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B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

Changes in anaerobic capacity influenced by during three years of judo training of 14–16 year-old boys

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Summary

Background: The aim of this study was to determine the anaerobic capacity of young boys during three years of judo training.

Material/Methods: The subjects of this study were boys judoists (n=15) from a Polish University Judo Club in Gdańsk during three years training (age 14.1±1.2 to 16.6±1.3) and untrained boys (age 14.3±0.5 to 15.6±0.5). The anaerobic capacity was assessed using the 30-second Wingate test applied to the subjects' legs.

Results: The maximal anaerobic power (Watt), (Watt/kg) increase means increased work outputs too. The differences were statistically significant. The training load during the three years brought about a significant increase in the maximal anaerobic power of the subjects.

Conclusions: The three-year training load of an aerobic and anaerobic-aerobic metabolism nature caused a significant increase in the maximal anaerobic power and overall values of the young judoists.

Key words: **anaerobic power • anaerobic capacity • training of young boys • judo training**

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Background

Anaerobic power or capacity is an expression used for maximal exercise lasting for two minutes at a maximum where the energy used during the workload is provided in large quantities without necessitating the use of oxygen since the phosphagenes and glycogen stored in the muscles will suffice for a period of up to two minutes. According to Boisseau et al. [1] children have lower anaerobic capacity than adults which might simply reflect a lower concentration of the key rate-limiting enzyme phosphofructokinase or lactate dehydrogenase in children. The research of Kaczor et al. [2] indicates that the activity of anaerobic enzymes (creatine kinase, adenylatekinaze and lactate dehydrogenase) in children is lower than in adults. The research of Falgaretti et al. [3] indicates that growth and maturation play jointly an important role in the development of anaerobic metabolism. The results also show that children have a greater ability to oxidize lipids during exercise. In general, the mechanisms underlying the enzymatic differences reported here in children and adults are not clear.

It presents very curiously Franchini et al. [4] about of judo young trained. They presents in among morphological, physiological indicators and technical actions during combat were correlated with each other [4].

The aim of this study was to determine the changes of anaerobic capacity in boys aged 14–16 during three years of judo training.

This study examines the effects of the load of three years of judo training on the anaerobic capacity of young boys. The investigative question is how a training load with a superiority of fetch aerobic and anaerobic-aerobic metabolism influences the changes of anaerobic capacity at a maturing age.

Material and Methods

The subjects of this study were boys judoists (n=15) age 14.1–16.6 from a Polish University Judo Club in Gdańsk during three years training and untrained boys (n=15) primary school and secondary school from Gdańsk (Tables 1–2).

The anaerobic capacity was assessed using the 30-second Wingate test [5–7] applied to the subjects' legs. The test started with full resistance, i.e. 0.74 N/kg of the body mass, and in order to facilitate the test, the position of the right pedal was set at 35° with respect to the ground. Therefore, the first revolution started to be recorded when the right pedal was pressed down. The statistical analysis of the data obtained was assessed by ANOVA.

Results

The maximal anaerobic power (Watt), (Watt/kg) increases at 484.9 (W), 9.98 (W/kg) – the first study and 801.12 (W), 12.29 (W/kg) – the last study after three years of training (Figures 1,2). The differences are statistically significant ($p<0.001$). Mean work outputs increase at 13.51 (kJ),

Table 1. Characteristics of judo trained boys (mean ±SD).

Year	study	Calendar age (years)	Biological age (years)	Height (cm)	Body mass (kg)	BMI (kg/m²)	Training (years)
I n=15	1	14.1±1.24	13.8±1.6	163±9.9	53.8±11.9	20.2±0.5	2.5
II n=15	1	15.1±1.24	15.26±1.8	168.8±9.1	59.8±11.2	21.0±0.7	3.5
	2	15.5±1.24	15.4±1.8	170.4±8.9	60.5±11.4	20.8±0.6	3.5
	3	15.6±1.24	15.5±1.8	171.4±8.9	62.0±11.3	21.1±0.5	4
	4	15.7±1.24	15.8±1.9	172.2±8.8	62.7±11.3	21.1±0.9	4
III n=12	1	16.1±1.31	16.1±1.7	172.9±7.4	62.6±9.5	20.9±0.8	4.5
	2	16.2±1.31	16.2±1.5	172.9±7.4	63.4±8.5	21.2±0.9	4.5
	3	16.4±1.31	16.4±1.4	173.8±6.8	64.8±8.6	21.5±0.7	5
	4	16.6±1.31	16.5±1.4	173.9±6.7	65.0±8.2	21.5±0.8	5

Table 2. Characteristics of untrained boys (mean ±SD).

