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The Relationship Between Impulsivity, Cognitive Consequences, and the Severity of Sports Injuries Among Iraqi Swimmers

Omar Rokan Hassan. Moniralajili[1], Mohammadtaghi. Aghdasi[1*], Seyed Hojat. Zamani Sani[1]

1. Department of Motor Behavior, Faculty of Physical Education and Sport Sciences, University of Tabriz, Tabriz, Iran

*** Corresponding author email address:** mt_aghdasi@tabrizu.ac.ir

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A B S T R A C T

Objective: This study aimed to investigate the relationship between impulsivity, Cognitive consequences of sports injuries, and the severity of sports injuries among Iraqi swimmers.

Methods and Materials: This applied, quantitative, descriptive-survey study was conducted among competitive swimmers in Iraq. The statistical population consisted of Iraqi swimmers, from whom 129 participants were selected using purposive and convenience sampling methods based on the sample size estimated through G*Power software. Data were collected using the Cognitive consequences of Sports Injuries Questionnaire developed by Rokan Hassan et al. (2022) and the Barratt Impulsiveness Scale (1994). Descriptive statistics were used to summarize participant characteristics and study variables. Inferential analyses were performed using Pearson correlation coefficients and linear regression analyses in SPSS version 23. All statistical tests were conducted at a significance level of 0.05.

Findings: The results demonstrated significant negative relationships between all dimensions of Cognitive consequences of sports injuries and swimmers' impulsivity levels ($p < .001$). Greater awareness and understanding of the Cognitive consequences associated with sports injuries were linked to lower levels of impulsive behavior among athletes. Regarding the relationship between impulsivity dimensions and sports injuries, cognitive impulsivity was not significantly associated with injury occurrence or severity ($p = .677$). However, a significant positive relationship was found between non-planning impulsivity and sports injuries ($p = .004$), indicating that swimmers who exhibited poorer planning tendencies experienced higher injury rates. Furthermore, motor impulsivity showed a significant positive association with sports injuries ($p = .050$), suggesting that athletes with greater tendencies toward acting without sufficient control were more likely to sustain injuries. Overall, the findings highlight the predictive role of specific impulsivity dimensions in sports injury occurrence among swimmers.

Conclusion: The findings suggest that cognitive awareness regarding the consequences of sports injuries and lower levels of impulsive behavior are associated with a reduced likelihood of injury among swimmers. In particular, non-planning and motor impulsivity appear to be important risk factors for sports injuries, whereas cognitive impulsivity does not significantly contribute to injury occurrence.

Keywords: *Impulsivity, Swimmers, Sports Injuries, Cognitive consequences, Injury Prevention, Athletic Performance.*

1. Introduction

Sports injuries constitute one of the most critical challenges in athletic development, performance continuity, and long-term athlete welfare. Although injuries are often interpreted primarily through biomechanical, physiological, or training-load perspectives, contemporary sport science increasingly emphasizes that injury occurrence and recovery are multidimensional phenomena shaped by physical, psychological, cognitive, behavioral, and environmental factors. In competitive swimming, this issue is particularly important because the sport involves high-volume repetitive movements, sustained training exposure, technical demands, and continuous interaction between physical conditioning and psychological self-regulation. Swimming is commonly perceived as a low-impact sport because it is performed in water; however, competitive swimmers are exposed to recurrent overuse injuries, especially in the shoulder, lower back, knee, and other musculoskeletal regions, due to repetitive stroke mechanics, high training volume, inadequate recovery, and technical or conditioning deficiencies (Barry et al., 2021; Hill et al., 2022; Trinidad et al., 2021). Therefore, understanding the factors associated with injury vulnerability among swimmers requires attention not only to anatomical and training-related variables but also to psychological characteristics and cognitive awareness related to injury prevention.

The epidemiology of swimming injuries shows that injury patterns differ across age, competitive level, swimming discipline, and training history. Shoulder pain and shoulder injury are among the most frequently reported problems in competitive swimmers, largely because of repetitive overhead movements and the continuous demand placed on glenohumeral stability, scapular control, and muscular endurance (Gračanin et al., 2023; McKenzie et al., 2023). In addition to shoulder-related problems, non-shoulder injuries and lower back disorders have received increasing attention, suggesting that swimming injuries should not be reduced to a single anatomical region (Hill et al., 2022; Hsu et al., 2024). Studies on high school, young elite, and artistic swimmers further indicate that swimmers may experience a wide range of acute and overuse injuries across developmental stages, highlighting the need for preventive models that are sensitive to both physical exposure and athlete-specific characteristics (Belilos et al., 2023; Vignaud et al., 2023). These findings confirm that swimming injury prevention should be based on a comprehensive understanding of risk factors rather than a narrow focus on technique or training volume alone.

