STUDY OF THE FIABILITY IN THE MEASUREMENT OF THE FAT RATE BY BIOELECTRICAL IMPEDANCE

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The valuation of the fat rate is very important both for the control of sportmen and for the different kinds of patients. The calculation of the fat rate by the body skinfolds method with the subsequent application of different formula have showed many mistakes. Because of that a new instrument by bioelectrical impedance (BIA), easier than other existing (OMRON), has been developed. The subject of this study was to comprobate the fiability of the measurements of the fat rate by OMRON. 93 students (58 males and 35 females) of the SHEE-IVEF (Basque Institute of Physical Education) were measured for 3 times. In order to reduce any hipothetical mistake from the researcher –f.e., procedure apprenticeship–

the first measurement was rejected. In this way, only the 2nd and 3rd measurements were considered. Manufacturer's conditions –timetible, rest, food and warm up– were considered too. The stadistical Altman method was used to test the fiability of the measurements. The difference average obtained for the procedure was $-0,2172 \pm 2$ SD=0,4539 by OMRON whereas the measurement of the body skinfolds was $-0,0086 \pm 2$SD=0,7007 by Möhr formula and $0,0581 \pm 2$SD=0,3979 by Carter-Yuhasz formula. So, these results lead us to think that the OMRON instrument provides measurements under acceptable fiability.

COMPARATIVE STUDY BETWEEN THE VALUATION OF THE FAT RATE BY BIOELECTRICAL IMPEDANCE AND BY THE BODY SKINFOLDS MEASUREMENT

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The valuation of the fat rate is very important both for the control of sportmen and for the different kinds of patients. The calculation of the fat rate by the body skinfolds method with the subsequent application of different formula have showed many mistakes. Because of that a new instrument by bioelectrical impedance (BIA), easier than other existing (OMRON), has been developed. The subject of this study was to comparate those values of the fat rate obtained by body skinfolds using two different formula –Carter-Yuhasz and Möhr– and those others provided by BIA instrument, OMRON. 93 students (58 males and 35 female) of the SHEE-IVEF (Basque Institute of Physical Education) were collected in this study. Their fat rate was valuated by the different methods mentioned above. These students were studied for 3 times. In order to reduce any hipothetical mistake from the researcher –f.e., procedure apprenticeship– the first measurement was rejected. In this way, only the 2nd and 3rd

measurements were considered. Manufacturer's conditions – timetible, rest, food and warm up– were considered too. The Altman method was used for the stadistical study of the comparations between the measurements. The difference average obtained for the procedure was $0,84 \pm 2$SD=6,04 with a difference average rate of $4,20 \pm 2$SD=41,20 for the comparation by OMRON-Möhr. The difference average obtained for the procedure was $5,26 \pm 2$SD=5,87 with a difference average range of $38,44 \pm 2$SD=42,10 for the comparation by OMRON-Carter Yuhasz. The difference average obtained for the procedure was $4,41 \pm 2$SD=3,42 with a difference average rate of $34,68 \pm 2$SD=27,13 for the comparation by Möhr-Carter Yuhasz. So, according to our results, the comparation between these two systems are not acceptable because there is an excessive wide division between measurements.

VALIDATION OF A BIORESISTANCE METHOD (BRE) WITH MAGNETIC RESONANCE IMAGING (MRI), IN A GROUP OF MALE AND FEMALE ELITE ATHLETES

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Despite the popularity and functionality of the Bioimpedance (BIA) or Bioresistance (BRE) methods, to assess body composition, their validity is very criticised. Besides the methodological and technical problems, there is a lack of predictive equations for specific groups as elite athletes. So, the aim of this study has been double: 1st to validate a BRE method against MRI and 2nd, to find the best prediction equations for males and females elite athletes.

A total of 24 females (18.2±3.3 years–age-; 19.2±2.1 kg/m2- body mass index-) and 23 males (21.3±4.3 years; 21.8±1.4 kg/m2) elite athletes were included. They were scanned with a 1.5 Tesla magnetic resonance device (Signa, General Electric) to quantify, with a semiautomatic technique through 85-134 slices, their adipose tissue volume (ATV), from which fat mass (FM) was derived. On the same day, previous to the MRI exam, their FM was also measured with a tetrapolar BRE method (Valhalla, 1990-A).

The best equation of the two provided by the BRE apparatus

manufacturer, overestimated significantly the FM quantified by MRI in both groups of athletes: females (8.75 ± 3.78 kg, against 7.10±2.03 kg) and males (7.19±2.76 kg, against 5.11 ± 1.22 kg).

