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Research Article

Analysis of rule violations leading to disqualification in youth swimming competitions: Evidence from Indonesia

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ABSTRACT
Background: The purpose of this study was to determine how disqualifications of competition rules in swimming competitions are committed. Rules must be obeyed when competing, and there are consequences for swimmers who violate them. Objective: To find out how the disqualification of the rules of the competition game in the swimming sport is carried out in the swimming competition. Methods: The research was conducted at the GBK Senayan Swimming Pool, and the study used a descriptive observational design. The population in this study consists of all beginner-level swimmers who take part in the 2025 DKI Jakarta swimming competition in Indonesia. The sample uses total sampling, namely all beginner-level swimmers who take part in the 2025 DKI Jakarta swimming competition. The instrument used is a disqualification blank that refers to the competition rules of the World Aquatics, which have been adapted into Indonesian. The data collection technique uses direct field observation during the swimming competition. The data analysis technique used is a descriptive one that explains how disqualification from the rules of the competition game in swimming is carried out in swimming competitions. Result: The highest proportion of disqualifications occurred in breaststroke events (70 cases; 45.8%), followed by butterfly events (45 cases; 29.4%). Moreover, the breaststroke swimming disqualification that was committed the most, 14 times, was SW 7.1.e, which sounded after the start of doing butterfly kicks more than 1 time. Conclusion: The most common disqualifications occur in the breaststroke, especially the wrong kick after the start. It is necessary to improve coaching related to understanding the rules, especially at the start, reversal, and finish, to minimize disqualifications during the race. Future research should experimentally examine determinants of rule violations (technical, cognitive, and coaching quality) and evaluate rule-based interventions. Cross-level and longitudinal designs are needed to address limited generalizability and to identify violation patterns with greater precision.

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Introduction

Swimming is a highly standardized competitive sport in which performance outcomes are determined objectively through precise time measurement. Nevertheless, competitive success is not solely dependent on physiological and biomechanical capacities (Abbes, Labbadi, & Salhi, 2026; Rahma, 2026), but also on strict adherence to World Aquatics regulations. These regulations encompass technical execution, procedural compliance, and ethical conduct, thereby ensuring fairness and integrity within competitive settings (Ianc, Sînziana, & Hömann, 2024). Consequently, rule compliance constitutes an integral component of valid performance, rather than a peripheral administrative requirement. From a theoretical standpoint, this study is anchored in regulatory compliance theory and the constraints-led

approach (CLA). Regulatory compliance theory emphasizes that adherence to rules is shaped by cognitive understanding, enforcement mechanisms, and environmental reinforcement (White, et al., 2018). In parallel, the CLA conceptualizes performance as an emergent property of interactions among individual, environmental, and task constraints (Renshaw & Chow, 2019). Within this framework, competition rules function as critical task constraints that directly influence athletes' behavioral adaptations. Thus, rule violations should not be interpreted merely as isolated technical errors, but as indicators of maladaptive responses to regulatory constraints within the performance system.

Despite a highly regulated competition structure, disqualification (DQ) remains a recurrent phenomenon in swimming competitions. Disqualification results in the immediate invalidation of performance outcomes, regardless of an athlete's physical superiority, thereby positioning regulatory compliance as equally decisive as performance capacity (Kuwelker, Diaconu, & Kuhn, 2022). Empirical observations indicate that violations frequently occur in key technical phases, including starts, turns, and stroke execution, particularly among youth athletes. This pattern suggests a persistent discrepancy between formal regulatory standards and their practical implementation within athlete development pathways. A critical examination of the existing literature reveals a substantial imbalance in research focus. Most studies have focused on performance optimization through physiological and biomechanical approaches, such as stroke efficiency, coordination, and energy system development (Morais et al., 2021; Barbosa et al., 2023; Fernandes, Carvalho, & Figueiredo, 2024). Additionally, technical and race performance analyses have identified variables such as reaction time, turn efficiency, and race strategy as key determinants of competitive success (Born et al., 2020; Hellard et al., 2019). Furthermore, research on coaching systems has explored the role of training environments and coaching quality in long-term athlete development (Larson et al., 2020; Maughan, 2024).