Among the psychological variables associated with injury, impulsivity has emerged as an important construct because it reflects tendencies toward rapid, insufficiently regulated, and poorly planned responses. Impulsivity is generally understood as a multidimensional trait involving cognitive impulsivity, motor impulsivity, and non-planning impulsivity. In sport contexts, these dimensions may influence athletes' decision-making, risk perception, adherence to safety recommendations, attention to bodily signals, and willingness to continue activity despite pain or fatigue. Earlier research comparing athletes in contact and non-contact sports demonstrated that impulsivity-related traits may vary by sport type and competitive demands, suggesting that sport participation itself may be associated with distinct behavioral regulation patterns (Besharat et al., 2013). More recent work has also shown that impulsivity is linked with cognitive patterns, perfectionistic responses, emotional regulation, competition level, and performance outcomes in athletes (González-Hernández et al., 2019; Millán-Sánchez et al., 2023). Therefore, impulsivity should be examined not only as a personality trait but also as a practical behavioral factor that may contribute to injury-prone actions in competitive environments.

The connection between impulsivity and injury risk can be explained through several mechanisms. Athletes with higher motor impulsivity may initiate movements rapidly without adequate technical control, ignore corrective feedback, or make sudden decisions during training and competition that increase biomechanical stress. Athletes with higher non-planning impulsivity may show weaker adherence to structured warm-up, recovery, conditioning, or injury-prevention routines. Cognitive impulsivity may also affect attention, evaluation of risk, and decision-making; however, its relationship with injury may depend on sport type, competitive conditions, and the athlete's level of knowledge. Evidence from collegiate athletes has linked impulsivity and sensation seeking with concussion history, while another study reported relationships among anxiety, anger, and impulsivity in athletes with sport-related concussion (Beidler et al., 2021; Byrd et al., 2021). Research on head injury has further indicated that injury experiences may be associated with changes in impulsivity and related risk behaviors over time, suggesting a possible bidirectional relationship between injury and behavioral regulation (Connolly et al., 2025). These findings support the need to

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examine impulsivity as both a potential predictor and correlate of sports injury outcomes.

Injury models in sport psychology have long emphasized the role of psychological factors in predicting injury occurrence. Stress, coping resources, personality traits, attentional disruptions, and emotional states can influence vulnerability to injury by affecting muscle tension, situational awareness, fatigue responses, and behavioral choices. A prospective study on senior soccer players showed that psychological variables may predict injury occurrence, providing foundational support for the psychological approach to injury risk (Ivarsson & Johnson, 2010). Subsequent research on male professional soccer players also highlighted the psychological aspects of sports injuries, reinforcing the idea that injury is not merely a physical event but a psychological and behavioral process as well (Madžar et al., 2017). Recent systematic review evidence on personality traits and sports injuries, based on the stress and sports injury model, further confirms that personality-related factors can meaningfully contribute to injury susceptibility (Naderi & Shaabani, 2024). Accordingly, examining impulsivity in relation to injury among swimmers is theoretically consistent with broader injury models that integrate psychological and behavioral dimensions.

Another important dimension in the study of sports injuries is athletes' and coaches' cognitive awareness of injury-related consequences. Cognitive consequences of sports injuries refer to the knowledge, beliefs, perceptions, and awareness that athletes or sport personnel hold regarding injury mechanisms, injury locations, causes of injuries, first aid, nutrition, physical fitness, and sport psychology. In swimming, cognitive awareness can influence how athletes interpret bodily symptoms, follow preventive protocols, seek timely medical or coaching support, and regulate their behavior during training. Rokan Hassan and Ahmad Altaravaneh examined cognitive assessment of sports injuries among Iraqi swimming club coaches, emphasizing the relevance of injury-related knowledge in the Iraqi swimming context (Rokan Hassan & Ahmad Altaravaneh, 2022). This is particularly important because coaches and athletes who possess stronger cognitive understanding of injury mechanisms may be better prepared to recognize risky conditions, modify training practices, and prevent avoidable injuries. Therefore, Cognitive consequences of sports injuries can be understood as an educational and preventive construct that may interact with psychological variables such as impulsivity.