The following prediction equations were obtained after a stepwise regression analysis using the Mallows "Cp" statistic coefficient:

Females FM (kg) = - 0.453 + 0.379 x body weight – 0.262 x height2 / R
    r= 0,88; E = 0,14 kg; SEE = 0,44 kg.

Males FM (kg) = 4.450 + 0.190 x body weight – 0.185 x height2 / R
    r= 0,77; E = 0,09 kg; SEE = 0,50 kg

body weight in kg, height in m, and R (bioresistance) in ohms.

Key words: Bioresistance, magnetic resonance imaging, fat mass, elite athletes.

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THE RELATIONSHIP BETWEEN GROWTH INDEX AND BODY COMPOSITION OF THE ROMANIAN OLYMPIC TEAM

Anca Mirela Ionescu; Anca Gurau

This study aims to show the relationship between the growth index and body composition of female gymnasts in the Romanian Olympic. The members of the team train intensively for 5 or 6 hours a day in which the body comsumes lots of energy. Due to the undersred effects of weight gain, the gymnasts are given a minumum amount of food to sustain their present body composition.

18 gymnasts participated in this study all having similar conditions in traing, food consumption and housing for 11 months a year. The selection age was between 10,3 and 13,4 years after which they were followed for 4 years.

Anthropometic examinations were carried out periodically in which the body composition, height and weight were measured. These examinations show that the gymnasts are shoter than the average height for their age (between -0,75

and -3,25) and also underweight (between -1,00 and .3,00). The annual average growth index varied between 0,93 and 3,20 cm, being directly proportional to the percentage of adipose tissue.

When the adipose tissue percentage decreases to 8,8-9,0%, the growth expectation is reduced. Once the adipose tissue percentage is back at its normal value (9-11%) the growth expectation will increase accordingly.

From this study we can conclude that better recommendations for sportive effort can be given by monitoring the body composition along with the percentage of adipose tissue. This allows us to have more influence on the gymnasts' further growth once they no longer practice gymnastics at a professional level.

THE EFFECTS OF PHYSICAL ACTIVITY ON THE BODY COMPOSITION AND FLEXIBILITY OF AGED WOMEN

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OBJECTIVES

The purpose of this investigation was to evaluate the influence of a regular physical activity program on the body composition and flexibility of older women.

MATERIAL AND METHODS

Twenty healthy and previously sedentary women ranging from 60 to 77 years of age participated in his study. The volunteers performed a diagnostic evaluation where cardiovascular function, flexibility and body composition were measured before and after 6 months of a program of physical activity twice a week, at a training intensity of 70% of maximal heart rate.

RESULTS

The resulting data were analyzed using a t-test paired at a confidence level of 0.05. The results demonstrated significant improvements in body composition indicating that 6 months of a regular physical activity program improved body composition of the volunteers with reduction of body fat. However, the results did not indicate statistically significant differences on the flexibility of the women.

DISCUSSION AND CONCLUSION

Participation in a regular exercise program is an effective way to prevent a number of functional declines associated with aging. The reason for no changes in flexibility levels may be associated with the frequency of training and sample size limitations. Nevertheless, the frequency of training was not a limitant factor when concerning the improved body composition found among the volunteers.

ACCURACY OF SKINFOLD ANTHROPOMETRY AND DESITOMETRY IN DETERMINING ELITE SOCCER PLAYERS'BODY COMPOSITION

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The purpose of this study was the assessment of height, weight and to compare independent estimates of body fat, determined by skinfold anthropometrics of 46 Premier League Portuguese soccer players (4 keepers - KP, 8 central defenders - CD, 7 lateral defenders - LD, 17 midfielders - MF and 10 forwards - FW). Skinfold procedures consisted of Harpender caliper measurements of skinfold thickness of 4 anatomical sites (biceps, triceps, subscapula and suprailiac skinfolds), using Siri and Brozek equations. Densitometry (DO) procedures consisted of dual energy X-ray absorptiometry

(Lunar DPX).

Keepers and central defenders are the higher and heavier soccer players. We didn't find any statistical differences between the groups in the summation of skin adiposity (however a higher threshold in keepers). As seen in Table I, there are some differences between densitometry fat percentage, Siri and Brozek equations. The Siri method is closer to densitometry method. In practical terms, of the three methods, the Siri method is probably the most accurate.

