

# THE INFLUENCE OF TRAINING FACILITY MANAGEMENT, INJURY RISK PERCEPTION, AND SELF-EFFICACY ON WUSHU TECHNICAL PERFORMANCE

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**Abstract:** Technical performance in wushu arises from the interplay of psychological factors, training-environment management, and safety perceptions. This study examined the effects of training facility management, injury risk perception, and self-efficacy on technical performance. **Methods:** A quantitative, cross-sectional correlational survey included 153 purposively selected participants. Data were collected with 4-point Likert scales. Item validity used Pearson's product-moment ( $r_{\text{calculated}} > r_{\text{table}} = 0.159$ ;  $N = 153$ ), and reliability used Cronbach's  $\alpha$  (0.869–0.963). Multiple linear regression ( $\alpha = 0.05$ ) in SPSS 25 tested effects. **Results:** The model was strong and significant ( $R = 0.833$ ;  $R^2 = 0.694$ ; adjusted  $R^2 = 0.688$ ;  $F(3,149) = 112.777$ ;  $p < 0.001$ ), indicating that 69.4% of performance variance was jointly explained by the three predictors. Self-efficacy showed a positive, substantive effect ( $B = 0.897$ ;  $\beta = 0.805$ ;  $t = 14.963$ ;  $p < 0.001$ ) and was the dominant predictor. Training facility management and injury risk perception did not exhibit significant direct effects at the 5% level ( $B = 0.023$ ;  $p = 0.665$ ;  $B = 0.041$ ;  $p = 0.434$ ). **Conclusions:** Self-efficacy is the principal lever for improving technical performance, whereas facility quality and risk perception likely act indirectly through session quality, feedback intensity, and a supportive learning climate. Practical implications suggest graded mastery experiences, expert modeling, and criterion-referenced video feedback to strengthen competence beliefs and skill transfer. Limitations relate to the cross-sectional design, which restricts causal inference. Future research should test mediating and moderating pathways via structural equation modelling and multilevel approaches, employ video- or standardised-judge-based assessments for greater objectivity, and adopt longitudinal or experimental designs to map mechanisms more precisely in wushu athletes.

**Keywords:** Training facility management; injury risk; self-efficacy; technical performance

## INTRODUCTION

Technical performance in wushu requires precise coordination, speed, directional accuracy, and timing control emerging from the interplay between individual characteristics and training design. Motor-learning research indicates that technical output is multi-determined by neuromuscular capacity, cognitive processing, and learning-environment quality, so analyses must address how these components interrelate (Kok et al., 2019). Practice with appropriate structure, intensity, and feedback—particularly when athletes can regulate feedback duration and frequency—strengthens skill through cognitive-motor reinforcement pathways, with self-efficacy acting as a proximal psychological mechanism shaping effort, attentional focus, and persistence when errors occur (Nor et al., 2024). Aligning task parameters, feedback strategies, and control over practice exposure is therefore strategic for steering learning trajectories towards mastery with clear, staged performance criteria (Arias et al., 2019). Mapping the interaction among individual, cognitive, and environmental factors thus provides a rational basis for practice programmes that support technical mastery, reliable execution, and competition-ready performance.

Training-facility management constitutes a prerequisite for meaningful repetition, competition simulation, and timely feedback that uphold learning quality. Although space, training aids, lighting, scheduling, and documentation do not automatically raise technical scores, they enhance practice certainty, exposure consistency, and regular performance evaluation, making learning more structured (Mödinger et al., 2021). Facility governance—including the

management of athlete flow and access to recording devices—shapes the effectiveness of video feedback for motor learning and tactical adaptation (White et al., 2024). Self-controlled feedback, whereby athletes regulate the frequency and content of feedback, further increases engagement, self-regulation, and the meaningful use of information for movement refinement (Meer et al., 2023). Consequently, the orchestration of physical resources, schedules, and evaluation protocols must be aligned with task demands and feedback strategies so that learning remains mastery-oriented rather than a simple accumulation of scores, and well-managed facilities become enabling conditions that reinforce training design, support reliable technical execution over time, and sustain gains across phases of technical learning.

