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Research Article

Skill-Related Fitness and Its Correlation with Taekwondo Athletes' Performance

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ABSTRACT

Skill-related fitness contributes to the physical demands of Taekwondo, particularly movements requiring rapid responses, coordination, balance, power, agility, and speed. This study examined the relationship between skill-related fitness components and the competitive performance of Taekwondo athletes. A quantitative descriptive-correlational design was employed involving 18 purposively selected athletes from two Taekwondo training groups in Bohol, Philippines. Skill-related fitness was assessed using standardized field-based tests for agility, balance, coordination, lower-body power, reaction time, and speed, while competitive performance was determined using a structured performance rating form supported by competition records. Descriptive statistics and Pearson's product-moment correlation were used to analyze the data. Results showed positive relationships between competitive performance and agility, reaction time, coordination, and speed, while balance and lower-body power showed weaker positive associations. However, none of the relationships reached statistical significance. The overall level of skill-related fitness also showed a positive but statistically non-significant relationship with Taekwondo performance. Descriptively, gold medalists demonstrated relatively better performance than silver medalists in selected components, particularly agility, coordination, and reaction time. These findings indicate possible performance-related patterns in skill-related fitness, although they should be interpreted cautiously given the small sample size. Further studies involving larger and more diverse samples are recommended to clarify the contribution of skill-related fitness to competitive Taekwondo performance.

Keywords: *Athletic performance, Skill-related fitness, Taekwondo performance*

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Introduction

Taekwondo is a high-intensity, precision-based combat sport that demands more than technical skill. Success in competition relies on the athlete's ability to react quickly, move efficiently, and execute explosive techniques under pressure. Matches are structured into three two-minute rounds with brief rest intervals, where points are awarded based on strikes, timing, and tactical execution. In this environment, skill-related fitness components like agility, balance, coordination, power, speed, and reaction time are not just supportive traits but essential contributors to performance.

These physical qualities underpin the movement strategies required in Taekwondo. Agility supports rapid directional changes; balance allows for controlled kicking and stable transitions; coordination and reaction time contribute to the timing and accuracy of both offensive and defensive actions. Power and speed, meanwhile, influence the force, precision, and timing of strikes factors that often determine the outcome of a match. Despite the clear performance relevance of these components, much of the existing research has focused on health-related fitness attributes like cardiovascular endurance or muscular strength, particularly in broader physical education and youth training contexts.

In contrast, the theoretical perspectives offered by Corbin and Hoeger place skill-related fitness at the core of athletic success in sports requiring quick, precise movements. According to their framework, athletes with well-developed skill-based attributes are more likely to excel in motor-demanding activities. This study adopts their position as a basis for investigation, asking whether these theoretical claims hold true in the context of competitive Taekwondo.

While prior work by Nam and Lim (2019) and Boguszewski et al. (2019) explored general physical fitness benefits of martial arts, they did not assess the performance-specific impact of skill-related traits. Fong, Ng, and Chung (2013) included reaction time in their comparison of Taekwondo practitioners and non-practitioners, but did not link this to competitive success. Even Kazemi, Perri, and Casella's (2010) analysis of medal-winning athletes

focused on demographic and anthropometric factors such as age, weight, and BMI overlooking the potential influence of agility, coordination, and speed.

Skill-related fitness provides a more specific basis for examining the movement demands of competitive Taekwondo. The present study focuses on six components: agility, balance, coordination, power, reaction time, and speed because these attributes support rapid changes in direction, postural control, coordinated movement, explosive actions, timely responses, and quick execution during competition. Examining these components together may provide a clearer understanding of how skill-related fitness is associated with competitive performance among Taekwondo athletes.

This gap is particularly notable when determining what sets apart gold medalists from other competitors. While it's widely accepted in the field that skill-related fitness plays a critical role in combative sports, very few studies have been conducted on what specific components are associated with outstanding achievement. Knowing this could offer coaches and athletes clearer direction in tailoring training to match performance demands.

To date, few studies have explored how multiple skill-related fitness components relate to actual competition performance in Taekwondo, particularly among non-elite or community-based athletes. Even fewer have examined which traits most strongly predict podium placements, especially gold medal outcomes. This study aims to address this gap by examining the relationship between skill-related fitness and competitive performance in Taekwondo. Specifically, it investigates which components are most prominent among medalists, and whether Corbin and Hoeger's theoretical concepts accurately reflect the physical demands of success in this sport.