Variables	KP	CD	LD	MF	FW
Height	181.1+25.05	184.36+5.80	172.54+2.60	175.48+5.59	176.66+3.78
Weight	81.46+2.71	82.62+7.14	71.60+4.33	72.53+4.96	76.12+5.22
Biceps skinfold	3.29+0.53	3.52+0.36	3.39+0.45	3.19+0.53	3.62+0.66
Triceps skinfold	5.67+1.09	6.78+2.17	6.76+1.73	6.03+2.15	6.13+1.63
Subscapula skinfold	9.03+1.9	8.62+0.91	8.22+0.88	7.83+1.27	9.03+1.25
Suprailiac skinfold	3.46+3.78	3.80+0.59	3.76+0.44	3.50+0.47	3.68+0.76
% Fat (DO)	6.94+2.01	8.35+2.87	6.46+2.53	5.88+2.00	6.63+2.21
Skinfolds summation	21.45+3.76	22.72+3.34	22.13+2.68	20.55+3.93	22.46+3.36
% Fat (Siri)	8.28+1.98	8.93+1.77	8.69+1.43	7.69+2.36	8.71+1.78
% Fat (Brozek)	9.10+1.83	9.70+1.64	9.48+1.32	8.55+2.18	9.49+1.65

RELATIONSHIP BETWEEN BODY COMPOSITION AND AEROBIC POWER

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The purpose of this study was to determine the relationship between VO2max and some physical characteristics such as lean body mass (LBM), body fat percent (FP), weight (W) and height (H).

Twenty male athletes participated in this study with mean + S.D. (age) 18.6+4.05 years, (LBM) 68.90+6.37 kg, (FP) 5.55+1.97 percent, (W) 73.80+7.76 kg and (H) 186.10+6.35 cm. All subjects performed Bruce protocol on treadmill for estimation of VO2max that their average was 56.15+8.01 ml.kg-1.min-1.

Significant correlation was not found between VO2max and each of the variables (p<0.05). But, there was relatively high correlation between FP and W. Correlation coefficient between LBM/VO2max, FP/VO2max W/VO2max and H/VO2max were 0.01, -0.17, -0.31 and 0.12 respectively.

While the correlation coefficient between FP / W was 0.67.

The results indicate that we can not evaluate aerobic power according to the body composition but the best way for evaluation of aerobic power is using a field or laboratory test.

Key Words: Body composition, VO2max, Lean body mass, Body fat percent.

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CANARIAN WRESTLER REFERENCE SOMATOTYPE

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Most of the wrestling modalities classify the practitioners grouped by weight. In Canarian Wrestling the best performers are classified as "puntales" (A, B and C), without taking in account their weights.

Few morphological studies have been performed in Canarian Wrestlers players, a lack of scientific information that could limit their performance. There is not a Reference Somatotype (SR) for these wrestlers, so the aim of this paper is, firstly, to stablish the Reference Somatotype for Canarian Wrestling practitioners. Two hundred thirty two wrestlers were measured according to the Heath/Carter anthropometric somatotype method. Wrestlers were grouped as A,B,C and NC according to the classification usually stablished at competition. Group A consist of 5 wrestlers named "A Puntales" (PA), the highest category in this sport modality. Group B consist of 13 wrestlers named "B Puntales" (PB), Group C consist of 37 wrestlers named "C Puntales" (PC), and, finally, a Group of Non-Classified (NC) that consist of 177 wrestlers. This last group was also divided into five sub-groups: 60 kilograms (K), 70K, 80K, 90K and more than 100K (>100).

All measurements were obtained according to the International Working Group of Kinanthropometry (IWGK) and to the Spanish Group for Kinanthropometry (GREC).

In our study, the oldest wrestlers were the PB, and the youngest the NC wrestlers. The tallest and the heaviest were PA. All wrestlers studied were endo-mesomorph, except the 60K sub-group of NC. Globally, the mesomorph component was dominant, and the endomorph component was higher than the ectomorph one. Puntales somatotype resulted to be (6.2-8.6-0.18) ; while Non Classified (3.9-5.9-1.2). Both in puntales and NC groups the distribution of somatotypes according to their component dominance revealed to be not very similar, as SDD and SAD showed.

We can conclude that, without consider the success in competition, the actual way of classification catalogue like puntales thouse wrestlers with a somatotype (6.2-8.6-0.18), which is quite different from the average measured in NC wrestlers. So, further studies are needed to stablish the Reference Somatotype for NC.

Key words: canarian wrestling, somatotype, anthropometry, wrestling, native.

