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Comparative Assessment of Selected Motor Fitness Components among International and National Level Taekwondo Players

[*1] Saurabh Ojha and [2]Dr. Amol Onkarrao Deshmukh

[*1] Research Scholar, B.P.E, B.P.Ed, M.P.Ed, Ph.D. (Pursuing), College of Physical Education, Shivaji Nagar, Yavatmal, Maharashtra, India.

[2] Principal, College of Physical Education, Shivaji Nagar, Yavatmal, Maharashtra, India.

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***Corresponding Author**
Saurabh Ojha
Research Scholar, B.P.E, B.P.Ed, M.P.Ed, Ph.D. (Pursuing), College of Physical Education, Shivaji Nagar, Yavatmal, Maharashtra, India.

Abstract
This investigation compared five selected motor fitness components in Taekwondo players competing at International and National levels: muscular endurance, reaction time, balance, flexibility, and agility. Participants were 140 male players drawn from different states of India. Of this total, 40 had competed at the International level and 100 at the National level. Their ages ranged from 20 to 35 years, and they had taken part in recognised competitions between 2020 and 2022. International-level participants were identified through purposive sampling, whereas the National-level group was formed using simple random sampling. The selected abilities were measured using the Lower Body Squat Test (muscular endurance), Nelson Foot Reaction Time Test (reaction time), Flamingo Balance Test (balance), Sit and Reach Test (flexibility), and Semo Agility Test (agility). Means and standard deviations were calculated, and differences between the two independent groups were examined with the t-test. Statistical significance was accepted at the 0.05 level. Significant group differences emerged for muscular endurance ($t = 2.655$), reaction time ($t = 2.731$), flexibility ($t = 2.689$), and agility ($t = 3.680$). The difference in balance was not statistically significant ($t = 0.640$). The International group had higher mean values for muscular endurance and flexibility, and shorter completion times for reaction time and agility. Overall, the results point to differences in four of the five assessed motor fitness components between International-and National-level players.

Keywords: Taekwondo, Motor Fitness, Muscular Endurance, Reaction Time, Balance, Flexibility, Agility.

Introduction

Taekwondo competition places varied physical demands on athletes. Competitors must deliver kicks quickly, move and reposition in different directions, defend against attacks, and sustain activity throughout a bout. Success therefore involves more than technical skill; it also relies on physical capacities and motor abilities that allow movements to be performed effectively in changing competitive situations.

Motor fitness refers to the physical abilities that support efficient movement. Its commonly recognised elements include muscular endurance, speed, power, agility, balance, flexibility, reaction time, and coordination. Each can contribute to Taekwondo skills: muscular endurance helps an athlete repeat actions, quick reactions support timely responses to an opponent, and balance assists in controlling body position while attacking or defending.

Flexibility is relevant to Taekwondo because many techniques, especially kicks, require movement through a considerable range of motion. Agility is also important, as players need to alter direction quickly without losing control. Together with other motor abilities, these qualities may support the execution and repeatability of techniques during competition.

International-and National-level competitors may differ in the level and nature of their competitive exposure and preparation. Comparing their motor fitness profiles can help identify components in which the groups differ and may offer information relevant to athlete preparation. Accordingly, this study examined selected motor fitness components in International and National level Taekwondo players.

Purpose of the Study
This study aimed to examine whether International and National level Taekwondo players differ in muscular endurance, reaction time, balance, flexibility, and agility.

Hypothesis
The study hypothesised that the International and National groups would differ significantly on the selected motor fitness measures: muscular endurance, reaction time, balance, flexibility, and agility.

Methodology
A comparative design was adopted to assess the selected motor fitness characteristics of International-and National-level Taekwondo players.

Selection of Subjects
The study involved 140 male Taekwondo competitors representing different states of India. Forty participants belonged to the International-level category and 100 to the National-level category. All were between 20 and 35 years old and had competed in recognised Taekwondo events during 2020– 2022.

Sampling Technique
International-level players were selected purposively. The National-level participants were selected by means of simple random sampling.

Selection of Variables and Tests
Five motor fitness variables were included in the investigation. The corresponding tests and recorded measures, as identified in the thesis, are listed in the following table.

