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## Assessment of physical development of the second-year physical education students, at Tay Nguyen University after completing the Karatedo course

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### Abstract

This study evaluates the physical development of the second-year Physical Education students (enrolled in 2022) at Tay Nguyen University after completing the Karatedo course during the 2023–2024 academic year. The course was part of the curriculum designed to enhance students' physical capacity through systematic martial arts training. Data were collected from nine physical fitness tests, including sprinting and endurance running. Results showed significant improvements in all tests, with performance gains ranging from 0.30% to 6.20%. The 1500-meter run showed the highest increase ( $W\% = 6.20$ ), and the 30-meter sprint showed the lowest ( $W\% = 0.30$ ), all statistically significant at  $p < 0.05$ . The findings indicate that the Karatedo course effectively supports physical development, making it a valuable component of the Physical Education curriculum.

**Keywords:** Physical fitness, students, Karatedo, Tay Nguyen University

### Introduction

Physical fitness is a fundamental aspect of overall health and well-being, particularly for students specializing in physical education. It plays a crucial role not only in their academic performance but also in their professional competence and physical preparedness for future roles as educators and trainers. In recent years, there has been increasing interest in evaluating the physical fitness levels of university students to better understand the effectiveness of current training programs and to make necessary adjustments for optimizing outcomes<sup>[1]</sup>.

Karatedo, a traditional Japanese martial art, is well-regarded for its ability to improve various aspects of physical fitness, including strength, endurance, flexibility, and coordination<sup>[2]</sup>. Incorporating Karatedo into the curriculum provides students not only with the opportunity to develop martial arts skills but also to enhance their overall fitness through targeted exercises. The unique combination of upper-body strikes, lower-body kicks, and defensive techniques in Karatedo contributes to a well-rounded physical development, making it a valuable addition to physical education programs<sup>[3]</sup>.

The primary objective of this study is to assess the physical development of Physical Education majors after completing the Karatedo course of the second-year students at Tay Nguyen University. The study utilizes a set of standardized fitness tests, as outlined by the Ministry of Education and Training (MOET), alongside additional tests specific to Karatedo to provide a comprehensive evaluation of students' physical capabilities<sup>[4]</sup>. These tests measure key fitness parameters such as speed, strength, agility, and endurance, and include a 30-meter sprint, standing long jump, shuttle run, and various timed striking and kicking tests<sup>[5]</sup>.

Prior to their participation in the Karatedo course, the students underwent a baseline fitness assessment. This initial data provides a benchmark for comparing their post-course performance, allowing for an analysis of the physical development that occurred throughout the semester<sup>[6]</sup>. The study aims to determine whether there were statistically significant improvements in the students' physical fitness and to identify specific areas where progress was most pronounced<sup>[7]</sup>.

The research is timely and relevant, as it addresses both the effectiveness of Karatedo as a physical education tool and the overall physical condition of university students who are training to become future educators [8]. Understanding how well these students perform in standardized fitness tests not only helps in optimizing training programs but also provides valuable insights into the role that physical activity, particularly martial arts, plays in academic settings [9]. With this study, we aim to contribute to the broader field of physical education research by providing data that supports the inclusion of martial arts like Karatedo in university curricula [10].

## Materials and Methods

### Participants

The participants in this study consisted of second-year students enrolled in the Physical Education program at Tay Nguyen University during the 2022 academic year. A total of 34 students, all specializing in physical education, participated in the study. All students had completed their first semester and were registered for the Karatedo course as part of their curriculum.

### Study Design

The study followed a pre-test and post-test experimental design, where the physical fitness levels of students were measured before and after completing the Karatedo course. The duration of the course was one semester, during which students attended practical and theoretical sessions focusing on Karatedo techniques. The practical component involved a structured training regime including basic strikes, kicks, defensive maneuvers, and sparring exercises, which was designed to develop endurance, strength, speed, and flexibility.

### Fitness Tests

To evaluate the students' physical development, a series of fitness tests were administered both before (baseline assessment) and after (post-course assessment) the Karatedo training. These tests included standardized fitness assessments outlined by the Ministry of Education and Training (MOET), as well as additional Karatedo-specific tests.

