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ORIGINAL ARTICLE

Comparison of the physical fitness of children who train karate in the Joinville/SC region

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ABSTRACT

The study aimed to compare the physical fitness of children who train Karate in the region of Joinville, Santa Catarina. The study population consisted of ten children aged eight to 14 who participated in Karate training, 40% of whom were female. The physical fitness variables were: Body Mass Index and Body Adiposity Index; Upper Limb Strength, Lower Limb Strength, Flexibility and Localized Muscular Resistance. Student's t-test was used to compare between pre and post-test, considering $p < .05$ as significant. Significant differences were found only for Lower Limb Strength ($p = .03$; d = -0.56) and Localized Muscular Resistance ($p = .01$; d = -0.54), showing improvement in jumping and abdominal resistance. Although not significant, there was a decrease in body composition in the post-evaluation. In all physical tests there was an increase in the average, revealing that the children presented good performance in jumping and abdominal resistance.
Keywords: Health, Martial arts, Exercise test, Sport, Aerobic exercise.

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INTRODUCTION

Sport such as Karate, which involve improving physical fitness (Krkeljas & Kovac, 2020). Karate is a sport that requires strength, flexibility and Endurance, essential characteristics for good performance of technical movements and for improving physical health (Stamenković et al., 2022).

According to the Stamenković et al. (2022) systematic review, practicing martial arts, such as Karate, can be an excellent sport to improve children's physical fitness, and can be used during physical education classes. In this case, Karate is a sport that positively influences children's health, improving body composition by reducing the Body Mass Index (BMI) and Body Adiposity Index (BAI), as well as physical conditioning, with better results in strength, endurance and flexibility (Arslan et al., 2024; Krkeljas & Kovac, 2020; Stamenković et al., 2022).

Monitoring the physical fitness of children who practice sports is essential to understanding their qualities or improving them, aiming not only at good performance in training and competitions, but mainly for their health, positively influencing them in adulthood (Jesus et al., 2025; Nahas, 2017). This research aims to fill this gap, providing relevant information on the evolution of physical fitness of children practicing Karate in a little explored region.

Therefore, given this context, the study aimed to compare the physical fitness of children who train Karate in the region of Joinville, Santa Catarina.

METHOD AND MATERIALS

Research design

This is an applied study with a quantitative approach and descriptive character, considering a longitudinal study. Obtaining the participation, unicentric, of a gym in the city of Joinville. Therefore, the research was carried out with voluntary participants, aware of the confidentiality of the data. The children's guardians were aware of the research objectives and its purpose. Likewise, this study was in partnership with the Physical Activities Center (PAC) Extension Project of the University of the Joinville Region, thus having the favourable opinion of the Ethics Committee in Research with Human Beings of Univille, sub number 5.161.461.

Participants

The study population consisted of children aged eight to 14 who participated in Karate training (each session lasting 60 minutes) in 2023 at a gym located in Joinville, Santa Catarina, Brazil. The sample consisted of ten children, 40% of whom were female. For this, the inclusion criteria were children who had authorization from their guardians to participate and who performed all physical tests. On the other hand, participants who did not meet the inclusion criteria were excluded from the sample.

Measures

The physical fitness variables were the Medicine Ball Throw Test (2 kg) to measure Upper Limb Strength; Horizontal Jump Test to measure Lower Limb Strength, Sit and Reach Test to measure Flexibility, 1-minute sit-up test to measure Localized Muscular Resistance according to the Manual of the Projeto Esporte Brasil - PROESP-BR (Gaya et al., 2021). Finally, the body composition variables analysed were weight (kg), height (m) and hip circumference (cm) for the calculations of the Body Mass Index [BMI = weight/height^2] and Paediatric Body Adiposity Index [IACp = hip circumference/height^0.8-38]. For this, the materials used were: Tape measure (25 meters), Medicine Ball (2 kg), ruler (30 cm), stopwatch (minutes), mat; stadiometer (2

meters), digital scale (100g accuracy), Tape measure (3 meters).

Procedure

As a procedure, an initial meeting was held with the academy's coordinators, requesting authorization to carry out the collections. Those responsible also participated in a meeting to be aware of the research objectives, with the aim of authorizing the children to participate.

