



Analysis of strategy and implementation of head injury prevention programs: A case study of boxers at HAN Academy Malang

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ABSTRACT

Background: Boxing is a high-risk combat sport with a high probability of head injuries, so effective prevention strategies are essential for athlete safety. However, empirical evidence on the implementation of head injury prevention programs at the training academy level is still limited.

Objectives: This study aims to explore strategies and the practical implementation of head injury prevention at the HAN Boxing Academy, Malang.

Methods: A qualitative case study design was used with purposive sampling. Four participants (one coach and three active athletes) were recruited. Data were collected through document review, direct observation, and semi-structured interviews, which consisted of 15 guiding questions. Data were analyzed using a thematic analysis approach, which involved data reduction, data presentation, and conclusion. Methodological triangulation was applied to enhance credibility.

Results: Three main themes emerged: (1) systematic emphasis on basic defensive techniques to minimize head collisions, (2) mandatory and consistent use of head protection during training sessions, and (3) active supervision by coaches combined with a gradual rehabilitation protocol, including competition restrictions for up to six months after a serious head injury. Participants considered head protection effective in reducing the severity of impacts, although the residual risk of head injury was still acknowledged.

Conclusions: Head injury prevention in academies is implemented through an integrated approach that combines technical skill development, the use of protective equipment, and continuous monitoring. To strengthen its effectiveness, it is recommended that structured injury prevention protocols be implemented and closer collaboration with medical professionals be fostered.

Keywords: athlete safety, boxing, head injury prevention, protective equipment.

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INTRODUCTION

Boxing is a full-contact sport with a high risk of head injury due to repeated exposure to impact and cranial acceleration during training and competition. International evidence shows that boxers, both amateur and professional, have a significant incidence of concussions, facial trauma, and head contusions, with reported head injury rates ranging from 17–25 cases per 100 matches (Loosemore et al., 2015). Repeated head impacts are also associated with long-term cognitive impairment, decreased executive function, and an increased risk of chronic traumatic encephalopathy (CTE) in combat sports athletes (McKee et al., 2016; Bernick et al., 2013). This underscores that preventing head injuries is not merely a performance issue, but a matter of athlete safety and long-term health.

Several international studies have identified key components in preventing head injuries in boxing and martial arts. The use of headguards has been reported to be effective in reducing superficial injuries and lowering direct impact force, although it does not eliminate the risk of concussion (Flynn, 2024; Hanson et al., 2014). Additionally, mastery of basic defensive techniques, such as slipping, blocking, and head movement, has been shown to contribute to reducing the frequency and intensity of blows to the head during training sessions (Del Vecchio et al., 2018; Beattie & Ruddock, 2025; Ruddock et al., 2016). From a post-injury perspective, the latest international guidelines emphasize the importance of a gradual rehabilitation protocol, symptom monitoring, and return-to-play decisions based on medical evaluation to minimize the risk of re-injury (Patricios et al., 2023; Schneider et al., 2017).

Conceptually, the prevention of head injuries in boxing can be understood through a multidimensional approach. Haddon's Matrix maps risk (Figure 1) and protective factors into the dimensions of people, equipment, environment, and policy, making it relevant for analyzing the roles of athletes, coaches, protective equipment, and training systems (Haddon, 1973). The Ecological Model of Sports Injury emphasizes the dynamic interaction between athletes' intrinsic factors and extrinsic environmental factors in the occurrence of injuries (Meeuwisse et al., 2007). Meanwhile, Social Cognitive Theory explains how athletes' safe behaviors are shaped through observation, coaching, and social reinforcement during daily training (Bandura, 1986; Fletcher, 2025). The integration of these three frameworks allows for a more comprehensive analysis of head injury prevention practices in boxing training environments.