Self-efficacy is conceptualised as the proximal psychological link between training design and technical output, as belief in one's capacity to meet movement demands influences strategy selection, effort allocation, persistence, and attention to relevant cues, with a frequently dominant contribution to performance variance (Mile et al., 2025). In wushu, self-efficacy is strengthened through repeated mastery experiences, specific feedback, and incremental targets, and its effects are amplified when athletes control the rhythm and frequency of video feedback in line with task complexity (Meer et al., 2023). At the same time, training facilities and injury-risk perception define the operational frame and require dosage adjustments so that progress is not undermined by excessive cognitive–motor load or threats to perceived safety (Lowenthal et al., 2021). Thus, self-efficacy underpins competence-building pathways, while facility management and calibrated risk perception maintain practice continuity and correction accuracy, making the enhancement of self-efficacy through structured practice and targeted feedback a key lever for consistent, measurable development of wushu technical expertise, shortened movement-pattern consolidation, strengthened competitive confidence, and stabilised performance under demanding conditions.

A risk-of-injury perspective is crucial because wushu involves high speed, aggressive directional changes, and rapid positional transitions. Risk perception theoretically shapes attention, emotion regulation, and decision-making, such that athletes' appraisals of risk can directly and indirectly alter performance dynamics (Snapp et al., 2023). These effects are moderated when training environments proportionally regulate load exposure, practice frequency, and feedback quality through progressive schemes that consider readiness and baseline skill. Empirical evidence indicates that risk perception calibrated to competence can sharpen vigilance and motor control, whereas excessive exposure disrupts movement flow and reduces response accuracy (Blagus et al., 2023). For intervention design, risk intensity must therefore be balanced with mastery goals by staging tasks, managing repetitions, and incorporating guided reflection to preserve fluent execution (Romdhane et al., 2025), so that risk calibration becomes a pedagogical variable that keeps training safe and effective, maintains movement quality, and minimises psychological barriers that could impair focus, commitment to technical choices, and the transfer of skills to competition at different levels.

Self-efficacy alone does not determine performance; environmental factors and sensory-based interventions also shape technical learning. Video-based feedback delivered in a self-controlled manner increases engagement, affective accuracy, and intrinsic motivation, thereby strengthening motor-learning capacity and supporting transfer to competitive contexts (Breda et al., 2017). Repeated mastery experiences supported by specific feedback routines foster active participation, proactive learning behaviours, and practice consistency (Campos & Taissun, 2024). In parallel, psycho-pedagogical elements—such as perceived instructor support, communication quality, and interaction dynamics—are associated with goal meaning, emotion regulation, and persistence when technical difficulties arise (Strandberg et al., 2024). These components should be integrated into a training curriculum that balances psychological demands, facility availability, and safety protocols to cultivate stable, measurable execution (Yang et al., 2019), so strengthening self-efficacy must be accompanied by a supportive learning ecology in which structured practice, a culture of mentoring, and effective feedback mechanisms collectively sustain motivation, reflective quality, and correction efficiency from session to session.

Previous studies confirm that video feedback enhances technical skills through attentional mechanisms, movement representation, and decision-making, with stronger effects when athletes control their exposure (Ma et al., 2025). In wushu, this practice is embedded in facility management, as the availability of cameras, recording spaces, and review protocols permits structured, iterative evaluation and directs correction towards the precise details of forms (Brenton et al., 2019). Expert modelling combined with positive reinforcement accelerates motor adaptation and helps stabilise tempo, angles, and positional transitions as indicators of technical performance (Yorganci, 2022). Planned video use also functions as a tool for calibrating risk perception by enabling athletes to identify error pat-

terms that may precipitate injury, thereby allowing adjustments to load, repetition counts, and task variation without diluting technical demands (Vold et al., 2023). Overall, integrating video-based facility management, proportionate risk regulation, and the reinforcement of self-efficacy through mastery experiences and targeted feedback is expected to yield tangible improvements in wushu technical performance, support skill transfer to competition, strengthen confidence, and promote consistent execution across competitive levels.