However, these strands of research share a fundamental limitation: they implicitly assume that all performances are rule-compliant and therefore valid. As a result, the risk and impact of disqualification are largely neglected as analytical variables. This omission reflects a broader theoretical limitation: regulatory compliance is not adequately integrated into performance models, despite its direct influence on competition outcomes. Accordingly, a clear research gap can be identified. Empirically, there is a lack of systematic, data-driven investigations into the types, frequency, and distribution of rule violations in swimming competitions, particularly at the youth level. Theoretically, existing frameworks have yet to incorporate rule compliance as a central performance constraint. Contextually, there is limited evidence from developing sport systems, including Indonesia, where variations in coaching practices, rule dissemination, and officiating consistency may significantly influence violation patterns. These gaps indicate that disqualification is not merely incidental but may reflect structural deficiencies in athlete preparation and competition management.

In response to these limitations, this study advances a novel perspective by positioning rule compliance as a core dimension of performance analysis. Specifically, this study provides a comprehensive examination of rule violations leading to disqualification by integrating technical, regulatory, and implementation perspectives. This integrative approach extends existing performance paradigms by explicitly incorporating regulatory constraints into the analysis of competitive outcomes. The objective of this study was to identify the dominant forms of rule violations leading to disqualification in youth swimming competitions. The findings are expected to advance the sport science literature by reconceptualizing disqualification as a performance-critical variable. Practically, this study provides evidence-based insights for coaches, athletes, and competition organizers to enhance regulatory compliance. At a broader level, the results inform policy development to improve the quality, fairness, and integrity of swimming competitions.

Method

Research Design

The method used is a quantitative descriptive study method. The research was conducted for 1 (one) year in 2025.

Participants

The population in this study comprises all swimmers who participate in the 2025 DKI Jakarta Beginner swimming competition. This swimming competition was attended by swimmers in DKI Jakarta, both women and men, with ages ranging from < 10 to 18 years old. The sample uses total sampling, namely, all swimmers who participated in the 2025 DKI Jakarta Beginner Swimming Competition.

Ethical Approval Statement

The study received approval from the ethical committee at Universitas Negeri Jakarta, with approval number 318/UN39.14/PT.01.05/III/2026.

Research Instruments

The instrument employed in this study was a structured disqualification recording sheet, developed from the official competition regulations issued by World Aquatics and adapted to the Indonesian context. To ensure content validity, the instrument was reviewed by certified swimming officials and national-level referees to confirm its alignment with current competition rules and officiating standards. The instrument was reviewed by three certified swimming referees with national-level officiating experience. Data were collected through systematic direct observation during official swimming competitions. Observers were strategically positioned within officiating zones (e.g., start, turn, and finish areas) to ensure comprehensive coverage of potential rule violations. Each observed disqualification was recorded in real time, including the type of violation, the corresponding rule code, and the event category. Prior to data collection, all observers received standardized briefing and training regarding the observation procedures and the application of competition rules to promote consistency in recording disqualification events.

Data Analysis

Data were analyzed using descriptive statistics. Frequencies and percentages were calculated to summarize the distribution of disqualifications across swimming stroke categories and rule violations. The results were presented in tables and graphical formats to facilitate interpretation.

Results and Discussion

Results

This study employs an exploratory design to examine patterns of rule violations that lead to disqualification in swimming competitions. The findings, summarized in Table 1 and Figure 1, indicate that disqualifications are not evenly distributed across stroke categories, but instead show a clear concentration in specific techniques.