Although international literature on concussion mechanisms, the effectiveness of protective equipment, and rehabilitation protocols continues to evolve, a clear research gap remains at the implementation level. Most previous studies have focused on elite athletes, professional competitions, or controlled experimental designs, thus not exploring how head injury prevention strategies are operationalized in small-scale boxing clubs or academies (Ruddock et al., 2016; Flynn, 2024). In particular, there is still limited empirical evidence documenting the defensive practices taught by coaches, the consistency of headguard use in routine training, the implementation of post-injury rehabilitation protocols, and the perceptions of athletes and coaches regarding the effectiveness of these strategies, especially in the context of Southeast Asia. To date, no research has specifically examined the implementation of head injury prevention at the HAN Boxing Academy Malang, an

academy with local characteristics, limited resources, and a distinctive training approach.

Based on these gaps, this study aims to explore in depth the strategies and implementation of head injury prevention in boxers at the HAN Boxing Academy in Malang. The research focuses on defensive technique teaching practices, the use of head protection equipment, the role of coach supervision, and the application of post-injury rehabilitation in the local context. The findings of this study are expected not only to contribute contextually to improving athlete safety at the academy level but also to enrich the international literature on the practical implementation of head injury prevention programs in boxing and other combat sports.

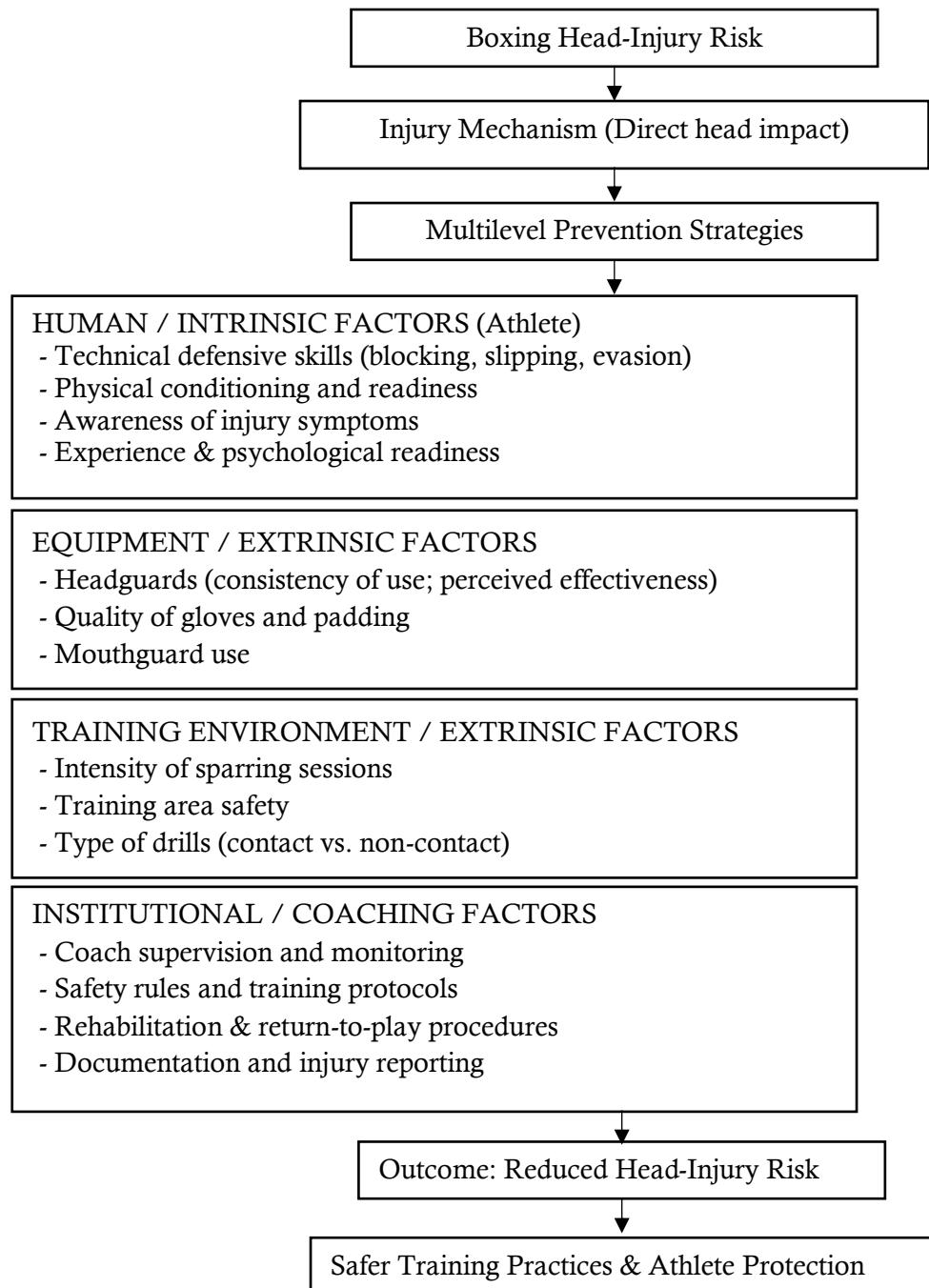


Figure 1. Conceptual Framework of Head-Injury Prevention in Boxing

METHODS

Study Design and Participants

This study uses a descriptive qualitative design with a case study approach to explore strategies and implementation of head injury prevention at the HAN Boxing Academy in Malang. A qualitative approach was chosen because it allows for in-depth exploration of experiences, perceptions, and contextual factors that influence injury prevention practices in boxing training environments (Creswell & Poth, 2018). The case study design was used to provide a comprehensive and contextual understanding of injury prevention practices in a limited case unit.

Research participants were recruited using total population sampling, which involved all individuals at the HAN Boxing Academy in Malang who were directly involved in the design, implementation, or supervision of head injury prevention practices at the time of the study. This approach was chosen to ensure that all key perspectives within the case unit were represented.

