was conducted. This involved testing the quality of the internet connection, sound and lighting effects, proper gestures to present the best facial expressions, and whether to use a power amplifier for the music.

- Process

The aim of the interview was to explore the experts' experience of organising previous sports events, in order to gain a better understanding of the current sports risk management mechanism. The researchers could also formulate probing questions based on words repeated by respondents to gain further explanations or information [21]. This could provide further information and resources. Several changes will be made when interviewing different managers about different events. According to Hennink et al. (2010), social and communication skills are needed for an effective and smooth interview process [22]. Effective facial expressions were needed in both interviews to help interviewees feel comfortable and relaxed, in order to obtain more profound and detailed answers in both face-to-face and online interviews. It was difficult to record the online interview with a camera, so only the voice was recorded as the interview progressed.

- Completion

Extra basic recorders will be used during each interview to record conversations for data interpretation. This process will be explained to interviewees before each interview. Warren et al. (2003) mentioned that the recorded interviews ended with saving the recorded materials, switching off the machine, ceasing to ask questions and thanking the interviewees for their participation [23]. After the interview, the recordings were played several times and translated into English. Therefore, an accurate Chinese-English translator was also needed for the translation process.

To specify security risk types and understand the security measures adopted by the Olympics to address these issues, the questions were divided into four relevant dimensions.

The research question for this project is: "What are the security risks and risk management measures in the current Olympic Games?" To collect and analyse the necessary data, the following process was conducted:

- Collect and translate relevant Chinese interview transcripts into English.
- Read each transcript and identify repetitive topics.
- Classify these topics under the proposed dimensions (security risks, security risk management measurements, security risk management in the current Olympic Games, and recommendations for the security risk management of future Olympic Games).
- Read these topics to find similarities or summarise a general conclusion.
- Form a comprehensive security risk management model to be applied to future Olympic Games.

Results and Discussion

Security risks

a. Security issues occurred during the Olympic Games. The following table summarises the security risks that existed during the previous three Olympic Games (Table 1).

Table 1

The main problems encountered at the three Olympic Games

Beijing 2008 Olympic Games	London 2012 Olympic Games	Rio 2016 Olympic Games
• Terrorism threat and other political security risks • Security issues in public transport • Public arena and equipment security risks • Food security issues • Natural disaster hazard risks • Air pollution security issues	• Terrorism threat and other political security risks • Security issues in public transport • Public arena and equipment security risks • Food security issues • Information security risks	• Terrorism threat and other political security risks • Security issues in public transport • Public arena and equipment security risks • Food security issues • Economic issues leading to social security risks • Public health security issues (virus threat, water pollution).

As shown in Table 1, terrorism and other political issues appeared to be the most common security issue during the three Olympic Games. Three of the interviewees mentioned terrorism at different events *(No. 5, male, Beijing; No. 1, male, London; No. 3, male, Rio)*. Food safety, public transport safety, public equipment security and other issues occurred simultaneously during the three Games. For example, one interviewee *(No. 3, male, London)* said that *"London's subways and buses do not have security equipment installed, and they don't have the security check process..."* The natural disaster safety issues and air pollution problem appeared to pose significant health and safety threats in Beijing *(No. 5, male, Beijing).* Information security issues also occurred during the London Olympics *(No. 1, male, London).* Furthermore, the Rio Olympics faced social security issues resulting from economic problems and health threats caused by viruses. *"Rio was faced with acute contradictions between rich and poor, which caused chaos on the streets. I did not feel secure there." (No. 1, male, Rio).*

b. Types of security risk

According to the answers provided by the interviewees, most of them gave subjective insights into what they thought were security risks. These included food safety, transportation security risks, security risks during sporting competitions, and health risks caused by pollution. As mentioned in the study by Liu and Jiang (2009), risk types include political, economic, diastral, human, event operation, site equipment, technical and event risks [5]. Based on the various types of security risk identified in these three Olympic Games by my interviewees, the security risks in this study coincide with the classification method and can be categorised into the eight common categories shown in Table 2. Conversely, the security risk types share some differences with the risk types, overlapping and interacting with each other.

Table 2

The types of risk encountered at the three Olympic Games

Beijing 2008 Olympic Games	London 2012 Olympic Games	Rio 2016 Olympic Games
• Terrorism threat and other political security risks (political, economic, human and event security risks) • Security risks in public transport (human security risks, economic security risks) • Public arena and equipment security risks (event operation risks, site equipment risks) • Food security risks (human security risks, event security risks) • Natural disaster hazards (natural disaster security risks, economic security risks and human security risks) • Air pollution security risks (human security risks)	• Terrorism threat and other political security risks • Security risks in public transport • Public arena and equipment security risk • Food security risk • Information security risks (technical security risks)	• Terrorism threat and other political security risks • Security risks in public transport • Public arena and equipment security risks • Food security risks • Economic issues leading to social security risks • Political, economic and human security risks, as well as event security risks. • Public health security risks (virus threat, water pollution) • Human security risks

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c. Security risk management process

