How can sports entrepreneurs achieve their corporate sustainable development goals under the COVID-19 epidemic?

Kuo Chiang Ting¹ · Hsiao-Hsien Lin² · Jung-Hul Chien³ · Kuan-Chieh Tseng^{4,5} · Chin-Hsien Hsu³

Received: 8 September 2021 / Accepted: 3 October 2021 / Published online: 21 October 2021
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Abstract

The present study aimed to explore the opportunities for the sustainable development of professional sports enterprises and events from the perspective of the public's awareness, attitude, and behavior, as well as the physical and mental health of the spectators of professional events in Taiwan. First, 1,129 valid questionnaires were collected and analyzed by statistical, *t* test, and ANOVA methods. In addition, 9 respondents were interviewed to provide their personal opinions on the questionnaire results, and finally, multivariate analysis was conducted. Sports entrepreneurs must follow the decision to prevent the epidemic, make good use of Internet technology, plan a complete process, and use accurate testing facilities to grasp the movements of participants. They will win public recognition to maintain professional sports companies and events in COVID-19 and normal operation under the epidemic and create a sustainable environment for professional sports companies and events.

Keywords Virus environment · Risk of infection · Real-name registration · GPS positioning · Alertness

Introduction

Sports cannot only maintain human health, but also cultivate the personality traits of law-abiding, fair, respectful, persevering, and never giving up individuals (Muhtar et al. 2020). Since entrepreneurship involves competition from peers, high risk, and failure (Chen 2020a), the development

of the sports spirit of being law-abiding, modest and courteous, fair, persevering, and never giving up is also a basic core quality for successful entrepreneurs (George and Jones 2002). Professional sports are single or integrated sports that are operated systematically with corporate funding or cooperation of specific public or private organizations. It is a kind of consumption and sports behavior (Liao 2020) but also a commercial behavior and business model (Kuo 2020).

The types and organizations of professional sports around the world are quite diverse. For the organizers or regions, organizing sports events attracts large crowds of people to watch and create, indirectly generating economic behaviors such as advertising, marketing, and consumption, which bring huge economic benefits and business opportunities to countries, organizations, companies, and individual athletes (Yang 2020) and are the main key factors for the establishment of professional sports organizations (Central News Agency 2020). However, since the outbreak of the COVID-19 virus on December 26, 2019, a large number of people have been infected due to the rapid spread of the epidemic, and 187 countries have been affected by the epidemic, with the number of confirmed cases exceeding 106,246,361 and 2,319,103 deaths (WHO 2020a). Because the source of infection is unknown, the virus can live in the air for a long time, and patients with or without symptoms are infectious (Liu et al. 2020), and the mortality rate is 5.95% (Xu et al.

Responsible Editor: Lotfi Aleya

✉ Hsiao-Hsien Lin
chrishome12001@yahoo.com.tw

✉ Chin-Hsien Hsu
hsu6292000@yahoo.com.tw

¹ Graduate Institute of Sport Coaching Science College of Kinesiology and Health, Chinese Culture University, Taipei, Taiwan, Republic of China

² School of Physical Education, Jiaying University, Meizhou City, Guangdong Province, China

³ Department of Social Work, Toko University, Chiayi County, Taiwan, Republic of China

⁴ MA Program in Social Enterprise and Cultural Innovation Studies, College of Humanities & Social Sciences, Providence University, Taichung, Taiwan, Republic of China

⁵ Department of Leisure Industry Management, National Chin-Yi University of Technology, Taichung, Taiwan, Republic of China

2020); it has caused public panic and impacted the global economy (Huang et al. 2020; McKibbin and Fernando 2020; WHO 2020b; Yang et al. 2020). The professional sports industry in various countries also suspended their activities due to the epidemic or conducted them in a closed spectator mode (Yuchen 2020), causing serious losses to companies, instant unemployment of surrounding goods or employees, and a serious impact on the sports industry (Horky 2020).

The development of sports in Taiwan is hot, and professional sports tournaments are flourishing. Currently, there are baseball, basketball, volleyball, billiards, badminton, soccer, and golf; especially, the baseball and basketball professional sports leagues have the largest revenue, high visibility, and the most flourishing organizations (Chinese Major League Baseball 2020; Nian 2020). Even now, with the spirit of never giving up on sports, companies are actively cooperating with the government's decision to prevent epidemics; carefully planning epidemic prevention and management measures for the tournament; using the Internet system, electronic bulletins, posters, and staff propaganda; and drawing up measures to open the stadiums to the public (Du 2020; Nian 2020), hoping to bring back the fans' willingness to attend the games. With the efforts of the professional sports companies, no one was infected during the tournament, and the tournament is still open for fans to attend (Nian 2021; Pan 2020; Taiwan Ministry of Health and Welfare 2020). It can be seen that professional sports organizations in Taiwan, with the efforts of the enterprises to adjust the tournament system, plan for epidemic prevention and contingency measures, and operate with the spirit of never giving up, have been able to promote the tournament activities normally, and maintain a regular income with the same fan attendance system. Compared to other countries' professional sports development, Taiwan has maintained its goal of sustainable development of the professional sports industry in the face of the severe epidemic.

The COVID-19 epidemic is not over yet. The professional sports games in each country in the world are actively seeking effective measures in response to the epidemic, attempting to restore the games and reinstate business opportunities (Burkhardt 2020; Grimm 2020; Kirkcaldy et al. 2020; Lacques 2020). However, vaccines are still being developed (Prompetchara et al. 2020). Not only the correct solutions have not been found, but some countries are at the brink of breakdown. Some countries even appear a second wave of the epidemic (Shennan 2020; Smith 2020). All the phenomenon will severely impact all industries, especially the professional sports games that need the audience to stimulate consumption (Cuomo 2020; United Nations 2020). The completeness and planning for epidemic prevention besides correct decisions require the compliance of the people as a key factor as well (Taiwan Ministry of Health and Welfare 2020). The people obtaining correct knowledge, the correct

attitude, cognition, and behavior (Hsiao and Schultz 2020; Huang 2009; Shen 2008; Shih 2002) through psychological preparation of epidemic prevention promotion, experience, judgment, or imagination can face the pressure and crisis of the global pandemic and further acquire comprehensive epidemic prevention results (Hsu et al. 2020b).