This study consisted of four participants, including one head coach and three active boxers. The relatively small sample size was considered methodologically adequate for a qualitative case study that focused on data depth rather than statistical generalization. The involvement of coaches and athletes enabled a more comprehensive exploration of strategies, implementation, and perceptions regarding the effectiveness of head injury prevention. In addition, this number of participants meets the principle of information power, where specific research objectives, a relatively homogeneous group of participants, and a narrow research context allow for the use of a limited sample (Malterud et al., 2016). The age range of the participants was 18 to 35 years.

Ethical approval statement

This study has obtained ethical approval from Universitas Negeri Malang with approval number 30.10.07/UN32.14.2.8/LT/2025. Prior to data collection, all participants received written and verbal explanations regarding the study's purpose, procedures, potential risks, and guarantees of data confidentiality. All participants provided written consent (informed consent) before participating. The anonymity and confidentiality of participants were maintained throughout the research process.

Data Collection

Data collection was conducted in January 2025 at the HAN Boxing Academy in Malang using three primary techniques: semi-structured interviews, non-participant observation, and document analysis.

Semi-structured interviews were conducted either face-to-face at the academy or via Zoom, depending on whether face-to-face meetings were possible. Each interview lasted approximately 25 to 40 minutes. The interview guide consisted of 15 open-ended questions covering topics such as defensive training strategies, the use of headgear, the supervisory role of coaches, perceptions of head injury risk, and rehabilitation and return-to-training practices. A semi-structured format was chosen to allow flexibility in exploring participants' answers while maintaining consistency between interviews. A complete list of interview questions is available in the supplementary materials or upon request.

Non-participant observations were conducted during routine training sessions to record training structure, intensity, equipment use, and interactions between coaches

and athletes related to head injury prevention. Additionally, a documentation study was conducted on relevant documents, such as training records, safety guidelines, and available injury data, to reinforce and contextualize the findings from the interviews and observations.

All interviews were recorded using voice recorders with the participants' consent and transcribed verbatim prior to analysis.

Research Instruments

Data were gathered using an audio recorder, observation sheets, and an interview protocol. Observation notes captured contextual details of the training sessions, while a review of the documentation provided additional information regarding injury-prevention procedures and academy policies.