Study Hypotheses

1. There is a statistically significant relationship between the proficiency levels of skill-related fitness components (agility, balance, coordination, power, reaction time, and speed) and the competition performance of Taekwondo athletes.

2. Athletes with higher proficiency in skill-related fitness components will demonstrate higher performance scores in Taekwondo competitions.

Methods

The researchers employed a descriptive-correlational research design to explore the relationship between the proficiency level of skill-related fitness components and competition performance among Taekwondo athletes. Standardized physical fitness assessments and structured performance rating tools were used to collect data from selected participants.

Participants

The study involved eighteen ($n = 18$) Taekwondo athletes selected through purposive sampling based on the specified inclusion criteria. The sample size reflected the limited availability of athletes in Bohol who met these requirements. Participants included male and female athletes with varying ages and competition experience.

To qualify for inclusion, athletes had to meet the following criteria: (1) active participation in official Taekwondo competitions, and (2) current enrollment in a structured training program under the supervision of a certified coach. Athletes aged 30 and above, as well as those without prior competition experience, were excluded from the study. All participants were medically cleared and provided informed consent prior to participation.

Participants were drawn from two separate Taekwondo training groups to ensure balanced representation and a broader perspective on performance trends. If a selected athlete chose not to participate or withdrew at any point, a replacement was selected using the same inclusion criteria to maintain sample consistency. Key characteristics considered during selection included age, gender, training background, and competition experience, allowing for a well-rounded participant pool aligned with the study's focus on skill-related fitness and athletic performance.

Data Collection Tools and Procedures

Two main tools were utilized in this study: standardized field-based fitness tests and a

structured performance rating questionnaire. The skill-related fitness components were assessed using standardized tests adapted from Principles and Labs for Physical Fitness by Werner W.K. Hoeger.

These tests included:

1. Agility: Illinois Agility Test
2. Balance: Stork Stand Test
3. Coordination: Alternate Hand Wall Toss Test
4. Power: Standing Long Jump
5. Reaction Time: Ruler Drop Test
6. Speed: 40-meter Sprint Test

To evaluate competitive performance, the researchers used a structured performance rating form designed specifically for this study. It consisted of three parts:

1. Competition Performance Status – athletes reported their general level of success in previous competitions.
2. Level of Competition – participants identified the highest tournament level they had competed in (e.g., Saulog, Boholympics, CVIRAA, PTA Regionals).
3. Recognition Achieved – athletes recorded their highest competitive award (gold, silver, or bronze medal) in Taekwondo events.

To ensure the accuracy of the data, athlete self-reports were verified using official competition records and documentation. All testing and data collection were conducted under standardized conditions to support consistency and reliability across participants.

Data Analysis

Descriptive statistics including percentages, means, and standard deviations were used to summarize skill-related fitness scores and performance outcomes. A weighted mean was calculated to assess overall proficiency across the six fitness components. To examine the relationship between skill-related fitness and athletic performance, the Pearson product-moment correlation coefficient (Pearson r) was computed. A significance level of $p < 0.05$ was established as the threshold for statistical inference. All analyses were conducted using standard statistical software.

