




Analysis of the Kanjuruhan Stadium Tragedy from an Occupational Health and Safety Perspective

Muhammad Rifqi Saifullah^{1*}, Marji Marji², Erianto Fanani³, Supriyadi Supriyadi⁴

¹ Department of Public Health, Faculty of Sport Science, Universitas Negeri Malang, Malang, East Java, Indonesia

² Department of Mechanical and Industrial Engineering, Faculty of Engineering, Universitas Negeri Malang, Malang, East Java, Indonesia

³ Faculty of Medicine, Universitas Negeri Malang, Malang, East Java, Indonesia

⁴ Department of Sports Science, Faculty of Sport Science, Universitas Negeri Malang, Malang, East Java, Indonesia

`muhammad.rifqi.1906126@students.um.ac.id`

Abstract. A tragedy occurred following Arema FC's defeat against Persebaya Surabaya at Kanjuruhan Stadium on October 1, 2022. As many as 135 people died and 575 others were injured. The incident became one of the worst tragedies in Indonesia and the second deadliest disaster in the world. The focus of this research is to explore the incident process and analyze the Kanjuruhan Stadium tragedy from an occupational safety and health perspective using the Human Factors Analysis and Classification System method. This research applied a qualitative approach with an observational analytic descriptive study research design. This research revealed that the Kanjuruhan Stadium tragedy was caused by failures at the level of unsafe acts, preconditions for unsafe acts, and unsafe supervision. Failures in unsafe acts include errors and violations. Errors are caused by skill-based errors, decision errors, and perceptual errors. Meanwhile, the violation is due to routine violation and exceptional violation factors. Meanwhile, in the preconditions for unsafe acts, there are environmental factors in the form of technological environment and personnel factors in the form of crew resource management and personal readiness. While in unsafe supervision there are failures in the form of inadequate supervision, planned inappropriate operations, failure to correct a known problem, and supervisory violations.

Keywords: Kanjuruhan Stadium Tragedy, Occupational Health and Safety, Human Factors Analysis and Classification System.

1 Introduction

On October 1, 2022, a tragedy occurred following Arema FC's defeat against Persebaya Surabaya at Kanjuruhan Stadium, Malang Regency, East Java [1]. According to information from security forces, the incident began when supporters descended onto the field to approach Arema FC officials and players after the match ended. The increasing number of supporters entering the field made the security forces think the

situation would become uncontrollable [2]. Based on the testimony of several supporters who came down, they received obstacles, pulling clothes, and blows until they fell by the security forces. This caused anger and led to the descent of thousands of supporters from all corners of the stands onto the field. The security forces then issued sniffer dogs to beat back the supporters. Although this effort was successful, the security forces also fired tear gas into areas of the field and stood where there was no riot. The tear gas shooting panicked supporters who wanted to save themselves outside the stadium, but some of the doors to the stands were closed so many of them were trampled and experienced shortness of breath due to crowding [3]. It was recorded that 135 people died, 23 people were seriously injured, 45 people suffered moderate injuries, and 507 people suffered minor injuries [4].

The incident at Kanjuruhan Stadium became one of the worst tragedies in Indonesia and the second deadliest disaster in the world. Similar to the Kanjuruhan Stadium tragedy, the Estadio Nacional tragedy in Lima, Peru became the deadliest incident in soccer history where 328 people died. The incident that occurred at Kanjuruhan Stadium and the Estadio Nacional tragedy in Lima, Peru has similar causes. These causes include chaotic supporters and security forces who fired tear gas and closed exits. It was confirmed by the Independent Fact-Finding Team (Tim Gabungan Independen Pencari Fakta abbreviated TGIPF) that the victims experienced shortness of breath and were trampled due to panic, so they ran after the security forces fired tear gas inside the stadium [5].

In handling mass riots, security forces have the right to take repressive actions that have been stipulated in the Regulation of the Chief of the Indonesian National Police Number 1 Article 15 of 2009 concerning the Use of Force in Police Actions. However, this regulation contradicts FIFA guidelines in Stadium Safety and Security Regulations article 19B which states that tear gas is not allowed to be carried or used in the stadium [6]. The National Commission on Human Rights (Komisi Nasional Hak Asasi Manusia abbreviated Komnas HAM) said that hundreds of fatalities in the Kanjuruhan Stadium tragedy were caused using tear gas [7]. According to the Centers for Disease Control and Prevention (CDC), tear gas can be described as a chemical compound that is used to quell riots with irritating effects on the eyes, mouth, throat, lungs, and skin. Tear gas consists of several chemicals including CS (o-chlorobenzylidene malononitrile) gas, CR (dibenzoxazepine), CN (chloroacetophenone), and pepper spray or OC (oleoresin capsicum) [8]. Typically, eye and respiratory tract irritation occurs after exposure to tear gas for 20-60 seconds and resolves within 10-30 minutes after ceasing exposure. Tear gas can also cause sneezing, coughing, photophobia, breathing difficulties, and death, especially in cases of high exposure [9]. The Chairman of Indonesia Police Watch, Sugeng Teguh Santoso, stated that tear gas used in closed spaces such as stadiums can cause havoc because it can cause panic which results in many people having difficulty breathing, fainting, and trampling each other [10].