The goal of epidemic prevention is to ensure that the people can maintain physical and mental health (Hsu et al. 2020b; Hung 2005). When the personal physical, psychological, and social health status are good (National Taiwan University Hospital 2015), the state of mind can make the people realize their potential, satisfy the demand for a normal life, and further transform to give back to society (WHO 1947). During the process, the immune system may improve; as a result (Chen 2020b), mental stress is reduced, and physical or mental disease is avoided (Chen 2009; Weiten and Lloyd 1994). Therefore, the status of the people's physical and mental health is the index of the success of epidemic prevention effort. To understand personal physical and mental health may be explored from the physical, psychological, and mental status (Lai et al. 2017; Maslach and Goldberg 1998). Under the influence of the epidemic, the goal of opening professional games is to form a safe and sanitary environment that lets the people watch the games in good state of physical and mental health. Although the decision applies to most people, however, the fans come from different areas, and thus, the demand for epidemic prevention policy is different. Different genders and ages experience different feelings (Hsu et al. 2020b; Huang 2009; National Taiwan University Hospital 2015; Shen 2008; Shih 2002).

Proper corporate preparedness and management mechanisms increase consumer confidence and trust (Ting et al. 2019), which in turn influences consumers' willingness to attend the games (Zhao et al. 2019). In-person experience allows for the examination of changes brought about by decisions, which encompasses the spirit or message conveyed by the decision-maker (Ap and Crompton 1998) and is usually discovered after the event is over (Widaningsih et al. 2020). Studies have found that the development of the sports industry has become increasingly critical due to the COVID-19 epidemic, and some scholars have begun to focus on the importance of entrepreneurial spirit in sports for business operations (Alon et al. 2020), the use of competitive sportsmanship to explore business operations (Kraus et al. 2020) and crisis management issues (Ratten 2020), and the impact of COVID-19 on spectator fans and businesses (Yuchen 2020), as well as on the response of professional sports leagues (Reade and Singleton 2020). They have also started to pay attention to the response of professional sports leagues (Reade and Singleton 2020) and started to evaluate opening the court to fans (Carmody et al. 2020). However, there are few countries or regions that have opened up their fans to the game, and there are still few research topics

(DiFiori et al. 2020). A case study of a country or region with existing open access to professional events would be useful to understand the key factors of success in the prevention and management of professional sports event entrepreneurs in that region.

Therefore, the researchers concluded that based on the physiological and psychological awareness as the decisive indicators, the effectiveness of epidemic prevention and management by professional sports entrepreneurs in Taiwan can be analyzed from the perspective of fans' personal experience, different gender and age backgrounds, and whether sports entrepreneurs still uphold the spirit of law-abiding, modest and courteous, fair, persevering, and never giving up to manage and operate the professional sports industry under the epidemic (George and Jones 2002; Muhtar et al. 2020), providing a safe environment for fans to watch games and stable and secure job opportunities for players and employees.

In accordance with the above description, the objectives of this study were (1) to examine people's attitudes, awareness, behaviors, and physical and mental health status of the Chinese professional baseball tournament; (2) to examine the differences in attitudes, cognition, behaviors, and physical and mental health of people by gender; (3) to examine the differences in attitudes, cognition, behaviors, and physical and mental health of people of different ages toward the preventive measures of the Chinese professional baseball tournament; and (4) to analyze the key factors for the sustainable development of professional sports in Taiwan.

Discussion

Sports and business management

Sports is not only a physical activity, but also a way to build a sense of lawfulness, fairness, respect for others, perseverance, and a never-give-up attitude (Muhtar et al. 2020). It is the formation and derivation of a team from individual athletes. It is also a physical phenomenon (Akanwa and Akpanabia 2012), an institutional field (Seth 2014), and a macro-level social form. Sports enterprises are different from material goods because professional sports organizations or sports enterprises are themselves a kind of sports organization or a business organization that sells sports goods. Through the athletes' skills and characteristics (Liao 2020), they sell peripheral goods (Kuo 2020) and create business opportunities, which is an ornamental commodity. Although the business opportunities are unlimited, there are also uncertainties in the effectiveness of management due to factors such as player skills, characteristics, and performance. Therefore, the willingness or ability of a highly sensitive entrepreneur (Akanwa and Akpanabia 2012) affects

the ability to maintain or expand the uniqueness of the corporate structure and culture (Seth 2014), resulting in profitability and feedback.

Nowadays, enterprises are facing competition from their peers and the demand for service quality from consumers. In addition to considering costs, how to survive under the fierce peer competition, adapt to strong consumer awareness, and establish a corporate attitude in line with the spirit of sports will be the main challenges faced by business operators nowadays. Competition is the basic communication process of sports culture (Turner 2010), whether it is an individual, a group, or an organization, the behavior, organization, and operation of sports will be conducted under competition (Seth 2017). It proceeds through stages of preparation, interaction, response, review, adaptation, correction, and interaction again and is a cyclical model of an individual or organization and its competitor. In general, sports business operators, even if they are not full-time athletes, must have professional sports training or basic sports experience and possess basic sports skills and spirit.

The trend of increasing competitive pressure and rising consumer consciousness is a challenge for business management. In addition to the need to survive under the conditions of law-abiding, modest, courteous, and fair, the basic corporate qualities are perseverance and never giving up (George and Jones 2002). In addition to the impact of the epidemic, the global industry is now facing the most severe challenges. Successful entrepreneurs must have extraordinary attitudes and vision, so the researchers believed that it would be helpful to learn from real-life cases to understand how decision-makers responded and to gain experience from them so that they can share and propose preventive and improvement measures to solve the current problems.

Taiwan professional sports open to fans

The professional sports events that are still open to the public in Taiwan include the Chinese Professional Baseball League (CPBL), Super Basketball League (SBL), and Plus League (PLG). The key executives of each organization have a background in sports and are former professional athletes. With the goal of promoting recreational sports for all in Taiwan, they sought to establish a professional sports environment, build a platform for professional athletes to perform, and continue their professional sports careers, attracting investment from entrepreneurs, recruiting professional athletes, and seeking official guidance to establish professional sports organizations.

Due to the COVID-19 outbreak, people's willingness to travel has been affected until the source of infection is confirmed and a vaccine is available (Huang et al. 2020; McKibbin and Fernando 2020; WHO 2020b; Yang et al. 2020). Major sports events or professional tournaments can

only be postponed (Tokyo Olympic Organizing Committee 2020) or closed, and the industry is becoming more and more critical (Horky 2020). However, in Taiwan, under the impact of the epidemic, the organizers of professional events weighed the practical problems of the sustainable development of professional sports enterprises and athletes and were willing to exercise the spirit of sports under the established principles of epidemic prevention measures and regulation management and successfully held the innovation of opening the venue to fans through planning, simulation, evaluation, application, trial run, review, and discussion (Pan 2020).