## **METHODS**

### ***Study Participants***

The study targeted individuals with experience in Wushu training or coursework (population size unknown). Purposive sampling was used with the following criteria: (1) school pupils who had attended Wushu training/courses; (2) university students who had attended Wushu training/courses; (3) athletes who had attended Wushu training/courses; and (4) willingness to complete the questionnaire in full. In total, 153 respondents met these criteria and were included in the analysis.

### ***Research Design***

This study employed a quantitative approach with a correlational–explanatory survey method to analyse the simultaneous and partial effects of Training Facility Management (X1), Perceived Injury Risk (X2), and self-efficacy (X3) on Wushu Technical Performance (Y). The design was cross-sectional; data were collected once using a four-point Likert-type questionnaire and analysed with multiple linear regression at a significance level of  $\alpha = 0.05$ .

### ***Research Instruments***

Data were collected using a questionnaire covering four variables: Training Facility Management (X1), Perceived Injury Risk (X2), self-efficacy (X3), and Wushu Technical Performance (Y). A four-point Likert scale was applied, ranging from 1 (“Very Inappropriate”) to 4 (“Very Appropriate”). Each variable was operationalised into four indicators with 16 items, producing 64 initial items. No pilot testing was conducted; instead, item validity was assessed directly on the study data using Pearson Product–Moment correlation in SPSS version 25.0. Items with  $r_{\text{calculated}} < r_{\text{table}}$  (0.159;  $N = 153$ ) were removed. The final valid item counts were 16 for each variable (X1, X2, X3, Y), with all retained items having  $r_{\text{calculated}} > 0.159$ , indicating satisfactory validity. Reliability was tested using Cronbach’s alpha, yielding  $\alpha = 0.940$  (X1), 0.869 (X2), 0.944 (X3), and 0.963 (Y), all above the 0.70 threshold, indicating high internal consistency and suitability of the instrument.

### ***Data Collection Procedures***

Questionnaires were administered to students and athletes over four weeks using both online (Google Forms) and offline (face-to-face at campuses/schools) modes. Respondents received brief guidance to ensure understanding of items and were reminded to answer honestly. All returned questionnaires were checked for completeness before data processing and analysis.

### ***Data Analysis Techniques***

Data analysis followed several stages. After preliminary checks, multiple linear regression was used to assess simultaneous and partial relationships between the independent variables (X1, X2, X3) and the dependent variable (Y). Statistical significance of simultaneous effects was tested with the F-test, and partial effects with the t-test, both at  $\alpha = 0.05$ . The coefficient of determination ( $R^2$ ) was calculated to estimate the proportion of variance in Wushu Technical Performance explained by the independent variables. All analyses were performed using SPSS version 25.0.

## **RESULTS**

### ***Descriptive Statistics***

Data from 153 respondents showed that Self-Efficacy (X3) had the highest mean ( $M = 53.84$ ;  $SD = 7.27$ ), followed by Training-Facility Management (X1) ( $M = 51.80$ ;  $SD = 8.28$ ) and Wushu Technical Performance (Y) ( $M = 51.32$ ;  $SD = 8.11$ ), while Injury-Risk Perception (X2) had a lower mean ( $M = 47.52$ ;  $SD = 7.79$ ). All variables had score ranges of 16–64, indicating adequate dispersion for subsequent modelling. Descriptively, athletes’ perceived

self-efficacy exceeded their perceived injury risk, and technical performance clustered within a similar band to facility-management quality, providing an initial context for testing each predictor’s contribution to technical performance.

**Table 1.** Descriptive statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Dev.
Training-Facility Management (X1)	153	22.00	64.00	51.7974	8.27994
Injury-risk Perception (X2)	153	16.00	64.00	47.5163	7.78841
Self-Efficacy (X3)	153	16.00	64.00	53.8366	7.27420
Wushu Technical Performance (Y)	153	16.00	64.00	51.3203	8.10511
Valid N (listwise)	153				

**Model Summary**

The multiple-regression model including X1, X2, and X3 to predict Y demonstrated a strong overall fit (R=0.833), with R<sup>2</sup>=0.694 and Adjusted R<sup>2</sup>=0.688. Thus, 69.4% of the variance in wushu technical performance is jointly explained by the three predictors, with a standard error of the estimate (SEE) of 4.53 points. Substantively, this indicates the model has considerable explanatory power for the outcome.