Year	Study	Calendar age (years)	Biological age (years)	Height (cm)	Body mass (kg)	BMI (kg/m²)
I n=15	1	14.3±0.5	14.0±0.4	168.0±12.1	59.8±15.9	21.2±0.5
II n=15	1	15.3±0.5	15.0±0.5	171.9±10.8	60.1±12.9	20.3±0.7
	2	15.6±0.5	15.0±0.6	172.9±10.6	61.1±13.1	20.4±0.6

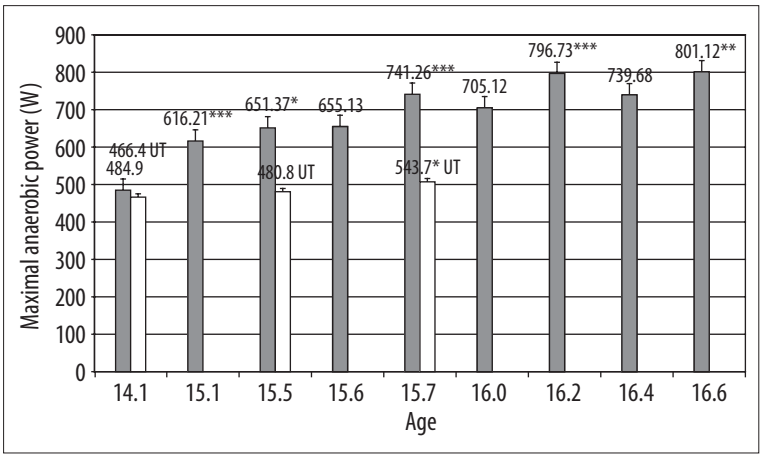

Figure 1. Maximal anaerobic power (W) boys judo trained during 3 years process training and untrained boys (UT) ($p<0.05$*, $p<0.01$**, $P<0.001$***).

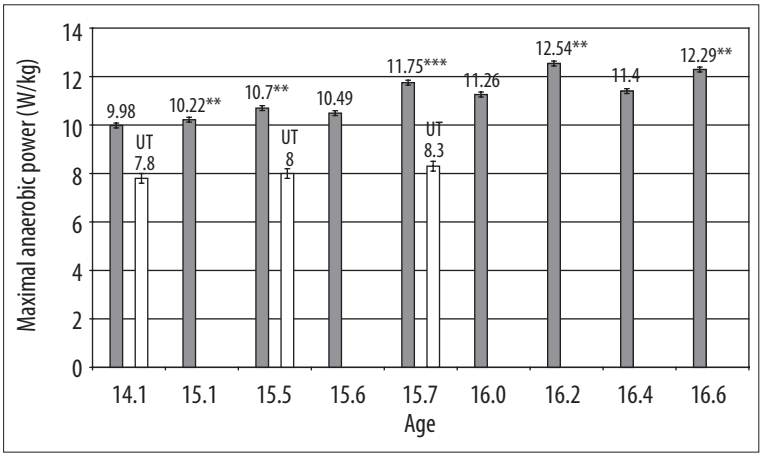

Figure 2. Maximal anaerobic power (W/kg) boys judo trained during 3 years process training and untrained boys (UT) ($p<0.05$*, $p<0.01$**, $p<0.001$***).

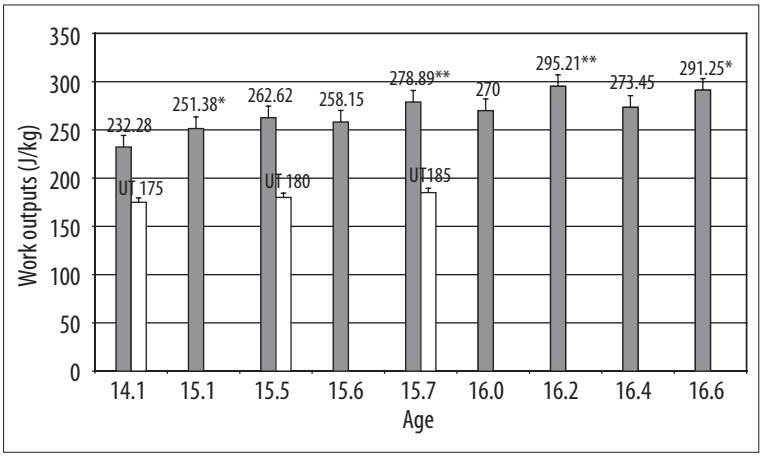

Figure 3. Work outputs (J/kg) boys judo trained during 3 years training process and untrained boys (UT) ($p<0.05$*, $p<0.01$**, $p<0.001$***).