Since May 8, 2020, various major events have been resumed, and spectators have been allowed to attend the games besides CPBL, SBL, and PLG. Under the severe environment of the epidemic, the successful opening of the games to fans not only brings business opportunities for the sports industry but also allows athletes to return to the stage, creating opportunities for sustainable development for the sports industry and related workers. Therefore, the researchers believed that it would be meaningful to identify the key factors by taking the existing cases of opening the stadiums to fans in Taiwan as examples. The relevant preventive measures are outlined in Table 1.

Awareness, attitude, behavior, and personal physical and mental health in venue prevention and management

In addition to the never-give-up entrepreneurial spirit of corporate managers, professional evaluation and sound planning are the key to good decision-making behind the approval of athletic events for public access. The perfect decision and effectiveness of epidemic prevention require people's cooperation and time to prove (Lin et al. 2018), and the ability to make judgments can only be achieved after receiving accurate information through information transmission and

establishing correct epidemic prevention cognition, attitude, and behavioral literacy.

Awareness can be viewed in terms of awareness of epidemic prevention, the consensus in decision-making, and emergency response (Hsu et al. 2020a) and can be discussed in terms of the effectiveness of peripheral propaganda, habits, message reception, and on-site epidemic prevention propaganda (Shih 2002). Attitudes can be viewed from the perception and appearance dimensions (Hsu et al. 2020a) and can be discussed in terms of personal willingness, alertness, and cooperation (Shen 2008). Behavior can be viewed in terms of life resilience, personal performance (Hsu et al. 2020a), and execution, feedback information, potential personal behavior, and ethical behavior (Huang 2009).

However, the effectiveness of decision-making needs to be proven over time and through the experience of users (Lin et al. 2018). For public health issues, scientific evidence is needed to show the actual effectiveness. Based on personal perceptions, the investigation of individual physical and mental health phenomena can reveal the impact of the current environment on people (Cianconi et al. 2020). Physical and mental health can be viewed in terms of psychological, spiritual, and attitudinal dimensions (Motta Zanin et al. 2020), as evidenced by anxiety, competence, enthusiasm, headache, abdominal pain, insomnia, stomach pain, irregular diet, and death-seeking thoughts (Taghrir et al. 2020; Yiengprugsawan et al. 2014).

Methods and instruments

Study framework and hypotheses

This study investigated how the public perceived the effectiveness of epidemic prevention management and their physical and psychological health perceptions at sporting events

Table 1 Epidemic management measures during professional sports events in Taiwan

Object	Description
Teams and players	1. Access control. 2. Health tracking. 3. Masks are required throughout the game, except for players in the field
Fans attending the game	1. Fans will have their body temperature taken and their hands disinfected with alcohol. 2. Real name information will be taken. 3. One seat will be left empty between seats for fans. 4. Masks will be worn during baseball games when people are moving or purchasing items; masks will be worn throughout other sports games. 5. Outside food can be brought to baseball games, but the packaging must be complete; food and drink is prohibited at all other sports games, and no food will be sold. 6. Personal information must be filled out online for admission. 7. No one with a cough will be admitted
Venue planning	1. Set up temperature measurement area. 2. Emergency isolation area. 3. Maintain ventilation. 4. Combine internet, posters, and manual methods to strengthen epidemic prevention and propaganda. 5. Require 1 m distance between queues. 6. Provide alcohol for disinfection
Contingency strategy	1. If there is an epidemic in the event area, the organizer will refund the ticket price and the event will be held behind closed doors immediately. 2. Communicate with the central epidemic prevention and control center and local medical units seamlessly. 3. In case of emergency, notify the competent authorities immediately and cooperate with epidemic prevention measures

and explored how professional sports operators maintained open access for fans in the midst of the COVID-19 epidemic, in order to identify key factors for the sustainability of professional sports development, as shown in Fig. 1. The study was conducted to examine the knowledge, attitude, behavior, and physical and mental health feelings of fans of professional sports in Taiwan who are currently open to attend games. From the perspective of different genders and age backgrounds, we analyzed whether professional sports entrepreneurs conformed to the spirit of sports entrepreneurship, properly formulated epidemic prevention measures and management mechanisms, and then launched collective gathering activities to relaunch the business opportunities of professional sports games.

Study procedure and tools

Population background

Demographic variables include gender, male and female; age, under 20, 21–30, 31–40, 41–50, 51–60, and 61; education level, elementary school, junior high school, high school, college, and graduate school; channels of epidemic prevention knowledge, family education, school institutions, government agencies, mass media organizations, and online community platforms; and methods of accessing epidemic prevention information, oral advocacy, bulletin, books, magazines, newspapers, and TV media.

The compiling and analysis of epidemic cognition, attitude, behavior, and feeling of physical and mental health questionnaire

The study has designed questionnaire on epidemic prevention cognition, attitude, behavior, and feeling of physical and mental health by referencing (Hsu et al. 2020a) research structure, considering (Huang 2009; Shen 2008; Shih 2002) research data and has generated a 38 question questionnaire on epidemic prevention cognition (14), attitude (8), behavior (16), and 16 questions on current status of physical and mental health by referencing (Cianconi et al. 2020; Motta

Zanin et al. 2020; Taghrir et al. 2020; Yiengprugsawan et al. 2014) research results.

Four scholars with public health, professional game sponsoring, leisure sports, and medical care background were invited to perfect the editing of the questionnaire. In consideration of the 5-point scale, 1–5 points were designed in which 1 represents totally disagree and 5 represents total agree. The interviewees are invited to provide feedback on the research questions. On the day of May 15, 2020, 50 questionnaires were given to conduct questionnaire prediction and analyzed using SPSS for Windows 22.0. When KMO is > 0.08 and the p value in Bartlett test is less than 0.01 ($p < 0.01$), it indicates that the scale is suitable for conducting factor analysis (Kaiser 1974). When the α coefficient is greater than 0.80, the result has good reliability (Devellis 1991).

According to the statistical analysis results, there are 14 questions about epidemic prevention awareness. The value of KMO is 0.966, χ^2 value yielded from the Bartlett test is 17943.369, df is 105, and the significance value is 0.000 ($p < 0.001$), suitable for conducting factor analysis. The explained variances of the scale are 66.059%, 1.358%, and 3.335%, and the total explained variance is 70.753%. After factor analysis, all of them are retained, and they are named epidemic prevention awareness (4), consensus on decision-making (4), and emergency response (6), respectively, 3 dimensions containing a total of 14 questions. The α coefficients of the three scales are 0.953, 0.949, and 0.950, respectively, and the α coefficient of the total scale is 0.958. According to the above analysis results, this questionnaire has good reliability.