### Standardized Fitness Tests

- **30-meter sprint:** Measured students' speed in short-distance running. Time was recorded using a stopwatch, with students performing the sprint from a standing start.
- **Standing long jump:** Assessed lower body explosive strength. Students performed a standing jump with both feet from a marked line, and the distance was measured.
- **Shuttle run (4 x 10 m):** Measured agility and quick directional changes. Students ran back and forth between two lines set 10 meters apart, and the time was recorded.
- **5-minute endurance run:** Evaluated cardiovascular endurance. The distance students covered in 5 minutes of continuous running was measured.

### Karatedo-Specific Tests

- **Kizami (front hand punch) in 10 seconds:** Students were instructed to perform as many front-hand punches as possible in 10 seconds. The number of punches was recorded.
- **Gyakuzuki (Rear hand punch) in 10 seconds:** Similar to the front-hand punch test, but focusing on rear-hand punches.
- **Step-in punch in 20 seconds:** This test measured the students' ability to step forward and punch within a 20-second timeframe.
- **Maegeri (Front kick) in 10 seconds:** Students performed as many front kicks as possible in 10 seconds, with the total counted.
- **Mawashigeri (Roundhouse kick) in 10 seconds:** Assessed students' roundhouse kick performance, counting the number of kicks executed within 10 seconds.

### Data Collection

Data were collected during the initial and final fitness assessments. All tests were conducted under the supervision of qualified instructors to ensure consistency and safety. Each test was performed at least twice, and the best result was recorded to minimize variations due to fatigue or external factors. The standardized fitness tests followed MOET guidelines, ensuring the results were comparable to national fitness standards. The Karatedo-specific tests were adapted from widely accepted martial arts performance evaluations to capture the unique fitness aspects cultivated through Karatedo training.

### Data Analysis

The collected data were analyzed using statistical methods to determine the significance of any observed changes in physical fitness. The mean and standard deviation were calculated for each test, both before and after the Karatedo training. Paired t-tests were used to compare pre- and post-training results, determining whether the changes were statistically significant at the  $p < 0.05$  level. The growth rate (W%) for each test was also calculated using the S. Brondy growth rate formula, which provides insight into the percentage improvement for each fitness parameter.

### Results and Discussion

The physical fitness of the students was assessed using various standardized tests. Table 3.1 illustrates both the strengths and areas for improvement in the physical fitness of second-year Physical Education students at Tay Nguyen University. The 30-meter sprint and shuttle run tests, with coefficients of variation (Cv %) of 11.19% and 10.04%, respectively, highlight significant variability in speed and agility. This suggests that students have uneven abilities in explosive movements and quick changes of direction, key components of many sports and physical activities. Addressing these discrepancies through targeted speed and agility training would help equalize performance across the student body.

**Table 1:** Current physical fitness status of the second-year physical education students at Tay Nguyen University

No.	Test	Mean	Std. Dev.	Cv%	Error
1	30 m Sprint (s)	5.45	0.61	11.19	0.02
2	Standing Long Jump (cm)	242.45	10.61	4.38	0.02
3	Shuttle Run 4x10 m (s)	13.25	1.33	10.04	0.02
4	5-Minute Run (m)	1151.56	87.71	7.62	0.01
5	Front Hand Punch (Kizami) - 10 sec (reps)	13.30	0.53	3.98	0.02
6	Rear Hand Punch (Gyakuzuki) - 10 sec (reps)	13.70	0.58	4.23	0.02
7	Single Step Punch - 20 sec (reps)	12.70	0.69	5.43	0.02
8	Front Kick (Maegeri) - 10 sec (reps)	11.60	0.76	6.55	0.01
9	Roundhouse Kick (Mawashigeri) - 10 sec (reps)	10.50	0.79	7.52	0.02

In contrast, the standing long jump (Cv% 4.38%) and 5-minute run (Cv% 7.62%) demonstrate more consistent leg strength and endurance, implying that students have undergone more uniform conditioning in these areas. The relatively low variability in these tests could be attributed to broader general fitness training that favors endurance and lower-body power, commonly emphasized in physical education programs.