The relationship between cognitive awareness and impulsivity is also conceptually important. Impulsivity is frequently associated with reduced deliberation, weaker inhibition, and difficulty delaying immediate responses. Cognitive knowledge, however, can provide a regulatory framework that helps athletes anticipate consequences, evaluate risks, and choose safer behavioral strategies. In broader cognitive and behavioral science, impulsivity has been linked with decision-making disturbances, experiential avoidance, distress tolerance, addiction tendencies, alexithymia, self-harming behaviors, and other maladaptive behavioral patterns (Asghari, 2023; Gorbanalipour et al., 2025; Morris et al., 2022). Although these studies are not limited to athletic populations, they show that impulsivity is closely tied to cognitive appraisal, emotional regulation, and behavioral control. In sport settings, this suggests that athletes with stronger knowledge of injury consequences may be less likely to engage in impulsive behaviors that place them at risk, while athletes with weaker awareness may underestimate risk and act with less restraint.

Within athletic environments, impulsivity is also influenced by contextual and motivational conditions. Coaching behaviors, psychological need frustration, and sport devaluation may shape athletes' motivation and continuation intentions, particularly in adolescent athletes (Aghdasi & Ahmadi, 2016). When sport environments are controlling or psychologically pressuring, athletes may become more vulnerable to maladaptive decisions, poor self-regulation, or disregard for injury-prevention behaviors. Similarly, attitudes and impulsivity have been examined in relation to sport-related risk behaviors such as betting motivation, with perceived social support functioning as an important mediating factor (Seifourian et al., 2024). These findings indicate that impulsivity does not operate in isolation; rather, it is embedded within broader motivational, social, and psychological systems. For swimmers, such systems may include coach-athlete relationships, team culture, training intensity, competition pressure, and access to injury-prevention education.

Recent intervention-oriented and applied studies further demonstrate that impulsivity can be modified or influenced by training, cognitive stimulation, and psychological regulation. For instance, combined exercise programs have been shown to affect motivational and impulsive self-talk among taekwondo practitioners, indicating that structured physical and psychological interventions may influence impulsive tendencies in athletes (Mohammadi et al., 2023). In another study, anodal transcranial direct current

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stimulation over the right dorsolateral prefrontal cortex improved decision-making and functional impulsivity in female sports referees, suggesting that executive control and impulsivity are closely related to neurocognitive regulation in sport-related decision contexts (Ghayebzadeh et al., 2023). Moreover, mindfulness has been examined alongside impulsiveness in university student-athletes in relation to sports injury history, supporting the view that self-awareness and attentional regulation may be relevant to injury prevention (Tingaz et al., 2020). These findings reinforce the practical significance of examining impulsivity as a modifiable psychological factor rather than a fixed trait.

Injury prevention also requires attention to psychological resilience, aggression, and emotional control, particularly in high-intensity sport environments. Research on martial arts athletes has shown that psychological resilience and aggression may play roles in injury prevention, suggesting that emotional and behavioral regulation can either protect athletes or expose them to greater risk depending on how these traits are expressed (Patenteu et al., 2024). Although swimming differs from martial arts in contact intensity and injury mechanisms, both contexts require disciplined self-regulation, controlled movement execution, and appropriate responses to competitive stress. This broader evidence suggests that athletes' psychological profiles may influence how they respond to fatigue, pain, pressure, and risk. In swimmers, impulsivity may therefore contribute to injury by weakening planning, increasing premature action, and reducing adherence to safety-related routines.

The Iraqi swimming context provides a meaningful setting for examining these relationships because swimming is developing in the country, and formalized injury-prevention education may vary across clubs, coaches, and athletes. In such contexts, cognitive knowledge about injury mechanisms, first aid, nutrition, physical fitness, and sport psychology may be particularly important for reducing risk. If athletes understand the cognitive and practical consequences of sports injuries, they may be more likely to regulate behavior, follow technical instructions, and avoid impulsive actions that increase injury exposure. Conversely, when awareness is limited, impulsive tendencies may become more consequential because athletes may not fully anticipate the long-term effects of injury on performance, participation, and health. Therefore, assessing both Cognitive consequences and impulsivity among Iraqi swimmers can generate evidence that is relevant for coaches, sport managers, rehabilitation professionals, and injury-prevention planners.