There are 8 questions about epidemic prevention attitudes. The value of KMO is 0.954, χ^2 value yielded from the Bartlett test is 18775.383, df is 120, and the significance value is 0.000 ($p < 0.001$), suitable for conducting factor analysis. The explained variances of the scales are 58.503% and 10.928%, and the total explained variance is 69.431%. After factor analysis, all of them are retained, and they are named cognition (4) and explicit reaction (4), 2 dimensions containing a total of 8 questions. The α coefficients of the two scales are 0.864 and 0.907, respectively, and the α

Fig. 1 Study framework

coefficient of the total scale is 0.907. According to the above analysis results, this questionnaire has good reliability.

There are 16 questions about epidemic prevention behaviors. The value of KMO is 0.966, χ^2 value yielded from the Bartlett test is 24122.727, df is 190, and the significance value is 0.000 ($p < 0.001$), suitable for conducting factor analysis. The explained variances of the scales are 64.894% and 5.203%, and the total explained variance is 70.097%. After factor analysis, all of them are retained, and they are named daily life adaptability (12) and individual performance (4), 2 dimensions containing a total of 8 questions. The α coefficients of the two scales are 0.954 and 0.958, respectively, and the α coefficient of the total scale is 0.960. According to the above analysis results, this questionnaire has good reliability.

There are 16 questions about influences on physical and mental health. The value of KMO is 0.950, χ^2 value yielded from the Bartlett test is 16325.989, df is 136, and the significance value is 0.000 ($p < 0.001$), suitable for conducting factor analysis. The explained variances of the scales are 54.135%, 10.188%, and 2.634%, and the total explained variance is 66.957%. After factor analysis, all of them are retained, and they are named psychological status (4), spiritual status (5), and attitude and health (6), 3 dimensions containing 16 questions. The α coefficients of the three scales are 0.945, 0.942, and 0.943 respectively, and the α coefficient of the total scale is 0.948. According to the above analysis results, this questionnaire has good reliability.

Analysis method and discussion

The study has discovered that although there are many public health issue investigations on COVID-19 in the world, the main ones are on the characteristics of the virus. Especially due to the impact by the epidemic, the professional games everywhere have not developed into opening the games to the public. Investigations on topics of epidemic prevention

measures by the professional sports are even much less (Alon et al. 2020; Carmody et al. 2020; DiFiori et al. 2020; Kraus et al. 2020; Ratten 2020; Reade and Singleton 2020). Therefore, the study believes that combining quantitative and qualitative method in addition to using triangulation can enhance the literature structure (Gursoy et al. 2002; Janesick 2000; Strauss 1998). Combining literature analysis, statistical testing, and interviews and establishing peer verification mechanism, data can be interpreted and explored in multiple ways.

At first, the questionnaire designed 1–5 points, 1 denoting totally disagree and 5 denoting totally agree in order to obtain the feeling of the interviewees on the issue. Samples are analyzed using SPSS for Windows 22.0, statistical testing, t test, and ANOVA in addition to individual interviews. After being authorized by the interviewees, 9 fans with sport management, baseball/softball athlete, entrepreneur, and average citizen background were interviewed (as in Table 1). Opinions on the statistical results are published for future deductions. Finally, multiple data are compiled and undergo cross checking and verification (Janesick 2000). If using in order induction, organization, analysis to derive the final correct (Strauss 1998) and plausible data to construct the paper herein (Gursoy et al. 2002) for exploration. The background and summary of the interviewees are explained in Table 2.

Study scope and limitations

The study was conducted to understand the effectiveness of epidemic prevention by professional event organizers through public awareness of the effectiveness of epidemic prevention and personal physical and mental health and to understand the corporate management philosophy and spirit of professional sports entrepreneurs in the face of the epidemic. Due to the restrictions and requirements imposed by the event organizers on spectators and the

Table 2 Interviewee background and interview topics

Background note	Scholar	Scholar	Player	Player	Player	Operator	Operator	People	People
Gender	Male	Female	Male	Male	Female	Male	Female	Female	Male
Age	39	51	32	19	23	61	57	19	22
Watching the game	6	5	10	3	5	20	20	2	2
Interview topics description									
1. How effective is the anti-epidemic measures planned at the venue for the competition in terms of entrepreneurs, hardware, staff, and publicity? Please briefly explain the reasons									
2. Under the propaganda of the on-site epidemic prevention measures in the watching venue, what changes can be achieved in personal prevention awareness? Please briefly explain the reasons									
3. Under the propaganda of the epidemic prevention measures at the watching venue, what changes can be achieved for personal prevention behaviors? Please briefly explain the reasons									
4. Under the epidemic prevention measures and management of the watching venue, what are your most obvious and least obvious feelings about your physical and mental health while watching the game? Please explain briefly the reasons									
5. Regarding the results and reasons presented in the survey, please provide your opinion									

risk of transmission and infection, the researchers used an online questionnaire platform and an on-site survey to collect a total of 1129 valid questionnaires from people who had attended professional sports events between June and December 2020, which is considered to be representative (Qiu 2014).

Due to the limitations of technological sophistication and lack of contact with the subjects, the perceptions and responses of the subjects during the sampling period may be lost due to the use of online platform questionnaires. In addition, the sampling period faced with the threat of epidemic, the number of samples collected, and the results may affect the conclusion of the study due to time, space, environment, and security factors. Therefore, the above deficiencies will be summarized in the recommendations below for subsequent research.

Research results and analysis

Background information analysis

This research from the 1129 samples we derived 466 males (41.3%) and 663 females (58.7%), 560 people under the age of 20 (49.6%), 465 between 21 and 30 (41.2%), 35 between 31 and 40 (3.1%), 49 between 41 and 50 (4.3%), 14 between 51 and 60 (1.2%), and 6 people above the age of 61 (0.5%). In terms of education level, one person is at elementary school (0.1%), 16 junior high school (1.4%), 147 high school (13%), 945 college and university (83.7%), and 20 people at graduate school (1.8%); 66 people whose acquirement of epidemic prevention knowledge channel is from family education (5.8%), 129 from academic institutions (11.4%), 127 from government institutions (11.2%), 537 public media (47.6%), 270 from social media platform (23.9%), and 56 people whose contact method of epidemic prevention information is from oral promotion (5%); 22 from banners (1.9%); 540 from books, magazines, and newspapers (47.8%); and 461 from television (40.8%).