Breaststroke accounts for the largest proportion of disqualifications, followed by butterfly and backstroke, while violations in freestyle and start phases are comparatively minimal. This distribution suggests that strokes with more complex and restrictive movement regulations are more prone to rule violations. In contrast, simpler or more flexible techniques tend to produce fewer disqualifications, indicating a relationship between rule complexity and error frequency. A more detailed examination of rule-specific violations (Table 2) reveals that a small number of articles account for a disproportionate share of overall disqualifications. The most frequent violations involve butterfly and breaststroke rules, particularly those governing leg coordination, start phases, and finishing techniques. This pattern indicates that errors are not random but clustered around critical technical elements that require high levels of coordination and precise rule interpretation.

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Table 1. Results of Research on Disqualification of Competition Rules

No	Types of disqualification	Total	Percentage
1	Start	8	5,6
2	Freestyle	1	0,7
3	Backstroke	14	9,7
4	Butterflye	45	29,4
5	Breaststroke	70	45,8
6	Individual Medley	9	6,3
7	During Swimming	6	4,2
		153	

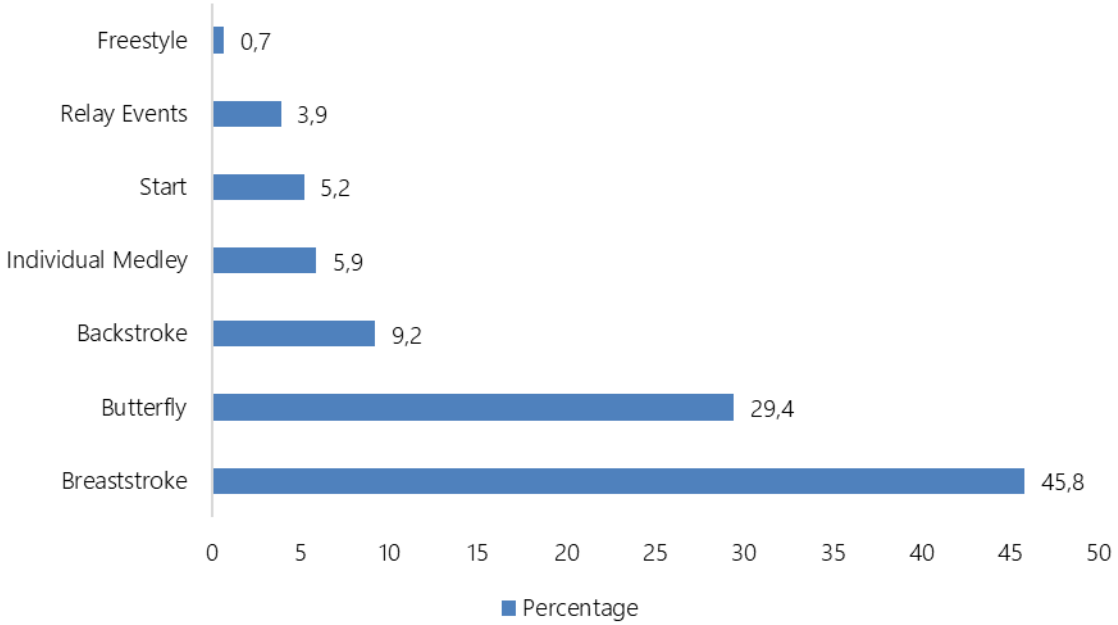


Figure 1. Distribution of swimming disqualifications by stroke category (n = 153)

Table 2. Distribution of disqualifications by swimming stroke category

Violation Category	SW Rules	Frequency (n)	Percentage (%)
Breaststroke violations	SW 8.x	70	45.8
Butterfly violations	SW 7.x	45	29.4
Backstroke violations	SW 6.x	14	9.2
Individual Medley violations	SW 9.x	9	5.9
Start violations	SW 4.x	8	5.2
Relay race violations*	SW 10.x	6	3.9
Freestyle violations	SW 5.x	1	0.7
Total		153	100.0

Note. Disqualifications were grouped according to the World Aquatics Swimming Rules (SW): Start (SW 4), Freestyle (SW 5), Backstroke (SW 6), Breaststroke (SW 8), Butterfly (SW 7), Individual Medley (SW 9), and Relay Events (SW 10).

