Presentation Title:

Estimation of body composition in adolescent judo athletes

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Abstract

Adolescent judo athletes are often involved in weight reduction practices. Knowledge and adequate follow-up of the body compostion of adolescent judo athletes is of uttermost importance to guarantee an optimal growth and development in combination with optimal performance in an acceptable weight category. Regular follow-up of body composition requires reliable field methods. It was the aim of the present study to estimate body fat percentage with different field methods in comparison with the under water weighing technique as criterium value. Body fat percentage differed as a function of the used technique for the girls while values for boy where more homogenous. Strong correlations were obained when comparing the different methods for the girls only. In adolescent athletes, follow-up of body composition should be carried out on regular time intervals. Field methods may be used but comparison against a criterion methods is required. Due to the specific morphology of judo athletes a further standardization of methods to estimate the body compostion is required.

Keywords : Judo, body composition, estimation body fat, estimation of muscle mass

Estimation of body composition in adolescent judo athletes

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Introduction: Traditionally, prior to competition lots of athletes undergo rapid weight loss in an attempt to compete in a lighter weight class. Especially the weight cycling in young athletes is of concern. Weight reduction practices in adolescents should be strongly discouraged since growth and development require additional energy and nutrient input. In order to prevent extreme weight loss regiments the Wrestling Federation developed the system of minimal wrestling weight. Wrestlers undergo a pre competition body composition analysis under euhydrated conditions. If the body composition is above the body fat percentage limits (7% for boys and 12% for girls), maximal weekly changes are given (1.5%/week). Athletes beneath the limits need medical clearance before they start competition. To estimate the fat percentages skin fold measurements are used. It is believed that the accuracy of Bio Electrical Impedance Analyses (BIA) is similar to skin fold assessment. BIA may be preferable because it does not require the technical skill associated with skin fold measurements. It was the aim of this study to estimate the percentage of body fat in adolescent judo athletes using several field techniques skinfolds; total body BIA; upper body BIA; lower body BIA ; near infra red interactance and under water weighing method.

Method 30 adolescent judo athletes (13 girls and 17 boys) of regional, national or international level participated in the study (mean age: 16.3 ± 1.3 years of age). Body composition was assessed using the following methods in randomized order except for under water weighing which was done last:

Anthropometric techniques

All measurements were carried out by one and the same investigator following ISAK guidelines.
Using the Durnin and Womersly equations body density was calculated using the sum of 4 skinfolds (biceps, triceps, subscapular and suprailiac).
Body density obtained with these formulas was used in the Siri formula to calculate the percentage of body fat.
Using the corrected arm, thigh and calf circumferences in the formula proposed by Poortmans et al. (2005), total skeletal muscle mass was calculated.

BIA techniques .

Foot-foot method: The Tanita Body Composition Analyzer TBF 410®
Hand-hand method: The Omron Body Fat Analyzer ®
Hand-foot method: The Nutriguard®

Near infra red reactance.

The Futrex® analyzes the amount of reflected near infrared light emitted into the biceps The near infrared light is absorbed by fat and reflected by lean tissue. The local amount of subcutaneous and intramuscular fat at the biceps was found to be proportional to the percent fat of the total body.

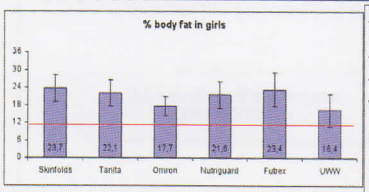
Under water weighing.