**Table 2.** Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.833 <sup>a</sup>	.694	.688	4.526

a. Predictors: (Constant), Self-Efficacy (X3), Injury-risk Perception (X2), Training-Facility Management (X1)

**Model ANOVA**

The ANOVA yielded F(3,149)=112.777; p<0.001, indicating the overall model is statistically significant. At α=0.05, we therefore reject H0 (H0: β1=β2=β3=0) and accept Ha (at least one β≠0). In practical terms, including the three predictors together significantly improves prediction of technical performance relative to a model with no predictors.

**Table 3.** ANOVA

ANOVA <sup>a</sup>					
Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	6932.338	3	2310.779	112.777	.000 <sup>b</sup>
1 Residual	3052.969	149	20.490		
Total	9985.307	152			

a. Dependent Variable: Wushu Technical Performance (Y)

b. Predictors: (Constant), Self-Efficacy (X3), Injury-risk Perception (X2), Training-Facility Management (X1)

**Model Coefficients**

At the partial level, only Self-Efficacy (X3) contributed significantly to Wushu Technical Performance (Y) (B=0.897; β=0.805; t=14.963; p<0.001). Hence, a one-unit increase in X3 is associated with a 0.897-point increase in technical-performance scores, controlling for X1 and X2. In contrast, Training-Facility Management (X1) (B=0.023; p=0.665) and Injury-Risk Perception (X2) (B=0.041; p=0.434) were not significant at α=0.05, indicating their unique contributions to Y were not supported in this model. The intercept was non-significant (p=0.961), which is common under bounded rating scales.

**Table 4. Coefficients**

Model	Coefficients <sup>a</sup>			t	Sig.
	Unstand. Coef.		Standa. Coef.		
	B	Std. Error	Beta		
(Constant)	-.154	3.131		-.049	.961
1 Training-Facility Management (X1)	.023	.054	.024	.434	.665
Injury-risk Perception (X2)	.041	.053	.040	.784	.434
Self-Efficacy (X3)	.897	.060	.805	14.963	.000

a. Dependent Variable: Wushu Technical Performance (Y)

Partial Hypothesis Decisions:

1.  $H_{01} (\beta_1=0, X1)$ : Not rejected (non-significant)
2.  $H_{02} (\beta_2=0, X2)$ : Not rejected (non-significant)
3.  $H_{03} (\beta_3=0, X3)$ : Rejected  $\rightarrow H_{a3}$  accepted (X3 has a significant positive effect)

## DISCUSSION

The multiple regression model combining training-facility management (X1), injury-risk perception (X2) and self-efficacy (X3) explained 69.4% of the variance in wushu technical performance (Y;  $R^2 = 0.694$ , F significant), with partial tests indicating self-efficacy as the dominant predictor ( $\beta = 0.805$ ;  $p < 0.001$ ), whereas X1 and X2 were not significant at the 5% level (Reigal et al., 2019; Chen et al., 2019). This pattern is consistent with evidence that self-efficacy predicts athletic performance through self-regulation, goal setting and adaptive training strategies (Lochbaum et al., 2022; Carreres-Ponsoda et al., 2021). The higher mean scores for self-efficacy relative to the other variables suggest that belief in personal capability is a crucial source of performance variance (Musculus et al., 2018). Within this framework, athletes' confidence in mastering technical tasks promotes self-control, persistence, strategy selection and constructive use of feedback, positioning self-efficacy as the principal determinant of performance variation in this sample and a key target in evidence-informed coaching designs.