Despite the growing body of evidence on swimming injuries, personality traits, psychological predictors of injury, and impulsivity in sport, limited research has directly examined how Cognitive consequences of sports injuries relate to impulsivity and how dimensions of impulsivity are associated with sports injuries among swimmers. Existing swimming research has mainly focused on injury epidemiology, shoulder problems, training load, and anatomical risk factors (Barry et al., 2021; Hsu et al., 2024; McKenzie et al., 2023). Psychological research has separately examined impulsivity, emotional regulation, concussion, decision-making, mindfulness, and injury-related traits in various athletic populations (Beidler et al., 2021; Byrd et al., 2021; Millán-Sánchez et al., 2023; Tingaz et al., 2020). However, there remains a need for integrated research that connects injury-related cognitive knowledge with impulsivity and actual injury outcomes in swimmers. Such integration can help clarify whether cognitive awareness operates as a protective psychological-cognitive factor and whether specific impulsivity dimensions represent injury-related risk markers.

Accordingly, the present study aimed to investigate the relationship between impulsivity, Cognitive consequences of sports injuries, and the level of sports injuries among Iraqi swimmers.

2. Methods and Materials

2.1. Study Design and Participants

The present study was interpretivist in terms of paradigm, applied in terms of purpose, quantitative in terms of data type, and descriptive-survey in terms of data collection method. The statistical population of the study consisted of all swimmers in Iraq. According to the inquiry made from the Iraqi Swimming Federation regarding the number of active insured swimmers, no exact figure was obtained due to the continuous development of this sport in Iraq; however, according to the officials of the relevant federation, the population was very large. The required sample size for this study was determined using GPower software. Based on the information entered into GPower, including an error level of 0.05, statistical power of 0.95, medium effect size of 0.15, and number of variables equal to 4, the appropriate sample size for the present study was calculated as 129 participants.

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2.2. *Measures*

In the present study, the library method was used to examine the theoretical foundations and research background, while standardized questionnaires were used to collect data related to the main research variables. The first section of the questionnaire used in this study concerned demographic information and was designed by the researcher. The second section included two standardized questionnaires. The first questionnaire was the Cognitive consequences of Sports Injuries Questionnaire developed by Rokan Hassan et al. This questionnaire consists of seven sections. The first section is the sports injury knowledge scale, which includes 15 items. The second section is the sports injury location scale, which includes 11 items. The third section is the causes of sports injuries scale, which includes 9 items. The fourth section is the first-aid knowledge scale, which includes 11 items. The fifth section is the sports nutrition knowledge scale, which includes 16 items. The sixth section is the physical fitness knowledge scale, which includes 15 items. The seventh section concerns knowledge related to sport psychology and includes 11 items. The validity and reliability of this questionnaire were examined and confirmed in the study by Rokan Hassan et al. (2022). The second questionnaire was the Barratt Impulsiveness Scale. This scale is a 30-item instrument that measures individuals' ways of thinking and acting on a five-point Likert scale across three subscales: non-planning impulsivity, including items 1, 5, 7, 9, 10, 12, 17, 19, and 25; motor impulsivity, including items 2, 3, 8, 11, 13, 14, 16, 18, 20, 21, 22, and 24; and cognitive impulsivity, including items 4, 6, 15, and 23 (Barratt, 1993). In the study by Javid et al. (2012), the reliability of the questionnaire was reported as 0.81, and the questionnaire was also found to have acceptable validity. Although both questionnaires used in the present study had previously been validated, the opinions and approval of 10 experts were used to further examine the face and content validity of the research instruments. Their reliability was also assessed using Cronbach's alpha, which was 0.80 for the Cognitive consequences of Sports Injuries Questionnaire and 0.70 for the Impulsivity Questionnaire, indicating acceptable reliability of the research instruments.

In this study, the standardized questionnaires were provided to the research sample both in person and electronically. For this purpose, the necessary coordination was made with the Iraqi Swimming Federation, and information regarding the time and place of swimming training sessions and competitions, as well as the details of swimming sport boards, was obtained from the federation. After attending the relevant sports venues, the research questionnaires were distributed to coaches physically in 75% of cases and, in some cases, electronically through a questionnaire link in 25% of cases.