The risk management process was introduced in three main steps. These are the identification, assessment and evaluation of security risks for mega-sport events, and the reaction process. Specifically, risk identification is the first step in finding the source of security risks and is the key to determining where the risks exist *(No. 1, female, Beijing) believes that the risk identification process should follow the four principles of risk avoidance, risk retention, risk reduction and risk transfer.*

The assessment and evaluation process lays the groundwork for the risk reaction process. One interviewee mentioned that the assessment process is vital for judging the level and effect of risks *(No. 5, male, Beijing).*

The reaction process is the most essential part of security management, as it deals with preventing the occurrence of security risks and minimising their impact. One interviewee suggested that this process should involve concrete measures that the government needs to implement *(No. 1, male, London).* In addition, the government needs to strictly adhere to the security risk management process, using case studies and clear risk principles *(No. 2, male, Beijing).*

Summary of security risks at the three Olympic Games

Table 3 summarises the main findings of this research.

Table 3

The main approaches adopted in these three Olympic Games

Beijing 2008 Olympic Games	London 2012 Olympic Games	Rio 2016 Olympic Games
• Set up a security command system • Build a security command team with training • • Form a security network supported by the public • Search for new technology to improve security protection • Ask for international cooperation • • Carry out multi-area monitoring • • Make security and contingency protection plans	• • Set up a security command system • Strengthen website security • • Arrange security personnel and equipment • • Carry out multi-area monitoring • • Train for security emergencies • Search for new technology to improve security protection • • Make security practices and contingency plans	• Set up a security command system • Make a security plan • Arrange security personnel and equipment • Control the virus invasion • Progress army security control by region • Input the police budget • Crack down on crime

a. Set up a security command system and create security practices and contingency plans.

The Beijing, London and Rio Olympic Games all set up effective security command systems and made security practices and contingency plans in advance to ensure safety *(No. 3, male, Beijing; No. 2, female, London; No. 2, female, Rio).*

The Beijing Olympic Games set up emergency plans to respond to emergent situations. Cao (2006) mentioned that the Beijing Olympic Games set up 52 security plans and 594 concrete execution solutions during the Games [24]. As for the London and Rio Olympic Games, the Home Office also published separate documents entitled *"London 2012 Olympic and Paralympic Safety and Security" and "Security in the Rio 2016 Olympic and Paralympic Games"* to identify potential security risks and the related measures and plans for how the authorities and relevant personnel should respond to these risks.

b. Search for new technology to supervise security

Both the London and Beijing Olympic Games attempted to use technological innovations to ensure security *(No. 3, male, Beijing; No. 1, male, London).*

c. Multi-area monitoring

Another important approach adopted by the Chinese and British governments was multi-area monitoring.

"The security control area of Beijing 2008 was divided into three zones: The first was the "Big Beijing security circle", which included all airports, railway stations, and highway traffic junctions; the second was the perimeter of the Olympic Village; and the third was the perimeter of each stadium. (No. 1, female, Beijing): "London's security measures were divided into three categories: land, water, and air. The air security operation was the biggest in the UK during peacetime" (No. 1, male, London).

d. Strong security protection personnel and equipment were arranged.

The British and Brazilian governments arranged strong security protection personnel and equipment. The governments dispatched large amounts of police forces and were equipped with strong military equipment *(No. 2, female, London; No. 1, male, London).*

According to the official materials, the Rio government also employed large numbers of personnel and pieces of equipment to ensure safety.

Security risk analysis of the three Olympic Games

Apart from the above essential measures, other actions were mentioned according to the different situations in these three countries.

a. Security risk measurement analysis for the Beijing Olympic Games

The Beijing Olympic Organising Committee has demonstrated significant operational advantages in security risk prevention, as it is closely integrated with the Beijing municipal government. Together with central and local government departments, the Committee forms a unified system. This multilevel framework of supervision, control, and management is unmatched by that of any other country.

The Beijing Municipal Meteorological Bureau conducted a meteorological disaster risk assessment, while the Beijing Municipal Seismological Bureau completed the *Olympic Games Earthquake Risk Assessment and Countermeasure Report*. These assessments provided an important basis for strengthening earthquake emergency safeguards and ensuring the smooth running of the 2008 Beijing Olympic and Paralympic Games in the face of natural disaster risks. The Beijing Meteorological Bureau also developed disaster and emergency plans, including the successful implementation of cloud seeding operations during the opening ceremony. In response to potential political risks relating to Taiwan, Tibet and Xinjiang, as well as the threat of international terrorism, the Chinese government used the central government propaganda system to emphasise that any intentional interference or destruction of the Olympics would not be tolerated. China was supported by the whole nation and the public firmly backed the government's project, which helped to successfully manage security risks [5]. Therefore, forming a security network supported by the public was a distinctive action adopted by the Chinese government. The 2008 Olympic Games also established a security risk team with well-organised training (No. 5, male, Beijing). The study by Liu and Jiang (2009) also revealed that the Beijing Olympic security department had established an international police liaison department, and that the International Olympic Committee had hired security experts and previous Olympic security command staff as consultants, in order to seek international cooperation [5].

b. Security risk analysis for the London Olympic Games

The British government has done a lot of preparatory work to ensure the success of the Olympic Games and deal with the threat of terrorism in London. First of all, the government established an organisational guarantee mechanism for the Olympic Games and published the document London 2012 Olympic and Paralympic Safety and Security to ensure the preparation and hosting processes were fully planned and arranged. The British government also invested £1 billion in Olympic security, and the London police station set up the National Olympic Coordination Centre at Scotland Yard headquarters. The London government has asked relevant staff to undergo training to reach a certain level of proficiency in order to be permitted to perform certain tasks (No. 1, Male, London).