Before the match was held, the security forces had recommended changing the match schedule which was originally at 20.00 WIB to be advanced earlier at 15.30 WIB by considering security as an anticipatory step [11]. In line with this statement, Kesit Bayu Handoyo as a soccer observer said that the anticipation of riots in matches can be carried out during the day or afternoon because if it is done at night the situation tends

to be more vulnerable and it is more difficult to find irresponsible parties when a riot occurs. However, PT. Liga Indonesia Baru (PT. LIB) and the organizing committee chose to continue to hold the match according to the original schedule [12]. In addition, the organizing committee ignored recommendations from the security forces that recommended selling 38,000 tickets, but continued to sell 42,000 tickets, which exceeded the stadium's capacity [13]. Furthermore, the door to the Kanjuruhan Stadium stands is very narrow with a size of 270 cm x 300 cm in a closed state and has a downhill stairway with a slope of ± 60 degrees.

Based on this explanation, work accident analysis is needed to avoid, minimize, and eliminate risks that can endanger a person's life. Therefore, research is needed regarding the analysis of the Kanjuruhan Stadium tragedy from an occupational safety and health perspective. The occupational safety and health perspective uses the Human Factors Analysis and Classification System (HFACS) method. The method is used to determine the source of the cause of the Kanjuruhan Stadium tragedy as a work accident. In addition, the method is considered systematic because it not only examines human factors but also examines the mistakes made by the organization [14]. Meanwhile, 90% of accidents are caused by human errors such as carelessness, overconfidence, lack of knowledge and experience, fatigue, discomfort, boredom, anger, and sadness [15]. Researchers hope that by conducting this analysis, lessons can be learned from the tragedy in the form of recommendations for safety procedures to prevent similar tragedies from recurring.

2 Methods

This research applied a qualitative approach with an observational analytic descriptive study research design. The research was conducted from January to July 2023 at Kanjuruhan Stadium which is located at Jalan Trunojoyo, Krajan, Kedungpedaringan, Kepanjen District, Malang Regency, East Java.

Data collection was done through interviews, observations, literature studies, and documentation. The data sources in this study came from primary data and secondary data. Primary data was obtained through interviews, observation, and documentation. Interviews were conducted with the medical team and supporters who were at the location when the Kanjuruhan Stadium tragedy occurred. Meanwhile, interviews with the organizing committee and security forces could not be conducted because they were still in the process of being investigated by the authorities so they could not provide information. Meanwhile, the secondary data used came from literature studies such as articles, journals, news, and other relevant documents. This research has passed the ethical review by the Universitas Airlangga Faculty of Dental Medicine Health Research Ethical Clearance Commission with certificate number 713/HRECC.FODM/VI/2023.

Data analysis in this study used an interactive model through the stages of data reduction, data presentation, and conclusion drawing or verification. Researchers checked the validity of the data using source triangulation and technique triangulation.

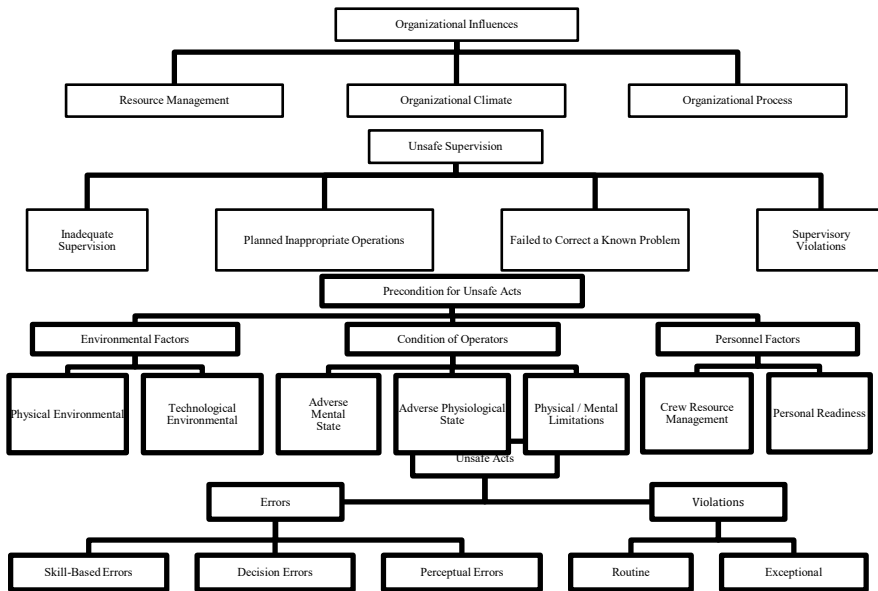


Fig. 1. Human Factors Analysis and Classification System.

This research focuses on exploring the incident process and analyzing the occurrence of the Kanjuruhan Stadium tragedy from an occupational safety and health perspective. The occupational safety and health perspective uses the HFACS method. The method consists of four failure levels in human error which include unsafe acts, preconditions for unsafe acts, unsafe supervision, and organizational influences. This research has limitations at the level of organizational influences and the level of preconditions for unsafe acts in the condition of the operator’s sub-level because researchers cannot approach the leadership and members of the organization because they are in the process of investigation and investigation by the authorities. This research also has limitations at the level of preconditions for unsafe acts at the sub-level of environmental factors in physical environmental factors because to analyze these factors requires analysis during the incident, while this research was conducted after the incident occurred.

3 Results

In this research, several events in the Kanjuruhan Stadium tragedy can be described as unsafe acts in Table 1.

Table 1. Unsafe Acts

Number	Sub Level	Factor	Circumstances
1	Error	Skill-based error	1. The doorman is not careful enough in checking the supporters' luggage.
			2. There were no guards at each door during the match.
		Decision error	1. Security forces are guided by the Regulation of the Chief of Police of the Republic of Indonesia, but not in accordance with FIFA guidelines.
			2. Security forces fired tear gas.
Perceptual error	3. No inspection of supporters' luggage in the VIP/VVIP stands.		
	1. The security forces considered the supporters' descent into the middle of the field as an attempt to riot.		
2	Violation	Routine	1. Supporters were present in an intoxicated state.
			2. Supporters carrying prohibited items such as flares and liquor.
			3. Supporters ignored the ban on entering the pitch area.
		Exceptional	1. Supporters commit provocative and anarchic acts.
2. Security forces kicked and hit supporters.			