Analysis of the public's attitudes, cognitions, behaviors, and current status of physical and mental health to the epidemic prevention measures in competition venues

As illustrated in Table 3, statistical analysis was conducted to analyze the awareness, attitude, behavior, and perception of the current epidemic prevention status of the venues and individuals' physical and mental health. The awareness of epidemic prevention was categorized into awareness, consensus, and contingency and was found to be the highest in the awareness of epidemic prevention among the venue staff (75.1%), the consensus of epidemic prevention among the

sports organizers (76.2%), and perfect contingency facilities of the venue (71.5%) and lower in the effectiveness of epidemic prevention promotion among the enterprises (64.3%), staff promotion (74.4%), and official contingency measures (68.7%).

The attitude toward epidemic prevention was divided into perception and appearance, and the issues of reducing the risk of infection (76.7%), valuing official epidemic prevention information, and valuing epidemic prevention measures at venues (75.2%) were the highest, while raising awareness during consumption (67.1%) and valuing personal knowledge of epidemic prevention at venues (33.4%) were the lowest.

Attitudes toward epidemic prevention were categorized into responsiveness and personal performance, with the issues of spontaneous consultation with experts (76.7%) and sharing knowledge about epidemic prevention (72.4%) being the highest and spontaneous cleaning of the personal environment (55.8%) and spontaneous cleaning of community environment (56.0) being the lowest.

For physical and mental health feeling, anxiety and panic (27.7%), headache (13.1%), and increased diet and smoking (18.2%) are the highest; reduced ability (9.8%), insomnia (6.1%), and stomachache and indigestion (5.8%) are the lowest.

Analysis of differences in attitudes, cognition, behavior, and physical and mental health status of people of different genders toward epidemic prevention measures in competition venues

As shown in Table 4, the awareness, attitudes, behaviors, and personal health of people of different genders were analyzed using the *t* test. It was found that, in terms of awareness of epidemic prevention among different genders, in addition to the issues of epidemic prevention consensus among sports organizers, the effectiveness of corporate epidemic prevention promotion, epidemic prevention promotion at sports venues to change epidemic prevention habits, epidemic prevention awareness among venue staff, epidemic prevention consensus among the public, epidemic prevention promotion at venues, epidemic prevention promotion among staff, epidemic prevention consensus among families, official response measures, stringent control measures, contingency among staff, the on-site response at the venue, the contingency of video media, and improvement of emergency response facilities at the venue all showed significant differences, indicating that there were differences in the views of different genders on the issues of epidemic prevention consensus among the campaign organizers.

There were significant differences in the attitudes toward epidemic prevention and the two issues of attaching importance to the advice of friends and relatives on epidemic

Table 3 Analysis of the public's attitudes, cognitions, behaviors, and current status of physical and mental health to the epidemic prevention measures in competition venues

Dimension	Subdimension	Issue (%)		
Epidemic prevention cognition	Epidemic prevention cognition (4)	Effectiveness of epidemic prevention promotion by enterprises (64.3%)		
		Change of epidemic prevention habits by sports venues' epidemic prevention promotion (66.6%)		
		Awareness of epidemic prevention among venue staff (75.1%)		
		Public consensus on epidemic prevention (74.5%)		
	Policy consensus (4)	On-site epidemic prevention promotion at venues (76.0%)		
		Advocacy by staff (74.4%)		
		Campaign organizers' epidemic awareness (76.2%)		
		Family consensus on epidemic prevention (75.4%)		
	Emergency response (6)	Official contingency measures (68.7%)		
		Stringent control measures (70.5%)		
Worker response (71.0%)				
On-site contingency at venues (71.1%)				
Epidemic prevention attitude	Perception (4)	Contingency for video media (67.1%)		
		Good contingency facilities at venues (71.5%)		
		Increased attention to preventive measures (67.5%)		
		Increased vigilance during consumption (67.1%)		
	External display (4)	Increased vigilance during spectating (75.8%)		
		Venue epidemic prevention has reduced risk of infection (76.7%)		
		Emphasis on official vaccination information (75.2%)		
		Valuing the advice from friends and relatives on epidemic prevention (71.2%)		
		Emphasis on the measures to prevent epidemic in venues (75.2%)		
		Emphasis on personal knowledge of venue epidemic prevention (33.4%)		
Epidemic prevention behavior	Life adaptivity (12)	Promoting proper vaccination measures (66.2%)		
		Voluntarily implement other epidemic prevention behaviors (73.7%)		
		Increase knowledge of epidemic prevention measures (65.5%)		
		Improved efficiency of epidemic prevention in the venue (62.4%)		
		Voluntary mask wearing and protective behavior improvement (75.5%)		
		Proactively seek expert advice (76.7%)		
		Proactively search for online information (69.8%)		
		Proactively consult a teacher for advice (68.1%)		
		Proactively respond to friends and relatives (59.4%)		
		Proactively clean personal environment (55.8%)		
		Voluntarily cleaning the surrounding environment (70.3%)		
		Voluntary collection of waste (71.3%)		
	Personal performance (4)	Sharing knowledge about disease prevention (72.4%)		
		Reminding individuals of inappropriate behaviors (58.6%)		
		Voluntarily cleaning the community environment (56.0%)		
		Alerting the public of inappropriate behaviors (58.0%)		
		Physical and mental health	Psychology (4)	Unstable mood (23.6%)
				Anxiety and panic (27.7%)
Reduced ability (9.8%)				
Reduced passion (22.9%)				
Spirit (5)	Stressed for time (26%)			
	Headache (13.1%)			
	Mental weakness (12.4%)			
	Pain sensitivity (9.6%)			
Attitude and health (6)	Lumbar pain (7.3%)			
	Insomnia(6.1%)			
	Stomachache and indigestion (5.8%)			
	Increased diet and smoking (18.2%)			
	Easy to anger (7.7%)			
	Loss of confidence (6.3%)			
	Loss of life goal (9.3%)			
	Suicidal thoughts(6.4%)			

Table 4 Analysis of differences in attitudes, cognition, behavior, and physical and mental health status of people of different genders toward epidemic prevention measures in competition venues