Result

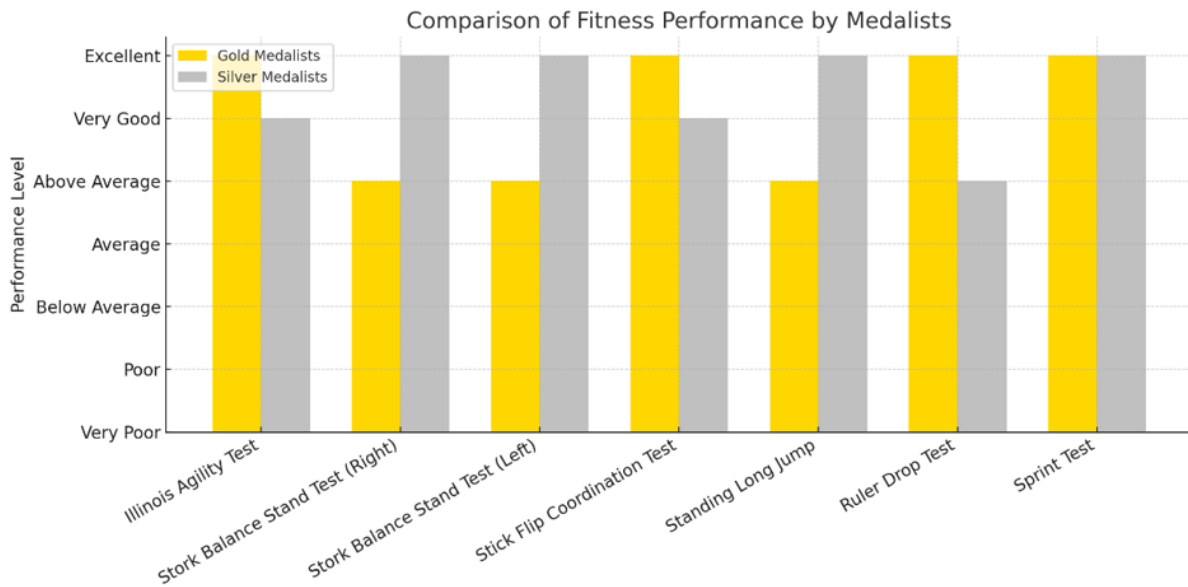


Figure 1. Status of taekwondo athletes' performance

Figure 1 depicts the comparative performance of gold and silver medalists across all measured fitness components. Gold medalists consistently outperformed silver medalists in agility, coordination, and reaction time, as re-

flected by higher bar heights in these categories. The difference was particularly notable in the Illinois Agility Test and Stick Flip Coordination Test, where gold medalists showed a clear advantage.

Table 1. Level of skill-related fitness components

Fitness Components	Category	Percentage (%)
Illinois Agility Test	Excellent	67
	Above Average	33
Stork Balance	Excellent	44
	Above Average	33
	Average	22
Stick Flip Coordination Test	Excellent	67
	Above Average	11
	Average	22
Standing Long Jump	Excellent	33
	Above Average	44
	Average	6
	Very Good	17
Ruler Drop Test	Excellent	56
	Above Average	44
Sprint Speed Test over 30 meters	Excellent	100

Table 1 summarizes the distribution of skill-related fitness component scores among all athletes. The majority of participants achieved the highest ratings in agility and coordination, with over two-thirds rated as

“Excellent” in both the Illinois Agility Test and Stick Flip Coordination Test. In contrast, scores in the Stork Balance and Standing Long Jump were more broadly distributed, indicating a greater variability in balance and lower-body

power within the group. Remarkably, all athletes attained "Excellent" in the 30-meter Sprint Speed Test, underscoring speed as a common strength.

Table 2. Correlation of Taekwondo Athlete's Performance with the Skill-Related Fitness Components

Skill-Related Fitness Components	Pearson's r	P-value	Decision on H₀	Interpretation
Illinois Agility Test	0.43	0.075	Fail to reject H ₀	Not significant
Stork Balance Stand Test	0.199	0.429	Fail to reject H ₀	Not significant
Stick Flip Coordination	0.33	0.181	Fail to reject H ₀	Not significant
Standing Long Jump Test	0.12	0.635	Fail to reject H ₀	Not significant
Ruler Drop Test	0.36	0.142	Fail to reject H ₀	Not significant
Sprint Speed Test Over 30 Meters	0.32	0.195	Fail to reject H ₀	Not significant
Level of skill-related fitness and Taekwondo athlete's performance	0.40	0.100	Fail to reject H ₀	Not significant

Table 2 presents the correlations between each skill-related fitness component and overall Taekwondo performance. Positive correlations were observed for agility ($r = .43$, $p = .075$), balance ($r = .199$, $p = .429$), coordination ($r = .33$, $p = .181$), lower-body power ($r = .12$, $p = .635$), reaction time ($r = .36$, $p = .142$), and speed ($r = .32$, $p = .195$). However, none of these relationships reached statistical significance at the .05 level. The overall level of skill-related fitness also showed a positive correlation with Taekwondo performance ($r = .40$, $p = .100$), but this relationship was likewise not statistically significant. These findings indicate that, although some fitness components showed positive associations with performance, the null hypothesis was not rejected for any individual component or for overall skill-related fitness in this sample.