2.3. *Data Analysis*

Data analysis in the present study was conducted in two descriptive and inferential stages. In the descriptive stage, demographic information and the main research variables were described. In the inferential stage, after the normality of data distribution was confirmed using the Kolmogorov–Smirnov test, Pearson correlation and linear regression tests were used. All analyses were performed in SPSS version 23 at a significance level of 0.05.

3. Findings and Results

The descriptive analysis of the participants' demographic information showed that 16 participants were under 20 years old, 33 were between 21 and 25 years old, 32 were between 26 and 30 years old, and 48 were over 30 years old. In terms of gender, 43 participants were female and 86 were male. Most participants were single, with 116 individuals in this category. In terms of educational level, associate degree had the highest frequency, with 42 participants, while doctoral degree had the lowest frequency, with 4 participants. Most participants had 3 to 5 years of sports experience, with 59 individuals in this category. Regarding sports injury history, 31 participants had never experienced a sports injury, 31 had a history of minor injury, 47 had a history of relatively severe injury, and 20 had a history of surgery due to injury.

Pearson correlation and multivariate linear regression analysis were used to analyze the data. The results are reported in two sections. The first section examines the relationship and predictive ability of athletes' impulsivity based on the Cognitive consequences of sports injuries. The second section examines the relationship and predictive ability of sports injuries based on athletes' impulsivity.

Table 1 presents the model summary and the correlation between the Cognitive consequences of sports injuries and impulsivity among swimmers.

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Table 1

Model Summary and Correlation for the Regression Models

Analysis	Model	Correlation	R^2	Adjusted R^2	Standard Error of the Estimate	Sig.	Durbin–Watson
Cognitive consequences	Regression	-0.638	0.619	0.604	0.537	0.001	1.972
Athletes' impulsivity predicting sports injuries	Regression	0.262	0.169	0.146	0.998	0.003	1.404

The results of Table 1 show that the Pearson correlation coefficient between the variables was -0.638. Accordingly, a significant negative correlation was observed between the set of predictor variables and the criterion variable of the study (R = -0.638, p = 0.001). In addition, the adjusted coefficient of determination, which indicates the percentage of variance in the criterion variable explained by the predictor variable, showed that 60% of the total variance in swimmers' impulsivity was related to the Cognitive consequences of sports injuries, while 40% was related to factors outside the proposed model. The results of the F test used to examine the regression model are reported in Table 2.

Table 2

Results of the F Test for the Regression Models

Analysis	Model	Sum of Squares	df	Mean Square	F	Sig.
Cognitive consequences	Regression	5.677	7	5.677	10.335	0.001
Cognitive consequences	Residual	34.908	121	0.288	—	—
Cognitive consequences	Total	40.584	128	—	—	—
Athletes' impulsivity predicting sports injuries	Regression	9.162	3	3.057	3.066	0.031
Athletes' impulsivity predicting sports injuries	Residual	124.528	125	0.996	—	—
Athletes' impulsivity predicting sports injuries	Total	133.690	128	—	—	—

Considering the significance of the F statistic shown in Table 2 (F = 10.335, p = 0.001), it can be concluded that the research regression model, consisting of the predictor variable of Cognitive consequences of sports injuries and the criterion variable of swimmers' impulsivity, was appropriate, and that the predictor variable could predict changes in swimmers' impulsivity. The results of the regression analysis are presented in Table 3.