Dimension	Subdimension	Subject (male:female)	
Epidemic Prevention Cognition	Epidemic prevention cognition (4)	(3.50:4.02)*	
		(3.53:4.01)*	
		(3.78:4.30)*	
		(3.81:4.37)*	
	Decision consensus (4)	(3.86:4.38)*	
		(3.82:4.30)*	
		(3.85:4.38)	
		(3.85:4.37)*	
	Emergency response capability (6)	(3.78:4.08)*	
		(3.78:4.09)*	
		(3.77:4.02)*	
		(3.76:4.19)*	
Epidemic prevention attitude	Perception (4)	(3.69:4.08)*	
		(3.80:4.16)*	
		(3.80:4.32)	
		(3.83: 4.27)	
	Explicit (4)	(3.83: 4.29)	
		(3.83:4.24)	
		(3.70:4.16)	
		(3.79:4.19)*	
	Epidemic prevention behavior	Resilience (12)	(3.80:4.22)
			(3.68:4.04)*
			(3.67:3.93)*
			(3.75:4.14)*
Personal performance (4)		(3.69:3.95)*	
		(3.69:3.85)*	
		(3.82:4.16)*	
		(3.83:4.21)	
Physical and mental health		Psychological (4)	(3.79:4.00)*
			(3.68:3.98)*
			(3.67:3.81)
			(3.61:3.70)
	Spirit (5)	(3.70:4.04)*	
		(3.75:4.03)*	
		(3.77:4.08)*	
		(3.68:3.79)	
		Attitude and health (6)	(3.63:3.69)
			(3.59:3.74)
			Unstable mood (2.83:3.06)
			Anxiety and panic (2.95:3.47)
		Reduced ability (2.65:2.63)	
		Reduced passion (2.75:3.00)*	
		Stressed for time (2.78:3.03)	
		Headache (2.61:2.57)	
		Mental weakness (2.56:2.56)	
		Pain sensitivity (2.51:2.38)	
	Lumbar pain (2.44:2.24)*		
	Insomnia (2.37:2.26)*		
	Stomachache and indigestion (2.37:2.18)*		
	Increased diet and smoking (2.33:2.02)*		

* $p < 0.01$

prevention and attaching importance to the knowledge of personal venues on epidemic prevention between the genders ($p < 0.01$), indicating that there were differences in the views of the genders on the issues of attaching importance to the advice of friends and relatives on epidemic prevention and attaching importance to the knowledge of personal venues on epidemic prevention.

There were significant differences ($p < 0.01$) between the genders in terms of the prevention behaviors, such as improving the correct prevention measures, voluntarily implementing other prevention behaviors, increasing the knowledge of prevention measures, improving the efficiency of prevention at venues, voluntarily wearing masks and improving protective behaviors, proactively searching for information on the Internet, proactively seeking advice from teachers, voluntarily cleaning the surrounding environment, voluntarily collecting waste, and sharing knowledge about prevention. This means that there are differences between the genders on the issues of voluntarily consulting with experts, proactively responding to friends and relatives, voluntarily cleaning the personal environment, alerting

personal misbehavior, voluntarily cleaning the community environment, and alerting public misbehavior, except for other differences.

There is significant difference ($p < 0.01$) in the physical and mental health feeling in reduced passion, lumbar pain, insomnia, stomachache and indigestion, increased diet, and smoking.

Analysis of differences in attitudes, cognition, behavior, and physical and mental health status of people of different ages toward epidemic prevention measures in competition venues

As illustrated in Table 5, the awareness and attitudes of people of different age groups toward epidemic prevention and their personal physical and mental health were analyzed using the ANOVA test. There were no significant differences ($p > 0.01$) in the attitudes toward epidemic prevention measures, vigilance during consumption, vigilance during spectating, risk of infection reduction from epidemic prevention, the valuing official information on epidemic prevention,

Table 5 Analysis of differences in attitudes, cognition, behavior, and physical and mental health status of people of different ages toward epidemic prevention measures in competition venues

Dimension	Subdimension	Subject (M)
Epidemic prevention attitude	Perception (4)	Increased attention to preventive measures (under 20 > 21–30, under 20 > over 61, 41–50, 51–60 > over 61)* Increased vigilance during consumption (under 20, 41–50, 51–60, > over 61)* Increased vigilance during spectating (under 20 > 21–30, under 20, 41–50, 51–60 > over 61)* Venue epidemic prevention has reduced risk of infection (under 20 > 21–30, under 20 > 31–40, under 20 41–50, 51–60 > over 61)*
	Explicit (4)	Emphasis on official vaccination information (under 20 > 21–30, 51–60 > 6)* Valuing the advice from friends and relatives on epidemic prevention (under 20, 51–60 > over 61)* Emphasis on the measures to prevent epidemic in venues (under 20, 41–50, 51–60 > over 61)* Emphasis on personal knowledge of venue epidemic prevention (51–60 > over 61)*
Epidemic prevention behavior	Resilience (12)	Promoting proper vaccination measures (under 20 > 21–30, under 20 41–50, 51–60 > over 61)* Voluntarily implement other epidemic prevention behaviors (under 20, 41–50, 51–60 > over 61)* Increase knowledge of epidemic prevention measures (51–60 > over 61)* Improved efficiency of epidemic prevention in the venue (under 20, 21–30, 31–40, 41–50, 51–60 > over 61)* Voluntary mask wearing and protective behavior improvement (under 20, 51–60 > over 61)* Proactively seek expert advice (51–60 > over 61)* Proactively search for online information (51–60 > over 61)* Proactively consult a teacher for advice (51–60 > over 61)* Proactively respond to friends and relatives (51–60 > over 61)* Voluntarily cleaning the surrounding environment (51–60 > over 61)* Voluntary collection of waste (51–60 > over 61)*
Physical and mental health	Psychological (5)	Stressed for time (under 20 > 21–30, under 20 > 51–60, under 20 > over 61)*
	Attitude and health (6)	Easy to anger (41–50 > 51–60)*

* $p < 0.01$

advising friends and relatives on epidemic prevention, emphasizing epidemic prevention measures at venues, and personal knowledge of epidemic prevention at venues. The results of ANOVA analysis showed that there was a partial difference ($p < 0.01$), and the results of the analysis using the Scheffé method showed that those under 20, age 41–50, and age 51–60 all felt more strongly about these issues than those age 21–30, age 31–40, and over 61.