Discussion

The findings of this study showed positive associations between agility, coordination, reaction time, speed, and Taekwondo performance; however, none of these relationships reached statistical significance at the .05 level. Among the measured components, agility showed the strongest positive correlation with performance, followed by reaction time, coordination, and speed. Although these trends suggest that athletes with better performance in these components may also tend to perform better in competition, the results should be interpreted cautiously given the small sample size. Descriptively, gold medalists also demonstrated better performance than silver medalists in several fitness components, particularly

agility, coordination, and reaction time. These observed patterns are consistent with previous studies by Chaabene et al. (2017) and Phogat et al. (2023), which emphasized the relevance of agility and rapid neural responsiveness in Taekwondo performance.

These observations are consistent with broader literature. Wazir et al. (2019) reported that elite Taekwondo athletes exhibited higher speed, power, and motor coordination than non-elite athletes, while Sadowski et al. (2012) and Čular et al. (2013) emphasized the importance of speed and dynamic strength in successful Taekwondo sparring. Gunawan (2021) similarly noted differences in speed, agility, flexibility, and reaction time between Taekwondo and karate athletes, highlighting the physical demands associated with Taekwondo performance.

The observed trends in the present study are also relevant to previous research on structured training programs that emphasize agility, neuromuscular coordination, and high-intensity interval training (Monks et al., 2017; Stankovic et al., 2024). Similarly, Jimenez and Ofrin (2025) found that structured physical education interventions, particularly aerobic gymnastics, significantly improved students' agility, coordination, physical fitness, and competitive engagement, reinforcing the potential value of targeted exercise programs. In the present study, the comparatively better coordination performance observed among gold medalists provides descriptive support for the possible relevance of reaction-based and reflex development exercises, although the correlation between coordination and competition

performance was not statistically significant. Adding further support from related combat-sport research, Salem et al. (2023) found that Bulgarian bag exercises in judo training improved strength, speed, flexibility, coordination, and technical skill performance. These findings from previous studies suggest that dynamic and multimodal training approaches may be useful for developing physical attributes relevant to combat sports.

Recent research applying Self-Determination Theory in Taekwondo contexts emphasizes that competence, relatedness, and autonomy significantly influence students' motivation and continued engagement in training activities, with competence emerging as the strongest predictor of motivation (Catapang et al., 2026). This perspective complements the present study's observation that agility, coordination, reaction time, and speed showed positive, although statistically non-significant, relationships with competitive performance. As athletes develop these physical competencies, they may also strengthen their sense of competence and confidence, which can further reinforce motivation, sustained participation, and long-term performance improvement. Competence, relatedness, and autonomy were all significant predictors of motivation in the Taekwondo engagement study, with competence showing the strongest effect.

Although agility, coordination, reaction time, and speed showed relatively stronger positive correlations with performance, none of these relationships reached statistical significance. Balance and lower-body power likewise showed weak and non-significant correlations with competition performance. These findings suggest that no single skill-related fitness component measured in the present study can be considered a statistically established determinant of medal outcomes. Nevertheless, previous studies have demonstrated the importance of these physical qualities in specific aspects of Taekwondo performance.

Beyond physical attributes, psychological and cognitive factors are increasingly recognized as influential in Taekwondo performance. Hsieh et al. (2025) linked dynamic balance and inhibitory control to field performance, while Nabilpour et al. (2023)

demonstrated that mental toughness, emotional regulation, and resilience contribute positively to both physiological and competitive outcomes. This underscores the value of a holistic approach to athlete preparation that integrates psychological skills training alongside physical conditioning.

The patterns observed in the present study may be considered alongside the findings of Vivek (2014), who emphasized the contribution of skill-related fitness to sports performance. Similarly, Liu and He (2022) reported an association between physical fitness test performance and competitive success in Taekwondo. However, unlike those findings, the correlations observed in the present sample did not reach statistical significance. This difference may partly reflect the small sample size and the characteristics of the participating athletes.

The small sample of 18 purposively selected athletes limits the precision of the estimated relationships and the statistical power to detect associations. The findings should therefore be interpreted within the context of the participating athletes and training groups, with limited generalizability to other Taekwondo populations. The analysis did not control for factors such as years of experience, specific training routines, or injury history, all of which could influence performance outcomes. Future research should include larger, more diverse samples and multidimensional assessments to determine whether the observed patterns hold across broader groups of athletes and to examine the combined contributions of physical, technical, and psychological factors to performance.