As criterion value for body fat, percentage of body fat was estimated by the under water weighing (UWW) technique using the Siri equation (Siri 1956). Body fat and muscle mass estimation methods were compared for both genders. In case of a normal distribution, methods were compared using the repeated measures ANOVA or the Friedman (in case of non normal distribution) procedure with Post Hoc analyses. Correlations between methods were calculated using the Pearson or the Spearman procedure. The significance level was set at 0.05

Results:

Subjects		Body height	Body mass	Weight categories
Girls	U17 (n=10) and U20 (n=3)	163.3 ± 7.6 cm	56.2 ± 9.7 kg	-40 kg to -70kg
Boys	U17 (n=10 and U20 (n=7)	169.4 ± 8.1 cm	62.5 ± 11.4 kg	-50 to -90 kg

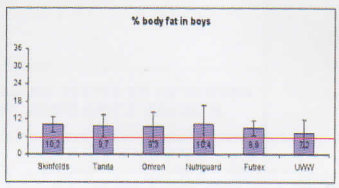
	Girls		Boys	
	U17	U20	U17	U20
Muslce mass	22.4 ± 3.7 kg 36.7 ± 4.6%	29.9 ± 1.8 kg 35.9 ± 1.3%	27.2 ± 3.5 kg 45.4 ± 1.8%	34.9 ± 5.5 kg 44.6 ± 0.2%



Analysis of the correlation coefficients between the different methods, indicate that all correlations, except between the UWW technique and the Tanita® were significant. UWW and skinfold (r=0.924), Futrex® and skinfold (r=0.843), Omron® and skinfold (r=0.850), Nutriguard® and skinfold (r=0.805)

The ANOVA procedure indicated significant differences between the used techniques/methods (F=36.4; p=0.001). Post hoc analyses revealed significant lower body fat percentage values for the UWW compared to estimates by: Skinfolds (p<0.001), Tanita® (p = 0.006), Nutriguard® (p=0.011), Futrex® (p <0.001). The estimate with the Omron® instrument was significantly lower compared to: skinfolds (p<0.001), the Tanita® (p=0.016), Nutriguard® (p=0.023), Futrex® (p=0.028).

The correlation between the different methods in the boys was only significant between: Nutriguard® and UWW (r=0.727), Omron® and Tanita® (r =0.714)



The results for the boys showed less variability. Due to the not normal distribution of the results obtained with the Nutriguard® and the Futrex® (both Kolmogorov Goodness of Fit test, p= 0.0200) non-parametric statistics were applied. The Friedman procedure did not detect statistical difference between the used measurement methods.

Discussion: The criterion UWW technique revealed for both girls and boys lowest absolute values. For girls the UWW estimate was significantly different from all other techniques except with the Omron. In boys only a trend towards different values was detected.
The low values for the UWW may be caused by specific bone density values in judo athletes. Research has shown that judo players have high bone mineral density, because of the specific biomechanical environment. This results in lower estimates of body fat percentage with the UWW technique.
The low values obtained for the girls with the Omron instrument may be explained by the uneven body fat distribution in females since the hand-hand BIA techniques estimate of body fat is mainly based on the upper body with a minor contribution of the lower body. The failure of the instruments (Omron, Nutriguard) to calculate an estimate of the percentage of body fat may be due to the out of range resistance measurements caused by the abovementioned specific body composition. Only in girls acceptable correlations were obtained between the different methods. It may be interesting to use user-friendly skinfold, BIA and infra red techniques as a follow up method in order to detect changes in body composition. Combined with a yearly measurement of the body composition using more specialized techniques (UWW, Dexa) it may result in a better weight management throughout the year. It should be born in mind that even the most specialized techniques deliver only an indirect estimate of the percentage of body fat. Additionally, the follow up of the SMM in combination with body fat can deliver information on the weight management procedures since a loss of SMM may point to an inadequate weight reduction program.
Our results indicate equally a substantial difference in muscle mass when comparing U17 judo athletes with U20 athletes. Again, an optimal growth and muscle development is only possible when training intensity; nutritional intake and recuperation are well balanced.

Conclusion: Adolescents changing body composition need sufficient follow up as most of the athletes go often through weight reduction periods in the preparation for competition. It may be important to also the muscle mass since absolute and relative power are important determinants of judo success. Relying on a single method/technique without control with a more standardized method may lead to considerable over or underestimation of body fat percentage. The specific morphology of judo athletes with a high muscular component and a high bone density calls for the development of a specific validated body composition assessment methodology.Further standardization is required with selection of an adequate reference method if measures are optioned to protect athletes for extensive weight loss procedures as proposed by Artioli et al. (2010b)

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