Several events in the Kanjuruhan Stadium tragedy can be described as preconditions for unsafe acts in Table 2.

Table 2. Preconditions for Unsafe Acts

Number	Sub Level	Factor	Circumstances
1	Environmental factors	Technological environmental	1. The sliding door is broken.
			2. The grandstand doors are very narrow.
			3. Steep stairway.
			4. No evacuation routes and fire detectors.
			5. Insufficient lighting.
			6. Inadequate communication equipment.
2	Personnel factors	Crew resource management	1. The match commissioner did not attend the meeting with the various match organizers.
			2. The security forces were never involved in the Match Commissioner Meeting.

Number	Sub Level	Factor	Circumstances
			3. PSSI does not socialize FIFA guidelines regarding safety and security at the stadium.
			4. Security officials are late in notifying the maximum number of tickets that can be sold.
			5. The coordination process is less effective.
		Personal readiness	1. The series of security implementation activities is very long.

This study also found some unsafe supervision that are described in several sub levels. The descriptions of each circumstance are shown in Table 3.

Table 3. Unsafe Supervision

Number	Sub Level	Circumstances
1	Inadequate Supervision	1. The organizing committee and security officers performed their duties poorly. 2. PSSI conducts supervision poorly.
2	Planned inappropriate operations	1. During the coordination meeting on September 15, 2022, the security forces said that tear gas would not be used to secure the match.
3	Failed to correct a known problem	1. PT. LIB did not consider recommendations from the security forces regarding changes to the match schedule. 2. Security forces are less assertive regarding recommendations for changes to the match schedule. 3. The organizing committee sold match tickets beyond the stadium capacity. 4. PT. LIB does not pay attention to the number of spectators who exceed capacity.
4	Supervisory violations	1. Kanjuruhan Stadium eligibility requirements documents are not met. 2. The organizing committee is less guided by the Safety and Security Regulations published by PSSI in 2021. 3. The organizing committee and security officers carry out their duties without legality.

4 Discussion

4.1 Unsafe Acts

Unsafe acts are classified into two sub-levels, namely errors and violations. Errors are further categorized into three basic types of errors, including skill-based errors, decision errors, and perceptual errors. Meanwhile, violations are divided into routine violations and exceptional violations [16].

Skill-based errors are errors related to failure of attention and/or memory. Based on the results of the research, it is known that there is a skill-based error which is one of the triggers for the Kanjuruhan Stadium tragedy. At the time of the Kanjuruhan Stadium tragedy, there were doormen who did not pay attention to the supporters' luggage and there were no officers on guard at each post-match door. The negligence of the doorman in checking the luggage of each supporter is evidenced by the findings of TGIPF which states that there are supporters who light flares after the match, where flares are actually prohibited from being brought into the stadium. In addition, the officers on guard at each door were not in place when the match was over [17]. The mistake resulted in supporters being unable to leave because the stadium exit was locked.

Decision errors are deliberate behavior that goes according to expectations but the action proves to be inadequate or less appropriate to the situation at that time. These factors were also found during the Kanjuruhan Stadium tragedy, including security forces following the Regulation of the Chief of Police of the Republic of Indonesia Number 1 Article 15 of 2009 on the Use of Force in Police Actions when securing football matches but contradicting FIFA guidelines, security forces using tear gas when securing matches, and the absence of checks on supporters' luggage in the VIP/VVIP stands. The decision of the security forces to apply the Regulation of the Chief of the Indonesian National Police Number 1 Article 15 of 2009 concerning the Use of Force in Police Actions in securing soccer matches was deemed inappropriate, because the regulation contradicts FIFA guidelines in the Stadium Safety and Security Regulations article 19B which states that tear gas is not allowed to be carried or used in stadiums [18]. From this decision-making error, the next impact was the security forces who fired tear gas [19]. The decision to fire tear gas was considered inappropriate because it caused panic which resulted in many supporters running towards the exit to avoid tear gas, while the condition of the door was inadequate to be accessed by thousands of supporters [20]. In addition, officers made exceptions in checking supporters' luggage in the VIP/VVIP stands. This decision-making error is thought to be a loophole for supporters to smuggle prohibited luggage. This is consistent with TGIPF's findings that supporters often throw liquor bottles from the VIP/VVIP stands to other stands [21].

Perceptual errors can be described as errors that occur when there is a decrease in sensory input resulting in differences in perception. Perceptual errors are also one of the factors causing the Kanjuruhan Stadium tragedy, where security forces considered the supporters' descent into the middle of the field as an attempt to riot [21]. Based on the results of the research, a number of supporters who took to the field had the aim of providing motivation and moral support to Arema FC players due to the defeat of Persebaya Surabaya. However, the security forces responded by committing acts of violence against these supporters [22]. Based on the testimonies of a number of supporters who came down, they received obstacles, pulling of clothes, and blows until they fell by the security forces. This caused anger and led to the descent of thousands of supporters from all corners of the stands onto the field [23].

Routine violations are violations that are commonly committed and often get tolerance in carrying out their actions. This factor is also one of the causes of the Kanjuruhan Stadium tragedy, where there were supporters who attended the match drunk, carrying prohibited items such as flares and liquor, and ignoring the restrictions on entering

the match field area. Supporters committed an offense by attending the match under the influence of alcohol. Even though supporters are prohibited from bringing liquor into the stadium, they consume the liquor before entering the stadium. This is in line with the statement of RW, as a supporter informant in the following interview.