The punching (Kizami and Gyakuzuki) and kicking (Maegeri and Mawashigeri) tests reveal even lower variability (Cv% ranging from 3.98% to 7.52%). These results suggest that students exhibit relatively uniform upper- and lower-body strength, coordination, and speed, likely due to the structured nature of martial arts training. Since these movements are practiced repetitively, it fosters

consistency across the group. The low error margins (< 0.05) across all tests affirm that the data are representative of the broader student population, providing confidence in the reliability of these findings.

Additionally, significant improvements were noted after the completion of the Karatedo module (Table 3.2), where growth rates in performance ranged from 0.30% to 6.20%. The data presented the growth rates in physical fitness performance among students after completing the Karatedo module. Each test showed an increase in performance, with growth rates (W %) ranging from 0.30% to 6.20%. The improvements were statistically significant ( $p < 0.05$ ) across all tests, underscoring the effectiveness of the training program in fostering physical development.

**Table 2:** Rrowth rates in physical fitness tests of the students after completing the Karatedo module

No.	Test	Before	After	Growth Rate (W %)	p-value
1	30 m Sprint (s)	5.45	5.31	2.60%	<0.05
2	Standing Long Jump (cm)	242.45	245.86	1.40%	<0.05
3	Shuttle Run 4x10 m (s)	13.25	13.21	0.30%	<0.05
4	5-Minute Run (m)	115.56	122.96	6.20%	<0.05
5	Front Hand Punch (Kizami) - 10 sec (reps)	13.30	13.25	0.38%	<0.05
6	Rear Hand Punch (Gyakuzuki) - 10 sec (reps)	13.70	13.48	1.62%	<0.05
7	Single Step Punch - 20 sec (reps)	12.70	12.55	1.19%	<0.05
8	Front Kick (Maegeri) - 10 sec (reps)	11.60	11.47	1.13%	<0.05
9	Roundhouse Kick (Mawashigeri) - 10 sec (reps)	10.50	10.35	1.44%	<0.05

**30 m sprint test:** The students exhibited an average improvement of 2.60%, indicating that short-distance speed training, an essential component of martial arts, successfully enhanced students' sprinting ability. This finding aligns with studies on the impact of martial arts on anaerobic performance, which emphasize improved explosive power and agility <sup>[11]</sup>.

**Standing long jump:** An increase of 1.40% in jumping distance suggests that Karatedo training positively influenced leg strength and coordination. The ability to perform powerful jumps is critical in martial arts for movements like kicks, indicating that the module effectively targeted lower-body muscle groups <sup>[12]</sup>.

**Shuttle run (4x10 m):** The marginal growth of 0.30% in shuttle run performance, although statistically significant, was the lowest among all tests. This slight improvement may reflect the fact that agility and change-of-direction speed, as tested by the shuttle run, are less emphasized in Karatedo training compared to strength and endurance exercises.

**5-minute endurance run:** A significant 6.20% improvement in endurance running performance indicates

that the Karatedo program also contributed substantially to aerobic capacity. This result suggests that the training was effective not only in anaerobic bursts but also in prolonged aerobic activities, likely due to the cardiovascular demands of prolonged martial arts sessions <sup>[13]</sup>.

Punching (Kizami and Gyakuzuki) and Kicking (Maegeri and Mawashigeri) tests: The growth rates for the punching and kicking tests ranged from 0.38% to 1.62%, showing moderate improvements in both hand and leg strike frequency. This reflects enhanced coordination, speed, and muscle endurance in the students' upper and lower limbs, directly tied to the specific skill set developed through Karatedo training <sup>[14]</sup>.

## Conclusion

The physical fitness assessment of second-year Physical Education students at Tay Nguyen University reveals consistent strength, endurance, and power across the group, with most students performing uniformly in activities like long jumping, endurance running, and striking exercises. However, the data also highlight significant variability in speed and agility, indicating that some students lag behind in these areas. After completing the Karatedo training program, all aspects of physical fitness showed marked improvements, with endurance and sprinting abilities

benefiting the most. These results underscore the effectiveness of the training in enhancing both aerobic and anaerobic capacities. However, the relatively modest gains in agility suggest that additional focus is needed on exercises that improve quickness and coordination. Overall, the Karatedo module successfully contributed to the students' physical development, though there remains an opportunity to refine the program to address gaps in speed and agility.

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