During the Olympic and Paralympic Games, high-level officials from all departments and agencies involved in security and emergency services took command at the coordination centre. Large-scale army deployment with advanced equipment also provided a powerful advantage in security prevention. Multi-area monitoring was carried out. *"London's security measures were presented in three aspects for the Olympics: land, water, and air. The air security operation was the biggest in peacetime in the UK." (No. 1, male, London).* London also took action to strengthen website security in response to the emergence of information security issues.

c. Security risk analysis for the Rio Olympic Games

Brazil has suffered its worst economic growth, stagnation and inflation since 1930 due to depressed commodity prices. The country has also faced ongoing problems such as domestic political instability and economic recession. Robberies and explosions occurred frequently; therefore, apart from the standard measures, the Brazilian government implemented security measures throughout different regions due to their

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unique characteristics. Large numbers of armed police patrolled the airport and the Olympic Stadium, and the crackdown on crime increased. In addition, virus control was another essential measure taken by Rio: *"...new measures were introduced to prevent the spread of the virus; all venues and the population were tested, and insecticides were sprayed. Each venue would have a fixed agent for inspection and monitoring." (No. 2, female, Rio).*

It should be noted that, except for one interviewee *(No. 2, female, Rio),* all the other interviewees had a negative attitude towards the success of the current Olympic Games since Brazil was still facing serious social security problems.

Recommendations for the security risk management of future Olympic Games:

a. The government should set up a risk control policy and multi-dimensional control, which should be the main guide when dealing with security issues *(No. 1 and No. 3, both male, Beijing and London respectively).*

b. Request multi-faceted cooperation

Cooperation was mentioned in all areas, including the public and government sectors, private and public partnerships, and the various armed forces. This cooperation establishes a network for carrying out all-round supervision, prevention and control.

"Cooperation is essential. The public need to support the government in any case." (No. 5, male, Beijing).

"... strengthening the command and coordination of the military police is essential." (No. 2, male, Beijing).

"The private and public sectors need to work together. To counteract global terrorism, host nations should seek support from other nations, for example the USA" (No. 1, male, London).

"Host nations should seek support from other nations, for example the USA" (No. 1, male, London).

c. Set up an effective security command system

The security command system is the response mechanism established by the government to help prevent and control security issues. Two interviewees believe that the command system is useful for managing risks *(No. 1, female, Beijing; No. 3, male, London).*

d. Set up contingency plans

Contingency plans provide guidance on how the government should react in an emergency. Apart from that, these contingency plans should be combined with effective training to ensure they can be applied in real conditions in a timely and accurate manner *(No. 3, male, Beijing).*

e. Search for new technology to supervise security

"Preparations should be made for the adoption of emerging technology, new products and manufacturers to achieve perfection." (No. 1, female, Beijing).

Last but not least, all measures should be based on the real situation and be flexible rather than fixed. *(No. 5, male, Beijing).* Since each country has its own culture, as well as different political and economic systems, there is no fixed security model or regulation that can be forced upon a country. Conversely, the dominant principle is to consider which measures could best solve a country's own security issues.

Conclusions

The three Olympics Games in Beijing, London and Rio were all facing the most serious security issue: terrorism. Food safety, public transport safety and security of public equipment were among the problems that occurred simultaneously during the three Games. Furthermore, the different games reflected various security issues, such as natural disaster security risks in Beijing, information security issues in London, and economic issues leading to health security problems in Rio. The security risk identification, assessment, evaluation and reaction process must be followed when conducting security risk management. However, different security problems require different government measures. Apart from the common measures, such as setting up a security command system and carrying out multi-area monitoring, a distinctive approach adopted in Beijing was to build a security network supported by the public, under the influence of the whole-nation system. Virus control was an important method in Rio due to Brazil's health security issues, while London sought ways to address information security problems.

Following the above analysis, these suggestions could inform the development of a comprehensive future Olympic security risk management model.

• Use the successful experiences of past Olympics as references.

Overall, the Beijing, London and Rio Olympic Games were successful in minimising and preventing security risks, although some may have a different opinion of the Rio Olympic Games due to serious economic and security issues. However, Rio's security was still satisfactory in terms of avoiding terrorist attacks, and it also performed well in terms of virus control. Therefore, future Olympics should follow these examples and combine theory with practice.

• Comprehensive and multiple prevention measures

This project identifies the security risk measures applied to these three Olympic Games and aims to implement them comprehensively. Security management must be carried out from multiple angles to avoid any loopholes in future Olympics. Nip problems in the bud.

• Be flexible and adaptable in variable environments

Different countries have different national conditions, and there is no fixed security model that can be applied perfectly to all Olympics. The measures must be flexible enough to be applied to real situations.

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