"Maybe it's the fault of the supporters, most of the people are under the influence of alcohol."

Meanwhile, there are supporters who carry prohibited items such as flares and alcohol. The violation is evidenced by the findings of TGIPF which states that there are supporters who managed to carry and light flares in the stadium. The use of flares in soccer matches is prohibited as regulated in FIFA Stadium Safety and Security Regulations article 52 and the PSSI Disciplinary Code 2018 article 70 paragraph 1. Other routine violations found were supporters ignoring the prohibition on entering the match field area [24]. The TGIPF report explained that previously supporters had often taken to the field to meet Arema FC players when fighting football clubs from anywhere as a manifestation of solidarity. This information is in line with RW's statement, as a supporter informant in the following interview.

"Yes, if in other matches when you lose, it's usually like that. Going down, asking, the point is asking not to hit the opposing players, no, just asking the Arema players how come they lost. Moreover, this is a rivalry, you know."

Exceptional violations are violations committed by someone who does not have to show a pattern of behavior or habits. These factors also caused the Kanjuruhan Stadium tragedy, including supporters who committed provocative and anarchic actions, as well as security forces kicking and hitting supporters. There were supporters who attacked the security forces because they did not accept seeing supporters who descended first to the match field area being intercepted and beaten down by the security forces [12]. The chaos got even worse when supporters from the stands threw a number of flares towards the pitch [25]. The report from TGIPF also mentioned that during the match there were stones taken by supporters from outside the Kanjuruhan Stadium and then thrown towards the field. In addition, a number of police vehicles were also damaged and burned by supporters. These vehicles included Brimob trucks, K9 cars, and cars belonging to traffic police [26]. Meanwhile, there were also security forces who kicked and beat supporters [27]. The action was caused because there were security forces who were injured due to attacks from supporters, seeing this incident other security forces responded by taking repressive actions in the form of kicking and beating supporters [21].

4.2 Preconditions for Unsafe Acts

Preconditions for unsafe acts are divided into environmental factors, conditions of operators, and personnel factors. This research discusses environmental factors and personnel factors. Environmental factors in this study discuss the technological environment. Meanwhile, personnel factors discuss crew resource management and personal readiness [16].

Technological environmental can be described as a condition caused by technical factors such as machine problems, personal protective equipment, and other supporting

equipment. Based on the results of the study, it is known that there are technological environmental factors in the sub-level environmental factors that are one of the causes of the Kanjuruhan Stadium tragedy, including damaged sliding doors, very narrow grandstand doors, steep stairways, lack of evacuation routes and fire detectors, inadequate lighting, and inadequate communication equipment. In the TGIPF report, it was mentioned that the access to the exit of the economic stands was in the form of sliding doors that could not be opened due to damage. This is also supported by the statement of the security officer who confirmed the damage and inoperability of the door [28].

The damage to the doors was one of the causes of the Kanjuruhan Stadium tragedy, where several doors were closed when many supporters wanted to leave after the match was over. Based on observations, it is known that the exit doors of the VIP/VVIP stands, medical room, changing room, and press conference room use a folding gate model of five doors. Meanwhile, the door to the economy stand uses a sliding system measuring 270 cm x 300 cm, but the sliding door is damaged. The door has a small 156 cm x 180 cm door with a pole divider in the middle that is used for spectator access [29]. Based on TGIPF's assessment, the door is only sufficient for two people to use at the same time. The narrow condition of the exit door is even more dangerous because to get to the door, the audience must go down a fairly steep stairway with a slope of ± 60 degrees [21]. Meanwhile, based on the observations obtained, it shows that the stairs in the stands have handrail rails as high as 80-114 cm using only ordinary lights without any emergency lights, where the condition of the stairway is not in line with the guidelines of SNI 03-1746-2000 and Regulation of the Minister of Public Works and Public Housing number 26/PRT/M/2008 concerning Technical Requirements for Fire Protection Systems in Buildings and Environments. The observation also shows that Kanjuruhan Stadium does not have evacuation routes and fire detectors. The entrance and exit of Kanjuruhan Stadium are one, there is no special path for evacuation during an emergency. The means of egress at stands 1-14 is in the form of a hallway from the entrance stairs to the stadium exit with a height of more than 2.5 meters. There is no evacuation route sign installed in stands 1-14, but only a sign that reads "exit" is installed above the hallway of all stands 1-14, except stands five and six. In contrast, the VIP/VVIP stands, changing rooms, medical rooms and press conference rooms have evacuation route signs installed. Researchers also found that all spectator stands, changing rooms, medical rooms, and press conference rooms were not equipped with fire detectors. Meanwhile, TGIPF found that the lighting in the stands was inadequate because the lighting at Kanjuruhan Stadium was only supported by large lights on each side of the playing field. The last cause related to the technological environment is in the form of inadequate communication equipment. TGIPF explained that at the Kanjuruhan Stadium tragedy many officers were not equipped with communication tools such as handy talky or the like. In addition, there was also one loudspeaker unit installed in front of the VIP/VVIP stands. The limited loudspeakers coupled with the full capacity of the Kanjuruhan Stadium at the match had an impact on the lack of optimal communication when used to make an announcement or appeal [21].