In terms of epidemic prevention behaviors, there were no significant differences in the issues of improving proper epidemic prevention steps, voluntarily implementing other epidemic prevention behaviors, increasing knowledge of epidemic prevention measures, improving the epidemic prevention efficiency of the venues, voluntarily wearing masks and improving protective behaviors, proactively seeking advice from experts, proactively searching for information on the internet, proactively seeking advice from teachers, proactively responding to friends and relatives, voluntarily cleaning the surrounding environment, and voluntarily collecting waste ($p > 0.01$). The analysis by ANOVA showed that there was a partial difference ($p < 0.01$), and the analysis by the Snow method revealed that participants over 61 felt the least on the issue of improving the efficiency of epidemic prevention in the venues, while those under 20, age 41–50, and age 51–60 felt slightly stronger on the issues of improving proper epidemic prevention procedures, voluntary implementation of other epidemic prevention behaviors, and the voluntary wearing of masks and protective behaviors. For other issues, age 51–60 had the strongest feelings.

In terms of feelings of physical and mental health, the Levene value for stressed for time, easy to anger after test did not reach significant level ($p > 0.01$), and χ^2 of the ensuing KW analysis reached significant level ($p < 0.01$). Conducting the comparison between two age groups at a time derived stressed for time (under 20 years old > 21–30 years old, 51–60 years old, 61 years old and above) and easy to anger (41–50 years old > 51–60 years old).

Discuss

Professional sports can be considered as a business and an organization (Seth 2014). Its athletes and industrial sports employees all rely on professional sports performance for sustainable development (Kuo 2020; Liao 2020). Sports entrepreneurs usually have sports literacy and experience and have developed a spirit of never giving up in the face of challenges (George and Jones 2002) and are often able to meet challenges in times of crisis (Akanwa and Akpanabia 2012; Muhtar et al. 2020). The global sports industry has been severely impacted by the epidemic. Devellis, 1991 In addition to a fearless spirit and a never-give-up attitude, entrepreneurs need to learn from good examples

and share their experiences in order to overcome this crisis together.^{57–58} The researchers examined the crisis management ability and effectiveness of sports entrepreneurs in Taiwan from the perspective of the public and explored the influence of the corporate philosophy of sports entrepreneurs on corporate crises.

The public's awareness of the effectiveness of epidemic prevention measures in venues

Sports events are not only a stage for athletes, but also a main source of livelihood for those involved.^{4–5} In order to maintain or expand corporate revenues^{57–58} and provide stable livelihoods for those involved, Taiwanese sports entrepreneurs have developed epidemic prevention measures and boldly embraced the spirit of never giving up by opening the stadiums to fans.²¹ The staff also took a cautious approach in implementing epidemic prevention and management measures and planned a detailed epidemic prevention strategy for fans during the game, which was recognized by the public. As a result, the public perceived that the stadium staff had the highest awareness of epidemic prevention, the sports organizers had a consensus on epidemic prevention, and the stadiums were well equipped for epidemic preparedness.

However, because sports entrepreneurs do not have public health expertise, they can only plan based on their existing knowledge of epidemic prevention and national epidemic prevention decisions, and because sports enterprises mainly sell sports events as commodities, the staff are unable to take care of all their responsibilities during events with the added work of epidemic prevention and inspection. Moreover, the domestic epidemic situation is stable, so it is easy for the staff and the event site to be lax in the epidemic prevention planning. It is therefore believed that because sports entrepreneurs are not public health professionals, the event is busy, and the epidemic is stable in Taiwan, the awareness of epidemic prevention and response measures may begin to be lax, and the staff may not reach a consensus on epidemic prevention.

Faced with the pressure of epidemic infection, although sports entrepreneurs actively prevent epidemics in anticipation of the normal operation of sports events, after all, entrepreneurs are not fully equipped with public health management expertise and face the challenges of epidemics; even though they are highly determined to prevent and control epidemics, they still have deficiencies. As a result, even though women have a careful attitude toward their daily lives, are patient, and have a high degree of self-discipline in their work,⁷³ they are under more pressure than men, so they expect to improve their physical and mental health through the leisure of watching events, and due to the safety of the epidemic, they want to have a safe environment to watch the games. Therefore, women pay more attention than men

to the effectiveness of epidemic prevention propaganda for corporate venues, staff, and other spectator fans during the spectator period and will prioritize epidemic prevention propaganda and contingency guidance measures for sports venues, on-site epidemic prevention facilities, and control mechanisms and then obtain video and media information to adjust the whole family epidemic prevention consensus and habits to achieve a safe and comfortable spectator environment.

The public's attitudes of the effectiveness of epidemic prevention measures in venues

Sports entrepreneurs seek to maintain the normal operation of professional sports events under the epidemic^{57–58} and to attract consumers to attend games and thus receive reward to maintain normal business operations.^{4–5} Therefore, they first observed the development of the epidemic in Taiwan, then developed measures for the prevention of epidemic and consumer flow to the tournament, and then reported to the Taiwan COVID-19 Epidemic Control Center and confirmed the decision to open the tournament after multiple discussions and approvals. Then, in accordance with the epidemic prevention and control measures for the opening of the tournament, the team, consumers, and staff were educated to wear masks at all times, to use alcohol disinfection, and to use Internet and thermometer equipment to track and screen the epidemic. In addition, the team also took measures to prevent the spread of the disease by keeping a distance between spectators and controlling the food and drink during the tournament.

However, because of the excellent epidemic prevention measures and the open space during the tournament, the stadium staff did not have time to remind consumers by keeping a close eye on them, and because of the effectiveness of epidemic maintenance in Taiwan, some people were less vigilant about epidemic prevention. Therefore, people attending the games think that the epidemic prevention at the venues is effective in reducing infections, and they will pay more attention to the official epidemic prevention information and measures. However, because of the spaciousness of the venues and the perfect control of the epidemic, there is a gap in personal epidemic prevention alertness, so people attending the games think that their epidemic prevention alertness and personal knowledge of the venues will be lowered during the consumption period.

Although leisure sports are popular in Taiwan, women are not able to experience them due to their personal physical condition or time, so they look forward to watching sports events for the purpose of leisure and relaxation. Therefore, in order to have a safe and comfortable environment to watch the game and eliminate the risk of infection, spectators will pay more attention to the effectiveness of on-site epidemic

prevention and control measures. As a result, women are more likely than men to pay attention to the advice of their friends and relatives and to adhere to their personal knowledge of venue preparedness. Furthermore, people under 20, age 41–50, and age 51–60 are more likely than people age 21–30, age 31–40, and over 61 to pay attention to epidemic prevention information from officials and family and friends, to evaluate venue epidemic prevention measures, and to increase their awareness of epidemic prevention during personal consumption and spectating, and to adjust their awareness of epidemic prevention at their venues to avoid the risk of infection.