The validity of the research is ensured through the application of four criteria of trustworthiness, namely credibility, transferability, dependability, and confirmability. Credibility is enhanced through data triangulation, which involves comparing and verifying findings from multiple sources, including interviews, observations, and documentation, to ensure the consistency of information. Additionally, peer debriefing is conducted to minimize interpretive bias. Transferability is supported by presenting detailed contextual descriptions of the research location, participant characteristics, and training environment, enabling readers to assess the applicability of the findings to other contexts. Dependability is maintained through the systematic recording of all research procedures, allowing the research process to be traced transparently. Confirmability is ensured through the researcher's reflection and the maintenance of an audit trail, which ensures that the findings are sourced from empirical data rather than the researcher's assumptions.

Data Analysis

Data analysis was conducted using inductive thematic analysis, following the six-stage analysis proposed by [Braun & Clarke \(2006, 2021\)](#). The first stage involved repeatedly reading the interview transcripts to build a comprehensive understanding of the data. The second stage involved manual open coding to identify units of meaning relevant to head injury prevention strategies and practices. The third stage involved grouping codes with conceptual relevance into initial categories. The fourth stage involved reviewing and refining these categories to form coherent main themes. The fifth stage involved defining and naming themes that represented the essence of the participants' experiences. In the sixth stage, the analysis results were presented in the form of analytical narratives supported by representative quotations and linked to theoretical frameworks and previous research findings.

The principal investigator carried out the coding and theme development process. To enhance the accuracy of the analysis, peer debriefing was conducted with qualitative research experts to review coding decisions and the thematic structure. During the analysis process, the researcher also maintained an audit trail documenting each step of the analysis and methodological decisions.

RESULTS

This study involved four participants, comprising one coach (P1) and three active boxers (P2–P4) from the HAN Boxing Academy in Malang. All participants had at least one year of training experience and were directly involved in routine training activities, including sparring sessions and the implementation of head injury

prevention practices. The coach played a role in planning and supervising training, while the athletes were involved as recipients and direct implementers of injury prevention strategies. **Table 1** presents a summary of the main themes, sub-themes, the number of participants who mentioned each sub-theme, and illustrative quotes representing the findings.

Table 1. Main Themes, Subthemes, Number of Participants, and Exemplary Quotes

Theme	Subtheme	n (of 4)	Exemplary quote (ID)
Prevention Strategies	Basic defensive technique training	4/4	"Learn basic boxing so athletes can dodge and block punches." (P1)
	Consistent headguard use	4/4	"Head guards are quite effective, protecting the head by around 70–75%." (P4)
	Regulation awareness (no strikes to the back of the head)	4/4	"Do not hit the back of the head." (P1)
Coach's Role in Injury Prevention	Continuous supervision and reminders	4/4	"The coach always reminds us to actively protect our heads." (P2)
	Training program management	3/4	"Training programs must be tailored to the needs of athletes to minimize injuries." (P3)
Protective Equipment Perception	Effectiveness of headguard	4/4	"If you wear a headguard, the risk of lip lacerations and bruising is lower." (P2)
	Limitations of equipment	4/4	"Even with a headguard, sometimes the skin still gets torn." (P4)
Injury Handling & Rehabilitation	Immediate response (ice, rest, supervision)	4/4	"If you are injured, rest first or apply an ice pack." (P2)
	Six-month competition restriction	2/4	"No competitions for 6 months after a head injury." (P1)
Athlete Knowledge & Risk Factors	Understanding risk factors	4/4	"Lack of focus and declining physical condition increase the risk." (P4)
	Influence of physical and mental readiness	4/4	"Minimum physical fitness of 80% to prevent injury." (P1)

Thematic Findings

Theme 1: Head Injury Prevention Strategies

All participants mentioned that basic defensive technique training was the primary strategy for preventing head injuries. Techniques such as blocking, slipping, and maintaining hand position (guard) were considered fundamental skills that were continuously emphasized in training. Additionally, all participants reported consistent use of headguards, particularly during high-intensity sparring sessions. Compliance with competition regulations, particularly the prohibition of blows to the back of the head, was also mentioned as part of prevention efforts.