The tests were applied over two days (two consecutive Fridays) in the last week of October (2022). In the first week, flexibility and Lower Limb Strength and body composition were collected. In the last week, the Localized Muscular Resistance and Upper Limb Strength were collected. To conduct the measurements, three students and a physical education professional, familiar with the research protocols/instruments, were recruited. This same team evaluated for the second time in early March (2023), accounting five months.

To collect the anthropometric assessment, the children were asked to be barefoot. For the physical tests, they were asked to wear sneakers. First for the Horizontal Jump Test, asking them to jump forward as far as they could. For the 2kg Medicine Ball Throw Test, the child was instructed to throw the ball as far as they could. For Flexibility, were asked to sit on the floor and try to reach their toes with their arms extended and hands together. For the Localized Muscular Resistance, was asked to perform as many sit-ups as possible in 1 minute.

Statistical analysis

The data were analysed using R Studio software (v 4.1.1), showing normality by the Shapiro-Wilk test. In this sense, the results were analysed using descriptive statistics (mean and standard deviation) and absolute and relative frequency (%). In addition, Student's t-test (paired samples) was used to compare between pre and post-test. To assess the effect size, Cohen's D was calculated, considering the classification from "*small*" (<0.19) to "*very large*" (>1.30), with a 95% confidence interval (95% CI), considering $p < .05$ as significant.

RESULTS

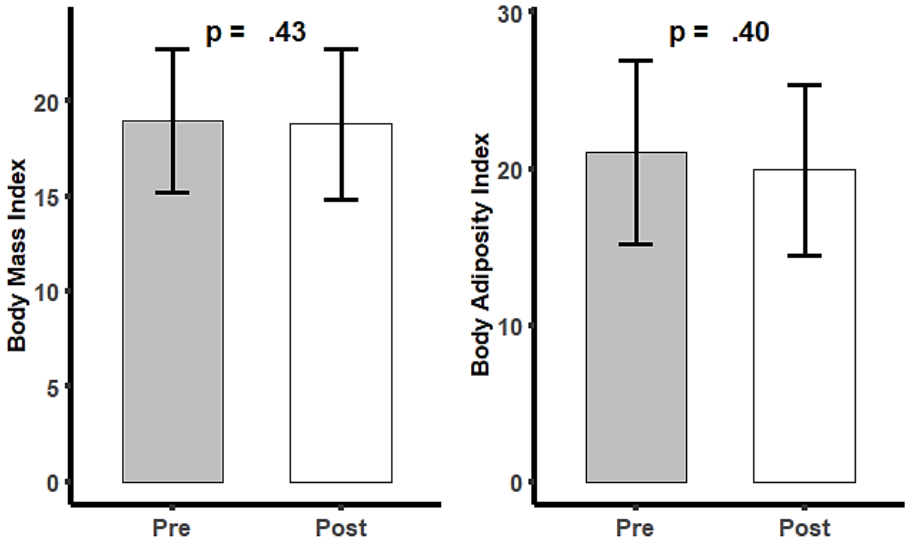
Ten children participated in the study, 40% of whom were female, aged 10.60 ± 2.27 years. Other information such as weight, height, Hip circumference (cm) and practice time are presented in Table 1.

Table 1. Sample characterization.

Variables	$\dot{x}$	SD
Age (years)	10.6	2.27
Weight (kg)	41.48	13.78
Height (m)	1.46	0.15
Hip circumference (cm)	80	11.9
Practice time (months)	41	22.76

Note. $\dot{x}$ = mean, SD = standard deviation. Source: own authorship (2025).

In Figure 1 it is possible to observe that there was a decrease in BMI [pre = 18.96 ± 3.78; post = 18.77 ± 3.96; d = 0.04] and BAI [pre = 21.03 ± 5.87; post = 19.92 ± 5.42; d = 0.19] in the post-evaluation, but without significance ($p = .4$).



Note. Source: own authorship (2025).

Figure 1. Body composition comparison.

For the physical tests, significant differences were found only for Lower Limb Strength (p = .03; d = -0.56) and Localized Muscular Resistance (p = .01; d = -0.54), showing improvement in jumping and abdominal resistance.

Table 2. Comparison (pre and post) of physical tests.