The public's behavior of the effectiveness of epidemic prevention measures in venues

Sports entrepreneurs actively plan and implement epidemic control measures to ensure the normal operation of sports events and venues.^{4–5} Therefore, epidemic control for players, fans, and staff is highly demanded, and all participants are controlled by taking their real names and closely integrated with Internet technology, on-site epidemic prevention facilities, and planning to achieve the goal of zero risk of infection. Thus, the spectators of the games thought that the epidemic prevention measures in the stadiums could strengthen their knowledge of epidemic prevention and they could get immediate professional advice to improve their personal epidemic prevention and response behavior.

However, because the effectiveness of epidemic prevention in Taiwan is evident and has been maintained for a long period of time, the public's alertness and cooperation are reduced, and because of the differences in the public's epidemic prevention and environmental literacy, as well as the consumer's boss mentality, a few people are unwilling to cooperate with measures to maintain their personal viewing environment. Consequently, for spectators, there is still room for improvement in the maintenance of the on-site spectator environment, and they are reluctant to cooperate with measures to clean their personal and community environments.

Although women also prefer to engage in recreational sports, they are not able to engage in more vigorous sports due to their individual physiological factors and therefore tend to compensate for the actual action by watching the games.⁷⁴ However, women are at a slightly higher risk of infection than men in the COVID-19 epidemic,^{75–76} so women are more concerned than men about how to obtain correct information about epidemic prevention on the Internet, and at the same time, they increase their knowledge of epidemic prevention measures, improve correct epidemic prevention steps, adjust their personal epidemic prevention behaviors, and pay attention to protective behaviors such as wearing masks at all times during race viewing, collecting waste voluntarily, cleaning their surroundings, and

sharing epidemic prevention knowledge, in the hope that the efficiency of epidemic prevention in the stadium will be improved and the spectators can have a safe and comfortable environment.

In addition, elderly people are less enthusiastic about sports because of their sensitivity and physical limitations.⁷⁷ The majority of spectators are between 18 and 35 years old^{78, 79} or families organized to participate in sports events or activities.⁸⁰ In order to pursue the health of individuals and children, they pay more attention to the safety and prevention mechanism of the event site. Thus, those over 61 valued less the voluntary wearing of masks and protective behaviors, while those aged 51–60 valued the voluntary implementation of other epidemic prevention behaviors, searching the Internet, consulting with experts and teachers, taking advice from friends and relatives, increasing knowledge of epidemic prevention measures, cleaning the surrounding environment and collecting waste, and improving the efficiency of epidemic prevention at the venue. Then, under 20, age 41–50, and age 51–60 placed more emphasis on improving proper vaccination procedures and implementing other vaccination behaviors spontaneously than those over 61.

The people's physical and mental health feelings under the effectiveness of the venue's epidemic prevention measures attitudes

According to the above analysis and discussion, although sports entrepreneurs have the passion to never give up and fully cooperate with the government's decision-making center for epidemic prevention and planning a perfect epidemic prevention system for spectators, due to the fact that sports entrepreneurs are not the public health or epidemic prevention professionals, the large space of the stadiums and the small number of staff, as well as the difference in personal health literacy, independent epidemic prevention awareness, and cooperation of the public, there may be some risks to the effectiveness of the relevant policies and controls. Coupled with the fact that food and drink are controlled on-site, people watching the game may feel anxiety and panic, headaches, stomach pains, and indigestion, as well as psychological reactions such as irregular sleep and eating.

Due to women's low pain tolerance and stress resistance⁸¹ and their high sensitivity to the surrounding environment⁸² and hunger,⁸³ they are prone to psychological and physiological discomfort while watching the game under the pressure of dietary restrictions and the existing risk of infection. As a result, women are more likely than men to experience loss of enthusiasm, back pain, insomnia, stomach pain and indigestion, and abnormal diet. Those under 20 years old are

more likely to experience anxiety, and those 41–50 years old are more likely to experience irritability.

Conclusions and recommendations

The study found that the deficiencies in the prevention of epidemics at stadiums are attributable to the space of the venue, the number and ability of the staff on-site, personal hygiene and cooperation with epidemic prevention, reduced alertness, food control, the elderly's sensitivity and physical limitations, and differences in pain tolerance, stress resistance, hunger, and sensitivity to the surrounding environment, resulting in the public feeling poorly and their physical and mental health being affected. However, as long as sports entrepreneurs uphold the spirit of sports, adopt a fearless attitude and never give up, follow the government's decision on epidemic prevention, make good use of Internet technology, plan perfect on-site testing facilities and procedures, grasp the actual contact information of all participants, control the movement of personnel, strengthen the promotion of personal epidemic prevention measures, and adhere to the epidemic prevention control procedures and decisions, they can gain the recognition of the spectators, overcome the COVID-19 epidemic, maintain the normal operation of professional sports enterprises and events, and create the sustainability of professional sports enterprises and events.

Accordingly, we suggest that future research:

(1) In terms of games

The sponsoring agency still needs to abide by the epidemic prevention measures but must consider the needs and differences in terms of gender, age, character, and physical characteristics by planning different management measures befitting time and place and providing different epidemic prevention rules and services.

(2) In terms of fans

Although Taiwan has effectively controlled the epidemic, however, before there is a vaccine, there is still the problem of invisible infection by the non-symptomatic infected people which the people cannot take lightly. Fans still have to follow personal epidemic prevention measures, reduce going to crowd gathering, wear masks, make sure of personal and surrounding environmental cleanliness, and maintain physical and mental health.

(3) For ensuing researches

Since the present study only focuses on Taiwan as a case study to examine the effectiveness of sports entrepreneurs in preventing epidemics during events during the epidemic from the perspective of spectators with different gender and

age backgrounds, it is suggested that other regions can make reference to the case study and conduct small-scale experiments or extend the study to other non-sporting events.

Acknowledgements We are grateful to all participating editors. They have made great contributions to this article. We are also grateful for assistance in investigating people, making the research complete, and obtaining meaningful survey results and contributions.

Author contribution Each author's assistance to the article is as follows: TKC, conceptualization and supervision; LHH, conceptualization, formal analysis, investigation, methodology, writing—original draft, writing—review and editing, software, and validation; HCH, writing—original draft, project administration, resources, and funding acquisition; CJH and TKC, investigation, data curation, and resources. Every author has made significant contributions.

Data availability The case and research samples presented in the content of this research report shall be collected and sampled after approval.

Declarations

Ethics approval and consent to participate This research does not involve human trials, and the interviewees are conducting the investigation under the understanding of the research theme and full authorization, so there is no need for ethical approval. All interviewees agreed to authorize the provision of interview information.

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Competing interests The authors declare no competing interests.

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