"Learn basic boxing so athletes can dodge and block punches." (P1)

Theme 2: The Role of Coaches in Injury Prevention

All athletes emphasized the active role of coaches in supervising training sessions and reminding athletes to protect their heads during training. Coaches routinely corrected athletes' defensive positions and adjusted training intensity. Most athletes

(three out of four) also mentioned that managing training programs tailored to their individual conditions helped minimize the risk of injury.

"Coaches always remind us to protect our heads actively." (P2)

Theme 3: Perceptions of Head Protection Equipment

All participants stated that headguards were perceived to be effective in reducing minor injuries, such as bruises or cuts to the face. However, all participants also acknowledged the limitations of protective equipment, whereby minor injuries could still occur even when headguards were worn.

"Headguards are about 70–75% effective in protecting the head." (P4)

Theme 4: Injury Management and Rehabilitation

In cases of head injury, all participants described a relatively uniform initial treatment regimen, consisting of rest, reduced training intensity, and the application of ice packs. For more serious injuries, some participants mentioned referral to medical personnel. Two participants specifically stated that there was a restriction on participating in matches for six months after a severe head injury.

"No participation in competitions for six months after a head injury." (P1)

Theme 5: Athletes' Knowledge and Injury Risk Factors

All participants demonstrated an understanding of various risk factors for head injuries, including lack of focus, poor physical condition, and suboptimal mental preparedness. Athletes and coaches agreed that physical and mental preparedness are essential prerequisites for minimizing the risk of injury during training and competition.

"Lack of focus increases the risk of injury." (P4)

DISCUSSION

This study aims to explore the strategies and implementation of head injury prevention at HAN Boxing Academy in Malang. In general, the findings indicate that head injury prevention efforts at this academy are implemented through a multi-level approach that encompasses mastery of defensive techniques, the use of head protection equipment, continuous supervision by coaches, injury treatment and rehabilitation practices, and athlete awareness of risk factors. The combination of technical, organizational, and individual elements is the primary mechanism employed by the academy to minimize exposure to head impacts during training.

One of the main findings of this study is the central role of mastering defensive techniques as the foundation for preventing head injuries. This finding is consistent with international research showing that technical skills—particularly evasion, blocking, and distance control—are important determinants in reducing head impact exposure in boxing (Loosemore et al., 2017; Tjønndal et al., 2022). Previous studies have also reported that athletes with low defensive abilities tend to experience more concussive and sub-concussive blows in the long term (Bernick et al., 2015). The consistency between the findings of this study and the international literature can be attributed to the nature of defensive techniques as skills that can be modified and trained systematically, particularly in the context of amateur athletes with varying levels of experience.

In addition to defensive techniques, participants perceived the use of headguards as an important component in preventing head injuries. This perception is consistent

with global evidence indicating that headguards can reduce superficial injuries, such as lacerations, abrasions, and facial bruises, by 60–80% (Dickinson & Rempel, 2016). However, as also reflected in the findings of this study, several studies confirm that headguards have limitations in protecting athletes from internal acceleration forces that contribute to concussions (Al Attar et al., 2024). This duality of function—providing external protection but not completely preventing internal injury mechanisms—explains why participants feel safer when wearing headguards but remain aware of residual risks during training. This reinforces the view that protective equipment-based strategies need to be combined with technical and organizational approaches.

Coach supervision emerged as another important determinant in athlete safety practices. The role of coaches in monitoring fatigue levels, adjusting training intensity, correcting technical errors, and ensuring the use of protective equipment is in line with research findings that confirm that the quality of education and involvement of coaches has a direct effect on the risk of injury in combat sports (Kirk, 2022). In line with studies on Taekwondo and Muay Thai, the findings of this study suggest that consistent feedback and effective training load management by coaches can reduce the risk of injury by maintaining the quality of athletes' defense and mitigating the impact of fatigue on concentration and defensive posture.

In terms of injury management and rehabilitation, practices at HAN Academy tend to be experience-based and not yet fully structured. Although there is an unwritten policy of restricting competition for six months after a serious head injury, the absence of standard procedures, medical screening, and neurocognitive assessment shows a striking difference from international guidelines, such as the AIBA Medical Handbook, which recommends a graded return-to-play and medical clearance before athletes return to training or competition. This difference is likely influenced by the local context, characterized by limited access to sports medicine professionals. These findings are consistent with reports from small boxing clubs in resource-limited settings, where the rehabilitation process often relies on the coach's judgment rather than formal clinical evidence.