Crew resource management can be described as a condition where there is poor coordination between workers. The causes of the Kanjuruhan Stadium tragedy when viewed from these factors include match commissioner who were absent from meetings

with various match organizers, security forces never attended the Match Commissioner Meeting, PSSI did not socialize FIFA guidelines, security forces did not provide information about the number of tickets that could be sold early, and the coordination process that took place was not effective. TGIPF stated that the security forces had carried out coordination meetings internally and externally. Internal coordination meetings were conducted by the security forces on several occasions, while the meeting with external parties was attended by the chairman of the organizing committee, the regional coordinator of Aremania, and the security officer on September 30, 2022. The meeting was held in order to provide a space for discussion with the various match organizers, but the match commissioner did not attend the meeting. Based on FIFA's definition, a match commissioner is one of the match officials appointed and trusted to oversee the proper organization of matches and to ensure that FIFA regulations are adhered to. In this regard, the presence of match commissioners from planning to implementation during the match is needed so that a match can be held safely. In addition, security officials revealed that they had not previously known and participated in the Match Commissioner Meeting, so match commissioners lacked understanding related to the security plan. So far, coordination related to match security is an initiative of the security forces. Meanwhile, PSSI does not socialize FIFA guidelines regarding safety and security at the stadium to match organizers [30]. This had an impact on the organizing committee's ability to explain the match implementation guidelines in accordance with PSSI regulations and FIFA Stadium Safety and Security Regulations. These guidelines were at odds with the security plan for Arema FC's match against Persebaya Surabaya, which followed the Regulation of the Chief of Police of the Republic of Indonesia Number 1 Article 15 of 2009 on the Use of Force in Police Actions. The next cause of the Kanjuruhan Stadium tragedy was the security forces who did not immediately notify the number of tickets that could be sold. The organizing committee sold match tickets until the Kanjuruhan Stadium was filled to the maximum. All tickets had been sold on September 26, 2022, but the security forces on September 29, 2022 had just given a letter to the organizing committee with number B/2266/IX/Pam.3.3/2022 regarding restrictions on printing match tickets so that only 38,000 tickets were sold. In addition, the coordination process related to match implementation and security was less effective. At the match planning stage, PT. LIB held a workshop on match implementation for the organizing committee online in a short time. The TGIPF assessed that the workshop was organized as a formality, and as a result, there was a possibility that the workshop participants may not have a good understanding of their responsibilities, which could lead to poor implementation in the field. Furthermore, the TGIPF report stated that there were two meetings that took place simultaneously, namely a security coordination meeting by security forces and a Match Coordination Meeting by match commissioners, just one day before the Arema FC match against Persebaya Surabaya. As a result, there were no competent officers present at both meetings so that match security procedures did not take place properly. Not only that, the security readiness ceremony was held at the same time as the arrival of spectators two hours before the match. The implementation caused the rally to run less effectively and security standards were neglected [21].

Meanwhile, personal readiness is a situation or condition when an individual fails to prepare themselves physically or mentally for work. This factor is also one of the causes of the Kanjuruhan Stadium tragedy, where the series of security implementation activities are very long. The procedure for securing a soccer match requires a long time, starting at 08.00 WIB until 22.00 WIB, with a lack of consumption and incentive support. These conditions have an impact on fatigue for security forces, triggering emotional feelings to act in a less measured and structured manner [21].

4.3 Unsafe Supervision

Unsafe supervision is classified into sub-levels which include inadequate supervision, planned inappropriate operations, failed to correct a known problem, and supervisory violations [16]. Inadequate supervision is a form of failure in supervising and managing human resources. The results of the study reveal that inadequate supervision is one aspect of the cause of the Kanjuruhan Stadium tragedy, including the duty of the organizing committee and security officers who are less competent, and PSSI supervises poorly. Based on the data obtained, the executive committee received the spotlight for doing its job poorly. It is known that when organizing the Arema FC match against Persebaya Surabaya, the executive committee did not understand the responsibilities in holding a match, did not understand the technical provisions related to the stadium, especially regarding safety, did not consider the use of doors to evacuate in emergency conditions, there was no safety briefing in dealing with emergencies, and did not prepare adequate personnel and equipment [31]. Meanwhile, security officers do not understand their duties and responsibilities related to safety in organizing matches [32]. The Chief of the Indonesian National Police, Listyo Sigit Prabowo, revealed that security officers did not prepare risk assessment documents and instructed stewards to leave the gate at the time of the Kanjuruhan Stadium tragedy [33]. Furthermore, PSSI conducts supervision poorly. The results showed that PSSI was not optimal in conducting security-related verification of the Kanjuruhan Stadium, where the last verification was carried out on February 6, 2020 [34]. It is known that the verification is still not in accordance with the Stadium Regulations issued by PSSI in 2021. In addition, the TGIPF report explained that PSSI was also not good at supervising the performance of match supervisors and only received written reports.

Planned inappropriate operations are a form of failure in implementation that is not in accordance with the plan. There was a cause of planned inappropriate operations in the Kanjuruhan Stadium tragedy, where during the coordination meeting process on September 15, 2022 it was reported that tear gas was not used by the security forces to secure the Arema FC match against Persebaya Surabaya [21]. However, on the day of the match, the security forces failed to carry out the original plan and were proven to have used tear gas in the security process.