As shown in Table 2, 153 disqualifications were identified. The highest proportion of violations occurred in breaststroke events (SW 8.x), accounting for 70 cases (45.8%), followed by butterfly events (SW 7.x) with 45 cases (29.4%). Backstroke violations (SW 6.x) represented 14 cases (9.2%), while individual medley (SW 9.x), start violations (SW 4.x), and relay race violations (SW 10.x) accounted for

5.9%, 5.2%, and 3.9% of all disqualifications, respectively. Freestyle violations (SW 5.x) were the least frequent, with only one case (0.7%).

Conversely, several rule violations occur only sporadically, primarily related to procedural or less complex technical requirements. The low frequency of these violations suggests that they are either well understood by athletes or less challenging to execute correctly during competition. From an analytical perspective, these findings highlight that disqualification is strongly linked to technical complexity and motor coordination demands, rather than being merely incidental. This supports the view that rule violations emerge from the interaction between athlete capability and regulatory constraints, as proposed in the constraints-led framework. Furthermore, the visualizations (Figure 1) illustrate a skewed distribution, with a limited number of violation types accounting for most of the overall frequency. This concentration effect underscores the need for targeted interventions rather than generalized training approaches. Overall, the results demonstrate that disqualification patterns are systematic and predictable, reflecting the underlying technical and cognitive challenges athletes face. Therefore, efforts to reduce disqualification should prioritize high-risk rule categories and focus on improving athletes' understanding and execution of complex movement regulations

Discussion

This study provides a systematic analysis of disqualification patterns based on official competition rules established by World Aquatics. The findings demonstrate that disqualifications are not randomly distributed but are concentrated in specific stroke categories and rule articles, suggesting underlying structural and performance-related determinants. The predominance of disqualifications in breaststroke and butterfly suggests that technical complexity is a primary determinant of rule violations. From a constraints-led perspective, these strokes impose greater coordination demands due to strict synchronization requirements between upper- and lower-limb movements (Sheaff, 2023). Consequently, even minor deviations in timing or technique may result in rule violations. This interpretation is consistent with biomechanical research indicating that coordination-intensive strokes are more susceptible to technical errors under competitive conditions (Morais et al., 2021; Barbosa et al., 2023).

However, attributing disqualifications solely to movement complexity would be insufficient. The findings also point toward multidimensional causal factors, particularly related to athlete experience, coaching practices, and cognitive understanding of rules. Previous research in talent development highlights that less experienced athletes tend to exhibit lower movement stability and decision-making accuracy under pressure (Yang, Xu, & Le, 2024). Moreover, coaching quality—especially the integration of technical instruction with rule awareness—plays a critical role in shaping athlete compliance (Riaz, 2025). From a regulatory perspective, rule adherence is influenced not only by knowledge but also by reinforcement and consistency in implementation (Lewington-Pearce et al., 2020).

Furthermore, the concentration of violations in specific rule articles suggests the presence of systematic learning gaps, rather than incidental mistakes. From a motor learning perspective, complex skills require structured, feedback-driven practice to achieve consistency and automaticity (Di Nota & Huhta, 2019; Iorga et al., 2023). When training prioritizes performance outcomes without sufficient emphasis on rule-constrained execution, athletes may develop technically efficient yet non-compliant movement patterns. This finding reinforces the importance of integrating regulatory constraints into skill acquisition processes.

The relatively low incidence of disqualifications in freestyle provides an important contrast. Freestyle allows greater flexibility in movement execution, which reduces the likelihood of rule violations. This aligns with research indicating that less restrictive task constraints enable greater adaptability and lower error rates in performance (Brackley, 2020). Thus, rule rigidity versus flexibility emerges as a critical factor influencing compliance behavior. From a theoretical standpoint, this study extends existing

performance models by explicitly incorporating regulatory compliance as a performance constraint. While prior studies have predominantly focused on physiological, biomechanical, and tactical determinants of swimming performance (Price, Cimadoro, & Legg, 2024; González-Ravé et al., 2025), the present findings demonstrate that performance validity is equally dependent on adherence to rules. This supports a more integrative framework in which performance is defined not only by efficiency but also by compliance with competition standards.