232.28 (J/kg) to 18.96 (kJ) 291.25 (J/kg) (Figure 3). The differences are statistically significant ($p<0.001$).

Discussion

Sports training may have both a positive and negative influence on the biological development of a young athlete. In our study, we observed insignificant statistical differences between the calendar age and the biological age (Table 1). In judo it is essential to strengthen the mental, technical and physical aspects of one's judo. The training loads applied during the three years (Figures 4,5) had a positive influence on the biological development of young boys training judo. A very interesting fact is that the training loads of the aerobic and aerobic–anaerobic exercise (Figure 5) caused important changes in the tested young judoists. Our previous research conducted on the same group showed an increase in the aerobic capacity [8]. According to Kraemer et al. [9] boys aged between 14–15 should progress to more advanced youth programs in the resistance exercise to in-

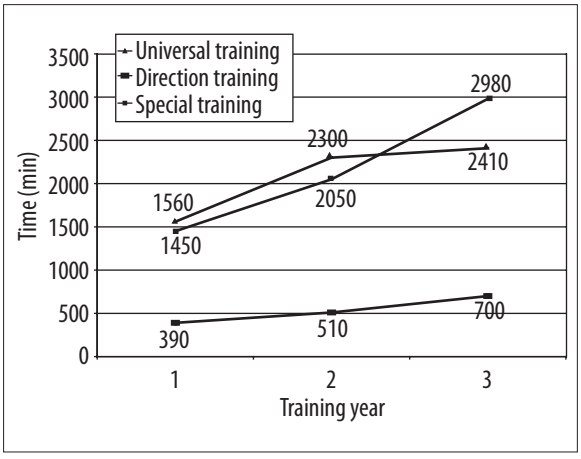

Figure 4. Effective exercise time (type of training) boys judokas the during 3 years process training.

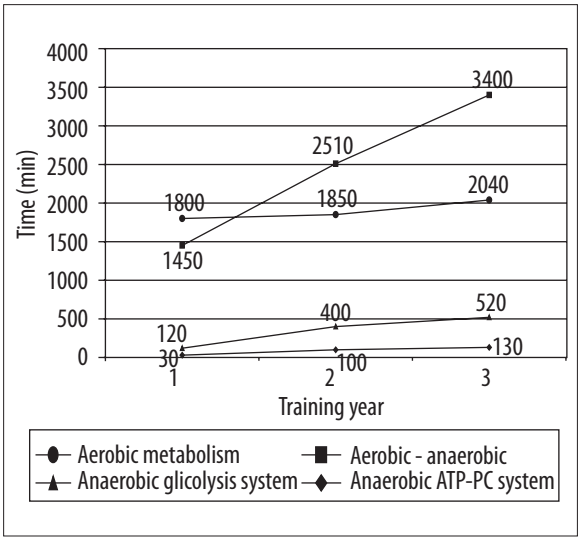

Figure 5. Effective time exercise (energetic system) boys judokas during 3 years training process.

clude sport-specific components, emphasize exercise techniques and increase the volume. Our results also confirm that (Figures 4,5) anaerobic training appears to improve the anaerobic capacity of children [10]. Following the training, the children have: increased resting levels of phosphocreatine, ATP and glicogen, increased phosphofructokinase activity and maximal blood levels [11]. Our study shows an increased anaerobic capacity of the judo practicing boys during a three-year training cycle. Our previous results confirm this as well Bar-Or [6], Inbar et al. [7], Boas et al. [12].

Conclusions

The three-year training load of an aerobic and anaerobic-aerobic metabolism nature caused a significant increase in the maximal anaerobic power and overall values of the young judoists. The training load during those three years had a positive effect on the biological age and anaerobic capacity of the young judoists.

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