Failed to correct a known problem can be described as a form of failure to correct a problem that refers to instances when there are deficiencies among individuals, equipment, training or other safety-related areas that are known by supervisors but are allowed to continue. The results of this study also show that there are causes in the form of failed to correct a known problem that contributed to the Kanjuruhan Stadium

tragedy, including PT. LIB not taking into account recommendations from security forces to change the match schedule, security forces not being strict about recommendations for changing the match schedule, the organizing committee selling match tickets with more than the stadium capacity, and PT. LIB not paying attention to the number of spectators who exceed capacity. Based on the findings of the TGIPF, the organizing committee had submitted a permit to the security forces to hold the Arema FC match against Persebaya Surabaya on October 1, 2022. Then on September 13, 2022, the security forces gave a letter to the organizing committee to change the match schedule which was originally at 20.00 WIB to be advanced earlier to 15.30 WIB by considering security as an anticipatory measure. Responding to the letter, the organizing committee sent a letter number 020/SEKR-ARM/IX/2022 dated September 12, 2022 regarding the request to change the match schedule. Because PT. LIB has the right to regulate the match schedule and the club must comply with the decision, PT. LIB sent a letter number 497/LIB-KOM/IX/2022 dated 19 September 2022 to Arema FC management to coordinate with the security forces so that the match is still held according to the initial schedule that has been determined because there is a contract with the host broadcaster. Based on the letter, the organizing committee then contacted the security forces regarding the rejection of the recommendation to change the match schedule. Then the security forces gave permission by releasing a recommendation letter number B-2448/IX/Yan.2.1./2022 dated September 28, 2022. Regarding soccer matches that are held at night, Kesit Bayu Handoyo as a soccer observer said that the anticipation of riots in matches can be carried out during the day or afternoon because when it is done at night the situation tends to be more vulnerable and it is more difficult to find irresponsible parties when a riot occurs [12]. Based on this, the security forces should still try to maintain the recommendation to hold the match at 15.30 WIB by considering security as an anticipatory measure. In relation to the number of spectators present exceeding the stadium capacity, the organizing committee considered that the Arema FC match against Persebaya Surabaya was included in the big match and made supporters enthusiastic to watch the match. In response, the organizing committee decided to sell tickets until the Kanjuruhan Stadium was maximally filled. According to the calculation of the Malang Regency Regional Revenue Agency, 42.906 tickets for Arema FC against Persebaya Surabaya on October 1, 2022 have been sold. Based on information from Komnas HAM in press statement number 039/HM.00/XI/2022, the Kanjuruhan Stadium owned by the Department of Youth and Sports has a capacity of 38.054 people, while Arema FC management, the organizing committee, and security officers stated that the Kanjuruhan Stadium can accommodate as many as 45.000 people [35]. Meanwhile, PT. LIB also paid little attention to the number of spectators who exceeded the capacity of Kanjuruhan Stadium [21].

Supervisory violations are violations committed by supervisors when applicable regulations are deliberately ignored. Supervisory violations are also one of the causes of the Kanjuruhan Stadium tragedy, where the Kanjuruhan Stadium eligibility requirements were not met, the organizing committee was not guided by the Safety and Security Regulations issued by PSSI in 2021, as well as the organizing committee and security officers who carried out their duties without legality. Based on Komnas HAM's statement in press statement number 039/HM.00/XI/2022, Kanjuruhan Stadium does

not have a stadium certificate document, evacuation plan, ground rules, and field availability letter [35]. In addition, the organizing committee was not guided by the Safety and Security Regulations issued by PSSI in 2021, especially regarding article 21 regarding doors and gates and article 22 regarding the placement of safety and security personnel [21]. Several violations were allegedly caused by the organizing committee and security officers carrying out their duties without legality. It was found that the organizing committee, including the security officer, carried out their duties illegally because their appointment was not based on an official letter of employment agreement with legal force. Meanwhile, the appointment of security officers was only made based on verbal agreements without a written decision letter. Security officers also lack competency tests, security training, and extensive knowledge of stadium facilities and infrastructure [36]. This resulted in the performance of the executive committee and security officers in organizing the match being less than optimal.

5 Conclusion

Based on the results of research using the HFACS method, it can be concluded that the Kanjuruhan Stadium tragedy was caused by failures at the level of unsafe acts, pre-conditions for unsafe acts, and unsafe supervision. Improvement efforts need to be made as part of the problem-solving process. A thorough evaluation of the soccer stadium is needed by FIFA standards. Furthermore, it is necessary to conduct a safety briefing before the match starts.

Author's Contribution

MRS: Concept this research, collect data, and analysis. MM and EF: Concept this research, guide analysis and interpretation, and review article. SS: Monitoring and providing recommendations on the research implementation and article draft. All authors write the manuscript.

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References

1. The Guardian, "125 dead after crowd crush at Indonesian football match | Indonesia | The Guardian," Oct. 02, 2022. <https://www.theguardian.com/world/2022/oct/02/indonesia-football-fans-killed-east-java-arema-malang> (accessed Nov. 10, 2022).
2. A. Nadhillah and S. Lubis, "Peran Komnas Ham Dalam Tragedi Stadion Kanjuruhan Di Kabupaten Malang," *Al Daulah: Jurnal Hukum Pidana dan Ketatanegaraan*, vol. 12, no. 1, pp. 90–109, 2023, doi: 10.24252/ad.vi.37406.