Overall, the findings of this study showed positive but statistically non-significant relationships between several skill-related fitness components and competitive performance among the participating Taekwondo athletes. Agility, reaction time, coordination, and speed demonstrated comparatively stronger positive correlations than balance and lower-body power, although none reached the .05 level of statistical significance. These trends are generally consistent with literature highlighting the relevance of agility, coordination, reaction time, speed, and other physical attributes in Taekwondo and related combat sports. For

coaches and practitioners, the findings may provide preliminary information for training considerations, but they should not be interpreted as evidence that any single component independently determines competitive success.

In addition to the skill-related fitness components measured in this study, it is important to recognize other physical qualities that contribute significantly to Taekwondo performance. Specific muscular strength subtypes, such as strength endurance, strength characterized by speed, and explosive strength, play a decisive role in delivering sustained, rapid, and high-power techniques during matches. Likewise, endurance capacities, particularly maximum speed endurance and less-than-maximum speed endurance, are critical for maintaining performance intensity over Taekwondo's three high-intensity rounds, each lasting two minutes. Although these variables were not directly assessed due to the focused scope of the present research, their relevance is well supported in the literature and in practical coaching contexts. Future investigations would benefit from incorporating these measures alongside agility, coordination, reaction time, and speed to develop a more comprehensive understanding of the multifaceted demands that underpin competitive excellence in Taekwondo.

Conclusion

The study found positive but statistically non-significant relationships between skill-related fitness components and competitive performance among the participating Taekwondo athletes. Among the six components examined, agility showed the strongest positive correlation with performance, followed by reaction time, coordination, and speed, whereas balance and lower-body power demonstrated weaker associations. Descriptive comparisons also indicated relatively better performance among gold medalists in selected fitness components; however, these patterns should be interpreted cautiously given the small sample size and absence of statistically significant correlations. The findings provide preliminary evidence that may guide further investigation of skill-related fitness in competitive Taekwondo rather than

establishing any individual component as a determinant of medal success. Future studies involving larger samples and broader performance measures are needed to clarify these relationships.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. Coaches and trainers should prioritize agility, coordination, and reaction-time exercises within Taekwondo training programs to maximize competitive performance.
2. Training regimens should integrate high-intensity interval training (HIIT) and neuromuscular conditioning to further enhance athletes' speed and reflexes.
3. Balance and lower-body power exercises should be included as complementary components of training, supporting but not replacing the primary focus on reaction-based drills.
4. Future research should investigate the long-term effectiveness of targeted skill-related fitness interventions through longitudinal or experimental study designs.
5. Regular fitness profiling and assessment are recommended in training centers to enable individualized, sport-specific performance strategies for athletes.

Declaration of Artificial Intelligence and Language Editing Tools

Artificial intelligence tools, particularly ChatGPT, were used to support language refinement, organization of manuscript content, and improvement of clarity and coherence. Grammarly was also used to assist with grammar, spelling, punctuation, and language clarity. These tools supported the presentation and communication of the authors' ideas and research findings but were not used to generate research data, perform statistical analyses, or independently determine the study results and conclusions.

The authors retain full responsibility for the research methodology, data analysis, interpretation of findings, and final manuscript, including the accuracy of AI-assisted and language-edited content. All AI- and software-assisted revisions were reviewed and evaluated by the

authors to ensure consistency with the actual research procedures, data, and evidence. This declaration provides transparent disclosure of the use of AI and language-editing tools while affirming the authors' accountability for the integrity and quality of the published work.

The main findings (novelty) and why they are important and useful:

This study found that agility, reaction time, coordination, and speed showed stronger positive relationships with Taekwondo performance than balance and lower-body power, although none reached statistical significance. The overall level of skill-related fitness also showed a positive but non-significant relationship with performance. Gold medalists descriptively performed better than silver medalists in agility, coordination, and reaction time. These findings provide preliminary evidence that selected skill-related fitness components may be relevant to competitive performance and may help guide training and athlete assessment. However, the results should be interpreted cautiously because of the small sample size.

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