In addition to technical and organizational factors, this study also shows that athletes are aware of the role of physical and psychological readiness in the risk of head injuries. These findings support previous literature stating that fatigue and decreased focus significantly increase exposure to head impacts during training and competition (Dunn et al., 2022; Steward et al., 2025; Wu et al., 2025). The influence of these psychological factors confirms that injury prevention cannot be understood solely as a technical or equipment issue, but rather as a multidimensional phenomenon involving interactions between individual behavior, the training environment, and post-injury responses. This understanding aligns with the Ecological Model and Haddon Matrix frameworks, which view injury as the result of complex interactions among human factors, equipment, environment, and management systems.

Overall, the findings of this study suggest that head injury prevention practices at HAN Academy are multifaceted but remain informal and non-standardized. The absence of written protocols, standardized assessment tools, and medical partnerships limits the strength and sustainability of existing practices. This situation also has the potential to affect the generalizability of the findings to a broader academic context or a more regulated system. Nevertheless, this study identifies clear opportunities for improvement, such as developing standard operating procedures

(SOPs) for sparring intensity, implementing structured return-to-play guidelines, conducting routine checks of protective equipment, and collaborating with healthcare providers for medical screening and concussion management.

The implications of this research are not only relevant at the academic level. For coaches, implementing evidence-based training and safety protocols can help reduce preventable injuries while supporting the long-term development of athletes. For sports organizations and policymakers, strengthening coach certification, safety education, and equipment regulations are important aspects of maintaining athlete welfare. Meanwhile, for athletes, increasing literacy about concussion symptoms, long-term neurological risks, and safe decision-making strategies can improve self-control over personal safety.

Limitations of the study

This study has several limitations. The limited number of participants (four individuals), although appropriate for a case study, limits the generalizability of the findings. The single-site design captures practices specific to one academy and may not represent broader patterns in amateur boxing. Data sourced from self-reports may contain memory bias or underreporting of injuries. The absence of clinical or biomechanical data limits the verification of injury severity and the quantification of impact exposure. Additionally, the coding process, which one researcher primarily carried out, has the potential to introduce interpretive bias, despite peer debriefing.

Further research is recommended to address these limitations through larger-scale quantitative studies to estimate the incidence and prevalence of head injuries in amateur boxers. Longitudinal studies are needed to evaluate the long-term neurological effects of repeated exposure to impact. Intervention trials can be conducted to assess the effectiveness of new headguard designs, defensive technique training modules, or structured concussion protocols. A mixed-methods approach combining observational, biomechanical, and qualitative data also has the potential to provide a more comprehensive understanding of injury mechanisms and effective prevention strategies. Cross-academy comparative studies will help identify the influence of organizational structure, coach experience, and resource availability on athlete safety practices.

In conclusion, this study highlights the importance of adopting a multi-level, evidence-based approach to preventing head injuries in amateur boxing. Although the HAN Academy has implemented several protective practices, further strengthening aspects of protocolization, medical integration, and athlete education is still necessary to ensure the safety and long-term sustainability of athletes' performance.

CONCLUSIONS

HAN Academy Malang implements a multi-component head injury prevention program, which includes mastering basic defensive techniques, consistently using headguards, and coach supervision during training sessions. These findings indicate that the program is perceived as effective by both coaches and athletes; however, it still requires strengthening through the development of written protocols, integration of medical services, and more systematic evaluation. This study has limitations due to its single-site design and the limited number of participants, so the findings cannot be generalized broadly. Therefore, further research is recommended using a mixed

methods approach with a larger sample to assess the program's effectiveness on head injury incidence and athlete safety outcomes.

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DATA AVAILABILITY

The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available because they contain information that could compromise the privacy of research participants

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CONFLICT OF INTEREST

The author officially certifies that there are no conflicts of interest with any party with respect to this research.

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