3. D. A. Ramadhan, S. Sakinah, N. Hamid, and A. A. Kusumadinata, "Analisis Framing Pemberitaan Media Narasi Tentang Tragedi Kanjuruhan Malang," 2023.
4. Liputan6.com, "Update Korban Meninggal Tragedi Kanjuruhan: Bertambah Jadi 135 Orang - News Liputan6.com," Oct. 24, 2022. <https://www.liputan6.com/news/read/5105573/update-korban-meninggal-tragedi-kanjuruhan-bertambah-jadi-135-orang> (accessed Nov. 10, 2022).
5. Kompas TV, "Cerita TGIPF soal Kengerian di Pintu 13: Itu Bukan Barisan Manusia Berdesakan, tapi Tumpukan Manusia," Oct. 14, 2022. <https://www.kompas.tv/article/338245/cerita-tgipf-soal-kengerian-di-pintu-13-itu-bukan-barisan-manusia-berdesakan-tapi-tumpukan-manusia/?page=all> (accessed Nov. 10, 2022).
6. K. W. Utama, Y. D. Sukmadewi, R. Saraswati, and A. Putrijanti, "Tragedi Kanjuruhan Dan Penyalahgunaan Wewenang Dalam Pelaksanaan Prosedur Administrasi Negara," *Masalah-Masalah Hukum*, vol. 51, no. 4, pp. 414–421, 2022.
7. CNN Indonesia, "Komnas HAM Tegaskan Korban Jiwa Kanjuruhan Akibat Gas Air Mata," Nov. 02, 2022. <https://www.cnnindonesia.com/nasional/20221102175248-12-868703/komnas-ham-tegaskan-korban-jiwa-kanjuruhan-akibat-gas-air-mata/> (accessed Nov. 10, 2022).
8. C. Rothenberg, S. Achanta, E. R. Svendsen, and S. E. Jordt, "Tear gas: an epidemiological and mechanistic reassessment," *Ann N Y Acad Sci*, vol. 1378, no. 1, pp. 96–107, Aug. 2016, doi: 10.1111/nyas.13141.
9. L. J. Schep, R. J. Slaughter, and D. I. McBride, "Riot control agents: The tear gases CN, CS and OC—a medical review," *Journal of the Royal Army Medical Corps*, vol. 161, no. 2. BMJ Publishing Group, pp. 94–99, Jun. 01, 2015. doi: 10.1136/jramc-2013-000165.
10. Kompas.com, "FIFA Larang Penggunaan Gas Air Mata di Stadion, tapi Mengapa Polisi Menembakkannya di Kanjuruhan? Halaman all/ - Kompas.com," Oct. 03, 2022. <https://surabaya.kompas.com/read/2022/10/03/074409278/fifa-larang-penggunaan-gas-air-mata-di-stadion-tapi-mengapa-polisi?page=all/> (accessed Nov. 10, 2022).
11. Y. Alwatan, "Komunikasi Krisis Polri: Strategi Image Repair Polri Dalam Tragedi Kanjuruhan Polri Crisis Communication: Polri Image Repair Strategy in Kanjuruhan Tragedy," *Translitera: Jurnal Kajian Komunikasi dan Studi Media*, vol. 12, no. 1, pp. 2088–2432, 2023, doi: 10.35457/translitera.v12i1.2694.
12. BBC News Indonesia, "Tiga hal penting dalam penyelidikan, 'Sudah bubar karena anjing pelacak, kenapa lempar gas air mata ke tribun?' - BBC News Indonesia," Oct. 02, 2022. <https://www.bbc.com/indonesia/articles/ckd1d521j77o> (accessed Nov. 10, 2022).
13. Kompas.com, "Soal Penjualan Tiket Melebihi Kapasitas Stadion, Ini Jawaban Ketua Pannel Arema FC," Oct. 07, 2022. <https://surabaya.kompas.com/read/2022/10/07/171943278/soal-penjualan-tiket-melebihi-kapasitas-stadion-ini-jawaban-ketua-panpel/> (accessed Nov. 10, 2022).
14. T. M. Alexander, "A Case Based Human Reliability Assessment Using HFACS For Complex Space Operations," *Journal of Space Safety Engineering*, vol. 6, no. 1. Elsevier Ltd, pp. 53–59, Mar. 01, 2019. doi: 10.1016/j.jsse.2019.01.001.
15. I. A. bin Jake, "Analisis Probabilitas Human Error Berbasis SOP Pelayanan Operasional Pelabuhan Dengan Metode SHERPA dan HEART," Doctoral dissertation, Universitas Hasanuddin, 2020.
16. D. A. Wiegmann and S. A. Shappell, *A Human Error Approach to Aviation Accident Analysis: The Human Factors Analysis and Classification System*. 2003.
17. Kompas TV, "Kapolri Ungkap Pintu Stadion Kanjuruhan Tidak Dijaga Petugas," Oct. 06, 2022. <https://www.kompas.tv/video/335666/kapolri-ungkap-pintu-stadion-kanjuruhan-tidak-dijaga-petugas> (accessed Jul. 02, 2023).