The absence of significant direct effects for training-facility management and injury-risk perception at the 5% threshold invites consideration of mediated and moderated pathways by which X1 and X2 influence Y via X3. A data-congruent explanation is that facilities in the sampled clubs already meet a sufficiency threshold, so additional quality variation does not translate linearly into performance. Alternatively, training-facility management may affect performance indirectly through session quality, feedback intensity and structured practice, which can attenuate any direct X1–Y association (Popa et al., 2020). This interpretation accords with work emphasising that features of the training environment shape technical outputs even when physical resources do not emerge as direct predictors (Booth et al., 2018). The non-significant coefficient for injury-risk perception may similarly reflect moderating influences not explicitly modelled, including safety climate, coach support and performance culture (Chun et al., 2022; Stanković et al., 2022). Conceptually, facilities and risk management operate through mediators such as session quality, strengthened feedback and opportunity structures, thereby retaining importance for safety and opportunity while exerting primarily indirect effects on performance (Peng & Zhang, 2021; Galarraga et al., 2020). Clarifying these indirect mechanisms and the characteristics of the training setting is therefore critical for proportionate interpretation of the present results.

Descriptive statistics showing the highest mean levels for self-efficacy further underline its role as a central source of self-regulation. Self-efficacy strengthens goal setting, adaptive motor-learning strategies and persistence when encountering difficulty (Liang et al., 2024), while elevated efficacy beliefs are associated with reduced cognitive load during complex movement sequences and more durable skill consolidation (Lee et al., 2024). Cross-disciplinary evidence links self-efficacy with motivation, successful motor learning, emotion regulation and mental toughness, all of which support performance under high-risk conditions (Ramolale et al., 2021). Psychologically safe learning environments and social support from coaches and peers magnify these effects by reinforcing competence beliefs and improving technical quality and performance outcomes (Koper et al., 2020). Accordingly, maximising the psychological and social conditions that underpin self-efficacy through mastery experiences, targeted feedback and appropriate modelling is a strategic avenue for accelerating technical acquisition and maintaining performance consistency across training cycles, tournament phases and competition.

The standardised coefficient of 0.805 observed here implies that even modest gains in self-efficacy are accompanied by substantial improvements in technical performance scores, underscoring clear practical implications for coaching. Meta-analytic syntheses consistently document robust associations between self-efficacy and athletic performance, with downstream effects on training adherence and competition outcomes (Lochbaum et al., 2023). Interventions that cultivate efficacy via graded mastery experiences, calibrated task-based feedback, credible modelling and specific verbal persuasion have been shown to yield sustainable performance gains (Anstiss et al., 2018; Brace et al., 2020). Self-regulation processes influenced by self-efficacy further support task planning and the adoption of effective strategies in particular performance settings (Ermiş & Çankaya, 2023). Complementary strategies such as video feedback, structured self-talk and motor imagery can reinforce competence beliefs, lower cognitive load and accelerate motor learning (Lee et al., 2024; Popa et al., 2020). When combined with social persuasion and peer involvement as sources of positive support (Koper et al., 2020; Ramolale et al., 2021), these cognitive, behavioural and social techniques constitute a coherent portfolio for enhancing self-efficacy and optimising the transfer of technical skills from training to formal assessments and demanding match situations.

Given that the influence of self-efficacy on technical performance is unlikely to follow a simple linear pathway, modelling mediation and moderation is necessary to capture the interplay between psychological and environmental variables. Empirical work suggests that safety climate, coach support and performance culture can moderate the strength of the self-efficacy–performance relationship (Chun et al., 2022), whereas session quality, feedback intensity and structured practice mediate links between facilities, risk perceptions and outcomes via self-efficacy (Galarraga et al., 2020). Studies of self-regulation and attentional management further indicate that efficacy beliefs guide focus, strategy selection and the precise execution of movement sequences in high-skill sports (Reverdito et al., 2023; Liang et al., 2024). In motor learning contexts, integrating self-efficacy with task-based training designs, expert demonstration, paired practice and repeated evaluations promotes comprehensive self-regulation and supports coherent sequence execution under high-tempo demands (Larumbe-Zabala et al., 2020; Ramolale et al., 2021). Priority should therefore be given to mapping mediation and moderation so that training interventions can be tuned to athlete characteristics and specific environmental conditions, thereby identifying when enhancing self-efficacy yields the largest gains in technical mastery and performance stability.