In practice, these findings underscore the need to shift coaching paradigms toward integrating rule-based training into technical preparation. Coaches should prioritize high-risk phases such as starts, turns, and finishes, particularly in breaststroke and butterfly events. Evidence suggests that structured feedback and technique-focused interventions can significantly reduce technical errors and improve performance consistency (Tokay & Akil, 2025; Schlueter et al., 2021). Nevertheless, this study has several limitations. The scope of observed competitions remains limited, potentially affecting generalizability. In addition, this study does not directly measure causal variables such as athlete experience, cognitive understanding, or coaching quality. Therefore, the interpretation of causal mechanisms remains inferential.

Future research should adopt multivariate and mixed-method approaches to examine the relationship between disqualification and key determinants such as experience level, coaching strategies, and rule comprehension. Longitudinal studies are also needed to explore how compliance develops over time. Furthermore, integrating video-based performance analysis has been shown to enhance the accuracy of technical evaluation and may support more effective interventions (Navarrete et al., 2025). In conclusion, disqualification in swimming competitions is a systematic and multidimensional phenomenon shaped by the interaction between technical complexity, regulatory constraints, and developmental factors. Addressing this issue requires a holistic approach that integrates performance training with regulatory compliance to ensure both optimal and valid competitive outcomes.

Limitations of Study

Several limitations should be acknowledged when interpreting the findings of this study. First, the analysis was based on a limited number of swimming competitions and may not fully represent disqualification patterns across different competitive levels, regions, or age groups. Second, the study relied exclusively on official disqualification records and did not incorporate contextual variables such as athlete experience, coaching quality, training history, psychological factors, or judges' decision-making processes. As a result, the observed relationships should be interpreted as descriptive rather than causal. Third, the absence of video-based performance analysis limited the ability to examine the specific technical errors that led to rule violations. Future research should expand the sample across multiple competitions and competitive categories, employ longitudinal designs to investigate changes in compliance over time, and integrate quantitative and qualitative methods to explore the influence of coaching practices, athlete development, and rule comprehension. The use of video analysis and biomechanical assessment may also provide deeper insights into the technical mechanisms underlying disqualification events and support the development of more effective prevention strategies.

Conclusions

The findings indicate that disqualifications were predominantly associated with breaststroke events, with the most frequent violation related to illegal butterfly kicks after the start. This pattern highlights a systematic issue in technical rule compliance rather than incidental errors. From a scientific perspective, these results reinforce the need to integrate regulatory compliance within performance analysis frameworks, positioning rule adherence as a critical constraint influencing competitive outcomes. This extends existing models that primarily emphasize physiological and biomechanical

determinants. From a practical perspective, coaches should incorporate structured rule-based training, particularly focusing on start, turn, and finish phases, to minimize recurrent violations. Emphasis should be placed on developing athletes' procedural understanding alongside technical execution to ensure valid performance outcomes. Future research should examine athletes' cognitive understanding of competition rules and explore how coaching communication strategies influence rule compliance during training and competition contexts.

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Authors' contributions

I.N.M. conceived and designed the study, collected and assembled the data, performed the data analysis and interpretation, drafted the manuscript, critically revised the manuscript, and approved the final version of the article. A.A. and H.W. contributed to data collection and assembly, performed the data analysis and interpretation, and approved the final version of the article. R.S. and M.S.R. contributed to the study conception and design, participated in manuscript preparation, critically revised the manuscript, and approved the final version of the article. All authors read and approved the final manuscript.

Competing interests

The authors declare no competing interests.

AI Disclosure Statement

During the preparation of this manuscript, the authors used ChatGPT (OpenAI) for language editing and improvement of readability. The authors reviewed and edited the content as necessary and take full responsibility for the content of the publication.

Data Availability Statement

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request. The data are not publicly available because they contain information that could compromise participant privacy and confidentiality.

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