18. CNN Indonesia, "Bunyi Larangan FIFA soal Penggunaan Gas Air Mata di Stadion," Oct. 02, 2022. <https://www.cnnindonesia.com/olahraga/20221002141347-142-855333/bunyi-larangan-fifa-soal-penggunaan-gas-air-mata-di-stadion> (accessed Jul. 02, 2023).
19. Al Jazeera, "Police tear gas main cause of Indonesia football tragedy: Report," Nov. 02, 2022. <https://www.aljazeera.com/news/2022/11/2/police-tear-gas-main-cause-of-indonesia-football-tragedy-report> (accessed Jul. 02, 2023).
20. D. E. Pratama and R. Apriani, "Analisis Perlindungan Hukum Konsumen Bagi Penonton Dalam Tragedi di Stadion Kanjuruhan," *Supremasi Hukum*, vol. 19, no. 1, 2023, [Online]. Available: <https://www.google.com/>
21. Kemenko Polhukam RI, "Laporan Tim Gabungan Independen Pencari Fakta Tragedi Stadion Kanjuruhan Malang," 2022. Accessed: Jan. 01, 2023. [Online]. Available: <https://polkam.go.id/laporan-tgipf-tragedi-kanjuruhan/>
22. Narasi TV, "Peristiwa Kanjuruhan: Koalisi Masyarakat Sipil Dapati 12 Temuan Awal," Oct. 10, 2022. <https://narasi.tv/read/narasi-daily/peristiwa-kanjuruhan-koalisi-masyarakat-sipil-dapati-12-temuan-awal> (accessed Jul. 10, 2023).
23. BBC News Indonesia, "Tragedi Stadion Kanjuruhan: Menit-menit mematikan, 'jeritan, tergeletak pingsan, tak bernyawa' di tengah 'lautan asap gas air mata', cerita para saksi dari sejumlah tribun," Oct. 03, 2022. <https://www.bbc.com/indonesia/indonesia-63118080> (accessed Nov. 10, 2022).
24. Deutsche Welle, "Indonesia: 125 killed after 'riots' at football match," Oct. 02, 2022. <https://www.dw.com/en/indonesia-125-killed-after-riots-at-football-match/a-63310088> (accessed Jul. 02, 2023).
25. JawaPos.com, "TGIPF Kanjuruhan: Suporter Provokatif, Pukul Petugas dan Pemain Arema," Oct. 15, 2022. <https://www.jawapos.com/sepak-bola-indonesia/01413577/tgipf-kanjuruhan-suporter-provokatif-pukul-petugas-dan-pemain-arema> (accessed Jul. 09, 2023).
26. antvklik.com, "Pray for Kanjuruhan, 127 Orang Tewas, 8 Mobil Polisi Rusak Parah," Oct. 02, 2022. <https://www.antvklik.com/olahraga/565018-pray-for-kanjuruhan-127-orang-tewas-8-mobil-polisi-rusak-parah> (accessed Jun. 14, 2023).
27. The New York Times, "Riots at Indonesian Soccer Match Leave Several Fans Dead," Oct. 01, 2022. <https://www.nytimes.com/2022/10/01/world/asia/indonesia-soccer-football-dead-arema-persebaya-surabaya.html> (accessed Jun. 08, 2023).
28. JawaPos.com, "Banyak Pintu Rusak, Security Officer Kanjuruhan Tak Mau Jadi Tersangka," Oct. 17, 2022. <https://www.jawapos.com/berita-sekitar-anda/01413810/banyak-pintu-rusak-security-officer-kanjuruhan-tak-mau-jadi-tersangka> (accessed Jun. 28, 2023).
29. Narasi TV, "Fakta-Fakta tentang CCTV di Stadion Kanjuruhan dalam Laporan TGIPF | Narasi TV," Oct. 17, 2022. <https://narasi.tv/read/narasi-daily/fakta-fakta-tentang-cctv-di-stadion-kanjuruhan-dalam-laporan-tgipf/> (accessed Nov. 10, 2022).
30. tvOneNews, "TGIPF Beberkan 8 Dosa PSSI dalam Tragedi Kanjuruhan: Lari dari Tanggung Jawab sampai Konflik Kepentingan," 2022. <https://www.tvonenews.com/bola/liga-indonesia/74595-tgipf-beberkan-8-dosa-pssi-dalam-tragedi-kanjuruhan-lari-dari-tanggung-jawab-sampai-konflik-kepentingan> (accessed Jul. 01, 2023).
31. Liputan6.com, "TGIPF Ungkap 6 Kelalaian Panpel dalam Tragedi Kanjuruhan," Oct. 14, 2022. <https://www.liputan6.com/bola/read/5097411/tgipf-ungkap-6-kelalaian-panpel-dalam-tragedi-kanjuruhan> (accessed Jul. 08, 2023).
32. Metro TV, "Sidang Tragedi Kanjuruhan, Security Officer Dinilai Menyepelkan Keselamatan Penonton," Jan. 16, 2023. <https://www.metrotvnews.com/play/NP6CZ7mA-sidang-tragedi-kanjuruhan-security-officer-dinilai-menyepelkan-keselamatan-penonton> (accessed Jul. 09, 2023).

33. tvOneNews, “Ngeri, Begini Peran 6 Tersangka Tragedi Kanjuruhan: 2 Orang Polisi Perintahkan Tembak Gas Air Mata, Security Officer Malah Suruh Tinggalkan Pintu Gerbang,” Oct. 06, 2022. <https://www.tvonenews.com/berita/nasional/72764-ngeri-begini-peran-6-ter-sangka-tragedi-kanjuruhan-2-orang-polisi-perintahkan-tembak-gas-air-mata-security-of-ficer-malah-suruh-tinggalkan-pintu-gerbang?page=3> (accessed Jul. 09, 2023).
34. Metro TV, “PT LIB Terakhir Verifikasi Stadion Kanjuruhan pada 2020,” Oct. 06, 2022. <https://www.metrotvnews.com/play/N0BCrjMD-pt-lib-terakhir-verifikasi-stadion-kanjuruhan-pada-2020> (accessed Jul. 09, 2023).
35. Liputan6.com, “Laporan Lengkap Komnas HAM Terkait Tragedi Kanjuruhan,” Nov. 02, 2022. <https://www.liputan6.com/news/read/5114832/laporan-lengkap-komnas-ham-terkait-tragedi-kanjuruhan> (accessed Jul. 09, 2023).
36. CNN Indonesia, “Pleidoi Security Officer Terdakwa Kanjuruhan: Saya Orang Kecil,” Feb. 10, 2023. <https://www.cnnindonesia.com/nasional/20230210204610-12-911704/pleidoi-security-officer-terdakwa-kanjuruhan-saya-orang-kecil> (accessed Jul. 09, 2023).

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