Physical tests	**Pre (n = 10)**	**Post (n = 10)**	**Δ**	***p***	**d (CI 95%)**
	Ẋ ± SD	Ẋ ± SD			
Lower limb strength	1.47 ± 0.24	1.62 ± 0.27	-0.2	**.03**	-0.56 (-1.07; -0.05)
Upper limb strength	2.10 ± 0.85	2.19 ± 0.80	-0.1	.22	-0.10 (-0.26; 0.06)
Localized muscular resistance	27.50 ± 11.74	33.70 ± 11.07	-6.2	**.01**	-0.54 (-0.88; -0.19)
Flexibility	43.40 ± 7.57	44.00 ± 8.78	-0.6	.73	-0.07 (-0.49; 0.34)

Note. Ẋ = mean, SD = standard deviation, n = sample number; Δ = mean difference, p = <.05 for significant, d = effect size; CI 95% = confidence interval. Source: own authorship (2025).

DISCUSSION

This study aimed to compare the physical fitness of children who train Karate in the region of Joinville, Santa Catarina. There was a decrease in body composition in the post-evaluation, but without significance. In the physical tests, there was also an increase, but significant differences were found only for Lower Limb Strength and Localized Muscular Resistance.

In the Lower Limb Strength and Localized Muscular Resistance test, there was a significant improvement, suggesting an improvement in jumping and explosive strength, as well as abdominal resistance. Lower limb strength and localized muscular endurance have an important relationship with the execution of certain movements in karate (Krkeljas & Kovac, 2020). Lower limb and abdominal exercises can improve performance in karate and are essential for effective technical execution (Krkeljas & Kovac, 2020).

For the Upper Limb Strength and Flexibility tests, there was an increase in the average, which could assume an improvement in physical performance, however the data were not significant. To improve upper limb strength, it is necessary to include strength training in Karate classes, taking into account the age groups and genders of the participants (Abuzayda, 2024). The results of Ivanović & Ivanović (2022) indicated that the perception of one's own flexibility had a statistically significant and positive contribution to predicting the variability of the participants' physical activity ($\beta = 0.037$; $p < .01$). This means that karatekas who believed they had greater flexibility tended to present higher levels of physical activity (Ivanović & Ivanović, 2022). In this context, it is up to teachers and parents to increase children's autonomous motivation, making them more self-determined and with greater self-efficacy (Gillison et al., 2017).

There was a decrease in BMI and BAI, which may indicate an improvement in body composition, but the results were not significant. Even so, karate is a sport that generates health benefits. A Karate training program (10 weeks) for children aged five to seven years (18 in the Karate group and 10 in the control group). The Karate group trained basic techniques (90 minutes, four times a week). In the comparison between groups, the Karate group presented a lower percentage of body fat in the post-test (Arslan et al., 2024). The Sun & Kim (2022) study analysed the effects of combat training on body composition in obese children and the results showed that body fat percentage and BMI decreased significantly in the training group after 12 weeks ($p < .001$). In this case, combat sports can decrease the inflammatory response and improve metabolic health (Sun & Kim, 2022).

The limitations of the study are the low sample size, as well as the location of the intervention, which determined only one gym in the Joinville region, making it difficult to extrapolate the data. However, these points should be seen as an opportunity for a new scientific research challenge, since the analysis of children's physical fitness is necessary in the contemporary times in which we live.

CONCLUSION

When comparing the physical fitness of children practicing Karate in the region of Joinville, Santa Catarina, it was possible to find better values in the post-test. Although not significant, there was a decrease in body composition in the post-evaluation. In all physical tests there was an increase in the average, however significant differences were found only for Lower Limb Strength and Localized Muscular Resistance, revealing that the children presented good performance in jumping and abdominal resistance. It is recommended that these instruments be applied to several other children who play sports, in order to create effective strategies for taking care of children's health and physical performance.

AUTHOR CONTRIBUTIONS

Author EEDJ collected and analysed the data and wrote the manuscript. Author DLC designed the methodology and collected the data. Author PJCM supervised and revised the content.

SUPPORTING AGENCIES

No funding agencies were reported by the authors.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

DATA AVAILABILITY

The data used in this study are available upon request to the corresponding author.

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