Table 3

Regression Analysis Between Predictor Components and Criterion Variables

Analysis	Predictor	B	Std. Error	Beta	t	Sig.
Cognitive consequences of sports injuries predicting swimmers' impulsivity	Intercept	4.033	0.497	—	8.113	0.001
Cognitive consequences of sports injuries predicting swimmers' impulsivity	Sports injury knowledge	-0.150	0.107	0.268	8.470	0.001
Cognitive consequences of sports injuries predicting swimmers' impulsivity	Sports injury location	-0.110	0.099	0.038	9.105	0.001
Cognitive consequences of sports injuries predicting swimmers' impulsivity	Causes of sports injuries	-0.111	0.043	0.030	8.252	0.001
Cognitive consequences of sports injuries predicting swimmers' impulsivity	First-aid knowledge	-0.114	0.048	0.043	6.295	0.001
Cognitive consequences of sports injuries predicting swimmers' impulsivity	Sports nutrition knowledge	-0.126	0.033	0.124	5.791	0.001
Cognitive consequences of sports injuries predicting swimmers' impulsivity	Physical fitness knowledge	-0.128	0.123	0.133	10.224	0.001
Cognitive consequences of sports injuries predicting swimmers' impulsivity	Sport psychology knowledge	-0.118	0.096	0.047	9.190	0.001
Athletes' impulsivity predicting sports injuries	Intercept	1.834	0.656	—	2.796	0.006
Athletes' impulsivity predicting sports injuries	Athletes' non-planning impulsivity	0.905	0.305	0.493	2.970	0.004
Athletes' impulsivity predicting sports injuries	Athletes' motor impulsivity	0.649	0.328	0.348	1.979	0.050
Athletes' impulsivity predicting sports injuries	Athletes' cognitive impulsivity	0.112	0.269	0.065	0.417	0.677

The results of the multivariate linear regression analysis in Table 3 show that all seven components of the Cognitive consequences of sports injuries, including sports injury location, sport psychology knowledge, sports injury knowledge, causes of sports injuries, first-aid knowledge, sports nutrition knowledge, and physical fitness knowledge, had significant negative relationships with swimmers' impulsivity (p = 0.001).

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4. Discussion

The present study examined the relationship between impulsivity, Cognitive consequences of sports injuries, and the level of sports injuries among Iraqi swimmers. The first major finding showed that the Cognitive consequences of sports injuries had a significant negative relationship with swimmers' impulsivity. The regression model was statistically significant, and the Cognitive consequences of sports injuries explained a considerable proportion of the variance in impulsivity among swimmers. More specifically, all seven components of Cognitive consequences, including knowledge of sports injuries, location of sports injuries, causes of sports injuries, first-aid knowledge, sports nutrition knowledge, physical fitness knowledge, and sport psychology knowledge, were negatively and significantly associated with impulsivity. This finding indicates that swimmers who had higher awareness of injury-related cognitive and preventive issues tended to report lower levels of impulsive behavior. In other words, injury-related knowledge may function as a cognitive-regulatory factor that helps athletes evaluate risks, anticipate consequences, and avoid hasty or poorly planned actions during training and competition.

This result is consistent with the broader literature emphasizing the psychological and cognitive foundations of injury prevention in sport. Sports injuries are not merely mechanical or physiological events; rather, they are shaped by the interaction of training exposure, psychological regulation, attentional control, decision-making, and behavioral tendencies. Research on psychological predictors of injuries has shown that psychological characteristics can contribute to injury vulnerability by influencing attention, risk appraisal, coping strategies, and responses to stress (Ivarsson & Johnson, 2010; Madžar et al., 2017). Similarly, systematic evidence based on the stress and sports injury model indicates that personality traits and psychological characteristics are meaningful factors in sports injury occurrence (Naderi & Shaabani, 2024). Therefore, the negative association observed in the present study between Cognitive consequences of injury and impulsivity can be interpreted as evidence that greater injury-related awareness may reduce the likelihood of unregulated, premature, or unsafe athletic behavior.

The finding also aligns with research showing that impulsivity is closely related to cognitive processing, decision-making, and self-regulation. Impulsivity involves difficulty inhibiting immediate responses, reduced planning, and rapid action without adequate evaluation of consequences. In this regard, studies have linked impulsivity with maladaptive cognitive and behavioral patterns in both athletic and non-athletic populations (Asghari, 2023; Gorbanalipour et al., 2025). From a cognitive perspective, impulsive behavior can be understood as a failure to integrate available information into adaptive behavioral control. Morris et al. described impulsivity within a cognitive framework of disordered decision-making, suggesting that impulsive behavior is closely connected to impaired evaluation of consequences and action regulation (Morris et al., 2022). Accordingly, swimmers who understand the causes, locations, first-aid responses, nutritional requirements, physical preparedness, and psychological dimensions of injury may be better equipped to regulate their behavior and avoid impulsive decisions that increase injury risk.