Motor Fitness Component	Test/Tool	Criterion Measure
Muscular Endurance	Lower Body Squat Test	Number of repetitions/score
Reaction Time	Nelson Foot Reaction Time Test	Seconds
Balance	Flamingo Balance Test	Seconds
Flexibility	Sit and Reach Test	Centimetres
Agility	Semo Agility Test	Seconds

Collection and Statistical Analysis of Data
Each of the five tests was administered to the 140 selected players, and the resulting scores were entered into the data record for analysis. The groups were described using means and standard deviations. An independent-samples t-test was then applied to test the differences between International and National-level players. The probability level was set at 0.05; with 138 degrees of freedom, the corresponding critical t-value was 1.977.

Results and Discussion
An independent-samples t-test was calculated for each motor fitness variable to establish whether the International and National groups differed significantly. The statistical outcomes are summarized in Table 1.

Table 1: Mean, Standard Deviation and t-ratio for Selected Motor Fitness Components of International and National Taekwondo Players

Motor Fitness Component	Level of Players	Mean	Standard Deviation	Mean Differences	SE of Mean Difference	t-ratio
Muscular Endurance	International	41.825	1.34	0.985	0.371	2.655*
	National	40.84	3.532			
Reaction Time	International	4.375	1.576	0.915	0.335	2.731*
	National	5.29	1.872			
Balance	International	0.3	0.6	0.13	0.203	0.640*
	National	1.43	0.652			
Flexibility	International	23.175	2.386	1.175	0.437	2.689*
	National	22	3.734			
Agility	International	10.121	0.504	0.633	0.172	3.680*
	National	10.754	0.347			

* Significant at 0.05 level. Tabulated t (0.05, 138) = 1.977.

Interpretation of Findings
Muscular Endurance: Table 1 indicates that the mean muscular endurance score of International-level players (41.825) was higher than that of National-level players (40.840). The obtained t-value of 2.655 exceeded the tabulated value of 1.977, indicating a statistically significant difference at the 0.05 level. Thus, International-level players demonstrated significantly higher muscular endurance scores.
Reaction Time: International-level players recorded a mean score of 4.375, compared with 5.290 for National-level players. The obtained t-value of 2.731 was greater than the tabulated value of 1.977. The difference was statistically significant at the 0.05 level. Since the test is recorded in seconds, the lower mean time of International-level players indicates faster reaction-time performance.
Balance: The mean balance scores were 0.300 for International-level players and 0.430 for National-level players. The obtained t-value of 0.640 was lower than the tabulated value of 1.977. Therefore, the difference between the two groups was not statistically significant at the 0.05 level.
Flexibility: International-level players obtained a mean score of 23.175, whereas National-level players obtained a mean score of 22.000. The calculated t-value of 2.689 exceeded the tabulated value of 1.977, indicating a statistically significant difference. The findings show higher flexibility scores among International-level players.
Agility: The mean agility time of International-level players was 10.121 seconds, while National-level players recorded 10.754 seconds. The obtained t-value of 3.680 was higher than the tabulated value of 1.977, showing a statistically significant difference. The lower time recorded by International-level players indicates better agility-test performance.

Conclusion

Considering the scope of the investigation and the results obtained, the following conclusions can be stated:

1. The International-level group achieved a significantly higher muscular endurance mean than the National-level group.
2. Reaction-time results favored the International-level players, whose recorded time was significantly lower.
3. The comparison did not identify a statistically significant balance difference between the two groups.
4. Flexibility scores were significantly higher among International-level players.
5. The International-level group performed the agility test significantly faster, as shown by its lower completion time.
6. Of the five variables assessed, significant differences were found in muscular endurance, reaction time, flexibility, and agility; balance was the only component without a significant group difference.
7. These results indicate that the selected motor fitness qualities warrant consideration when planning physical preparation for Taekwondo players.

Practical Implications

Regular testing of muscular endurance, reaction time, flexibility, agility, and balance can help coaches follow the motor fitness development of Taekwondo athletes. The present findings suggest that conditioning for National-level players could give attention to the areas where the International group achieved significantly stronger results. Balance remains a relevant part of a complete Taekwondo conditioning plan, notwithstanding the absence of a significant difference between groups in this study.

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