Methodologically, the present pattern of interlinked, and potentially nonlinear, relationships among self-efficacy, facilities, injury-risk perception and performance supports the use of structural equation modelling to test hypothesised mediating and moderating mechanisms (Diotaiuti et al., 2017). Multilevel approaches that incorporate club and coach hierarchies are likewise valuable for capturing contextual nuances that shape these relationships (Carreres-Ponsoda et al., 2021). To reduce common-method bias, objective performance assessments using video recordings or standardised judges, together with rigorous reporting of inter-rater reliability, should be integrated into evaluation protocols (Stanković et al., 2022). Longitudinal or experimental designs with repeated measurements will further strengthen causal inference and clarify trajectories linking self-efficacy, facilities and risk management to performance across competitive development stages (Larumbe-Zabala et al., 2020). In combination, structural equation modelling, multilevel analysis and objective assessment procedures provide a robust methodological platform for testing the mechanisms proposed here and for evaluating the effectiveness of technical training programmes in wushu.

At the applied level, emphasising self-efficacy within the broader ecology of the training environment has strategic implications for programme design in clubs and coaching practice. Integrating the self-efficacy model with key environmental features offers a comprehensive framework for explaining variation in technical performance, in which facility quality and safety climate function as reinforcing conditions for goal setting, task planning and adaptive strategy use (Galarraga et al., 2020). Practical implementation can include staged learning sequences, expert demonstrations, targeted feedback, peer involvement and video-based reflection sessions organised around micro-targets and performance benchmarks, thereby promoting continuous improvement, training discipline and efficient use of training time (Reverdito et al., 2023; Ermiş & Çankaya, 2023). Structured coach–athlete interactions that document progress with clear process and outcome indicators, supported by progressive reinforcement, timely feedback and collegial support, enable objective monitoring of intervention effects and facilitate skill transfer from practice to match situations across competitive levels (Anstiss et al., 2018; Koper et al., 2020). Clubs can additionally formalise mentoring arrangements, periodic review meetings and individualised planning to sustain motivation and adherence during intense schedules. By combining psychological and ecological perspectives in this way, coaches can tailor

interventions to individual athletes and situational demands, increase coaching effectiveness and sustain technical outcomes over time, ensuring that efforts to enhance self-efficacy remain directly relevant to the competitive situations athletes face in real tournaments.

## CONCLUSIONS

This study confirms self-efficacy as the principal determinant of wushu technical performance. A multiple regression with training-facility management, injury-risk perception and self-efficacy explained 69.4% of performance ( $R^2 = 0.694$ ), but only self-efficacy showed a partial effect ( $\beta = 0.805$ ;  $p < 0.001$ ), while facilities and risk perception had no direct effects, suggesting indirect pathways via session quality, feedback and the learning and safety climate. Because competence beliefs underpin self-regulation and strategy selection, coaching programmes should strengthen self-efficacy through mastery experiences, expert modelling, targeted feedback, video monitoring, peer support, verbal persuasion and cognitive strategies such as self-talk and imagery combined with behavioural drills and paired tasks to reduce cognitive load and stabilise performance. Training plans should incorporate micro targets, measurable indicators and periodic reflection, and clubs should create a strong safety climate and well-structured sessions (duration, intensity and directed practice), supported by technical benchmarks and progress reports, to enable individual adjustment, transfer of skills to competition and tangible, measurable, sustainable gains. The cross-sectional design and these non-significant direct effects limit causal inference and indicate the need for future research using SEM and multilevel models, longitudinal or experimental repeated-measures designs, and video-based or standardised-judge assessments with inter-rater reliability, together with broader sampling across clubs and competitive tiers and explicit modelling of environmental variables (session quality, feedback intensity, load and safety climate) as mediators or moderators to map mechanisms and optimise evidence-based coaching strategies.

## Conflict Of Interest

The authors declare no conflicts of interest.

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