The second major finding showed that athletes' impulsivity had a significant positive relationship with sports injuries among swimmers. Although the explanatory power of impulsivity for sports injuries was modest, the regression model was statistically significant, indicating that impulsivity can be considered one of the psychological predictors of injury among swimmers. This result is consistent with previous research linking impulsivity to sports injury history and injury-related outcomes. Beidler et al. found a relationship between impulsivity, sensation seeking, and concussion history in collegiate student-athletes, suggesting that athletes with greater impulsive tendencies may be more exposed to injury-related risk behaviors (Beidler et al., 2021). Byrd et al. also reported preliminary evidence connecting anxiety, anger, and impulsivity in collegiate athletes with sport-related concussion, highlighting the role of emotional and behavioral dysregulation in injury-related contexts (Byrd et al., 2021). The present finding extends this line of evidence to swimmers and suggests that impulsivity may be relevant not only in contact sports or concussion-related contexts but also in repetitive, technical, and endurance-based sports such as swimming.

The positive association between impulsivity and sports injuries may be especially meaningful in swimming because this sport requires high repetition, technical precision, controlled movement patterns, and careful management of training load. Competitive swimmers are exposed to considerable injury risk due to repetitive stroke cycles, high-volume training, and sport-specific biomechanical stress. Previous reviews have shown that training load is related to

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pain, injury, and illness in competitive swimming, while other studies have documented the epidemiology of swimming injuries across different populations and competitive levels (Barry et al., 2021; Belilos et al., 2023; Trinidad et al., 2021). In such a context, impulsive athletes may be more likely to ignore pain signals, return prematurely after discomfort, neglect recovery routines, or perform movements without adequate technical attention. Therefore, impulsivity may indirectly increase injury risk by weakening adherence to preventive behaviors and reducing sensitivity to early warning signs of overuse or strain.

The component-level findings provide a more precise interpretation of this relationship. Among the three dimensions of impulsivity, non-planning impulsivity had a significant positive relationship with sports injuries. This suggests that swimmers who are less likely to plan, anticipate consequences, or organize their behavior may be more vulnerable to injury. Non-planning impulsivity can manifest in inadequate preparation, poor recovery management, insufficient attention to warm-up and conditioning, and failure to follow progressive training principles. This interpretation is consistent with studies showing that psychological and behavioral regulation are important in sport performance and injury prevention. For example, Millán-Sánchez et al. demonstrated that emotional regulation and impulsivity are associated with sports performance, and González-Hernández et al. showed that impulsiveness is related to cognitive patterns among competitive junior athletes (González-Hernández et al., 2019; Millán-Sánchez et al., 2023). These findings support the idea that non-planning impulsivity may impair athletes' ability to manage sport demands in a structured and preventive manner.

Motor impulsivity also had a significant positive relationship with sports injuries among swimmers. This finding indicates that athletes who tend to act rapidly, physically, or without sufficient behavioral inhibition may be more likely to experience injuries. In swimming, motor impulsivity may appear as sudden technical changes, excessive force during training, poor pacing, insufficient attention to body alignment, or premature continuation of effort despite fatigue. This is important because swimming injuries frequently involve repetitive movement patterns and cumulative mechanical stress, particularly in the shoulder and lower back. Previous research has emphasized the importance of preventing shoulder injuries in swimmers and has identified shoulder pain and injury risk factors in competitive swimmers (Gračanin et al., 2023; McKenzie et al., 2023). Similarly, lower back injuries in competitive swimmers have been discussed in relation to swimming anatomy and sport-specific demands (Hsu et al., 2024). Therefore, motor impulsivity may increase injury risk by disrupting technical consistency and increasing exposure to unsafe movement patterns.

In contrast, cognitive impulsivity did not have a significant relationship with sports injuries among swimmers. This finding suggests that, in the present sample, the tendency toward rapid or distractible thinking was not sufficient by itself to predict injury outcomes. One possible explanation is that swimming injury risk is more directly influenced by behavioral execution and planning habits than by cognitive impulsivity alone. Unlike sports that require frequent open-skill decision-making, direct opponent confrontation, or rapid tactical reactions, swimming is a relatively structured sport in which injury may be more strongly related to repetitive physical behavior, training load, technique, recovery, and planning. This interpretation is compatible with evidence showing that non-shoulder, shoulder, and artistic swimming injuries often arise from accumulated exposure and sport-specific physical demands rather than from purely cognitive factors (Hill et al., 2022; Vignaud et al., 2023). Therefore, cognitive impulsivity may be less predictive of injury in swimming compared with non-planning and motor impulsivity.

The findings also suggest that injury prevention among swimmers should be conceptualized as both an educational and psychological process. Rokan Hassan and Ahmad Altaravaneh emphasized the importance of cognitive assessment of sports injuries among Iraqi swimming club coaches, indicating that injury-related knowledge is an important issue in the Iraqi swimming context (Rokan Hassan & Ahmad Altaravaneh, 2022). The present study adds that such cognitive knowledge is not only relevant to injury awareness but may also be negatively associated with impulsive tendencies. This supports the practical value of educational programs addressing injury mechanisms, first aid, nutrition, physical fitness, and sport psychology. When swimmers develop stronger cognitive schemas about injury consequences, they may become more capable of delaying immediate impulses, recognizing risk situations, and adhering to preventive strategies.

The results further correspond with intervention-based and regulatory perspectives in sport psychology. Studies have shown that mindfulness, decision-making training, combined exercises, and neurocognitive modulation can be associated with impulsivity, attentional control, and

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behavioral regulation in athletic populations (Ghayebzadeh et al., 2023; Mohammadi et al., 2023; Tingaz et al., 2020). These findings suggest that impulsivity is not merely a fixed personality characteristic but may be influenced through structured psychological, educational, and training interventions. Moreover, research on psychological resilience and aggression in injury prevention indicates that athletes' emotional and behavioral control can shape injury-related outcomes (Patenteu et al., 2024). Therefore, the present findings support the inclusion of self-regulation training, mindfulness-based methods, planning skills, and impulse-control strategies in swimming injury-prevention programs.

5. Conclusion

Finally, the findings should be interpreted within the broader motivational and social context of sport participation. Controlling coach behaviors, psychological need thwarting, sport devaluation, and intention to continue sport participation have been shown to be connected in adolescent athletes, indicating that athletes' behavioral regulation is influenced by the sport environment (Aghdasi & Ahmadi, 2016). Similarly, perceived social support has been examined as a mediating factor in the relationship between attitude, impulsivity, and sport-related risk behavior (Seifourian et al., 2024). These studies imply that impulsivity and injury risk are not only individual-level issues but may also be shaped by coaching climate, support systems, and organizational practices. In the context of Iraqi swimming, coaches, clubs, and federations can play an important role in strengthening athletes' cognitive awareness, reducing impulsive behavior, and improving injury-prevention culture.

6. Limitations & Suggestions

This study had several limitations. First, the research design was descriptive-correlational; therefore, causal relationships between Cognitive consequences of sports injuries, impulsivity, and sports injuries cannot be inferred. Second, the data were collected using self-report questionnaires, which may be affected by response bias, social desirability, or inaccurate recall of injury history. Third, the sample was selected through purposive and convenience sampling, which may limit the generalizability of the findings to all Iraqi swimmers. Fourth, the study did not control for some potentially important variables such as training load, swimming style, competitive level, previous rehabilitation history, coaching quality, and physical conditioning status.

Future studies should use longitudinal and prospective designs to examine whether impulsivity predicts actual injury occurrence over time among swimmers. Researchers are also encouraged to include objective injury records, coach reports, medical evaluations, and training-load data alongside psychological questionnaires. Future research may compare swimmers across age groups, gender, competition levels, swimming styles, and training histories to determine whether the relationship between impulsivity and injury differs across subgroups. It is also recommended that future studies examine mediating or moderating variables such as mindfulness, stress, resilience, coach-athlete relationship, recovery behavior, and adherence to injury-prevention programs.

Swimming coaches, sport psychologists, and sport managers should integrate psychological screening and injury-related education into routine athlete development programs. Particular attention should be given to athletes with high non-planning and motor impulsivity, as these traits may increase vulnerability to injury. Practical interventions may include structured planning exercises, impulse-control training, mindfulness techniques, technical correction sessions, recovery education, and workshops on injury mechanisms, first aid, nutrition, physical fitness, and sport psychology. Swimming clubs and federations should also develop systematic injury-prevention protocols that combine physical preparation with cognitive and psychological training.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. It should be noted that participation in the present study was informed and voluntary, and all ethical considerations were observed. The ethical approval for this study was also obtained under the code IR.TABRIZU.REC.1404.001.

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Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contributed to this article.

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