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INFLUENCE OF EXTRA-CURRICULAR PHYSICAL ACTIVITY ON BONE MASS IN PREPUBERTAL GIRLS

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Bone mineral content (BMC) and areal bone mineral density (BMD) were determined in 28 prepubertal girls divided into two groups depending on the level of physical activity performed in addition to that performed during the physical education sessions compulsory included the academic curriculum. The 11 girls who participated in extra-curricular sports activities during at least 3 hours every week were ascribed to the physically active group (PA) while the other 17 girls were considered as non-physically active(non-PA). Both groups had comparable age, body mass and height (11.5"0.3 vs 11.3"0.3 years, 41.8"3.5 vs 41.5"1.8 kg, 149"3 vs 146"1 cm, for the PA and non-PA, respectively). The degree of sexual maturation (Tanner) was also similar in both groups (Tanner #2).

Despite the higher level of physical activity in the PA group, non-significant differences were observed in endurance (test of Luc Leger) and vertical jump (squat jump). In contrast, 30m run time and 300m run time were slightly lower in the PA group than in the non-PA group (6.01"0.12 vs 5.65"0.16 s and 71"4 vs 80"3 s, both P=0.08). Lean body mass, fat mass, percentage of body fat, bone mineral content (BMC) and areal bone mineral density (BMD) at the whole body, hip and lumbar spine levels were similar in both groups. Whole body BMC was closely related to whole body lean body mass (r=0.94), running time in 300m (r=-0.47) and 30m (r=-0.49). Lumbar spine BMC was correlated with whole body lean mass (r=0.80), whole body mass (r=0.51), running time in 300m (r=-0.65) and 30m (r=-0.51). No relationship was observed between fat mass and either BMC or BMD. This cross-sectional study indicates that participation in a minimum of 3 h per week of extra-curricular physical activities is not associated with relevant improvements in neither physical fitness or body composition variables in prepubertal girls. The performance in common physical activities correlates well with bone mineral content in prepubertal girls such that the most fit girls have the higher whole body and lumbar spine BMC values.

REGIONAL BODY COMPOSITION BY MAGNETIC RESONANCE AND BIOELECTRICAL IMPEDANCE ANALYSIS

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BIOLECTRICAL IMPEDANCE

Local distribution and hydration of tissues are relevant in sport performance. A part from other factors, the knowledge of body segments composition is interesting to understand the moment of inertia in biomechanic studies. Recently, the development of multifrequency bioimpedance methods has made possible the evaluation of regional water and tissues distribution. The purpose of this study was to validate a bioelectrical impedance equipment. The objectives were: to quantify the volume and proportion of marrow and cortical bone, muscle, fat, and residual (vases, tendons and skin) tissues of the body extremities; and to estimate water content of every tissue by using Magnetic Resonance (MR) and correlate these values with results obtained by bioelectrical impedance analysis (BIA).

8 healthy voluntary subjects, 4 males and 4 females between 20 and 30 years old and with different fitness levels, were submitted to a BIA (7Scan system, mod. MIMSys, NTE, Barcelona), a complete anthropometric measurement, a magnetic resonance (Signa, General Electric) imaging (MRI) and spectroscopy (MRS) evaluation. Tissue volumes were calculated by digitizing the images obtained from MRI. A specific program which allows semi automatic segmentation was used. Tissue water was obtained through a set of 1H-MRS spectra. Water was calculated with respect to a phantom composed by water and gadodiamide (0.1mmol/l). Total segmental water (of arms and legs) was also obtained by multifrequency BIA measurement.

Either for men and women, the percentages of bone (cortical and marrow) and residual (vases and tendons) are similar (11% and 7.5%, respectively). A difference is observed on the percentage of muscle; men are more muscular than women (58% in men related to 43% in women). The main difference is on the fat tissue, being the values of men (22%) doubled by women?s (40%). Water values obtained by BIA and MR are significantly different (p<0.001), nevertheless they are high correlated (r=0.96; p<0.001). The water content observed by BIA is higher that the one obtained by MR and the difference is greater in women than in men, 72% and 42%, respectively. This difference between sexes could be explained

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by the fact that a difference on the water content of fat tissue has been observed between men (14.4% of water) and women (9.7%). The water content of muscular tissue is different between muscular groups; thus, a variation of 5% has been observed between gastrocnemius, semimembranosus and vastus medialis in the same subject.

MR is an effective device to calculate the segmental distribution of tissues; this proportionality could explain individual differences on exercise performance. A comparison between the values obtained by MR and anthropometry could be interesting to determine the prediction of body composition by means of anthropometric equations. BIA probably overestimates regional body water but there are some issues that could limit the correct estimation by means of MR. Besides the variability of water content observed within a tissue, there is a skin assessment restriction, which has a considerable amount of water, and a difficulty to distinguish between tendons and vases, which have different water content.

Key words: Regional body composition, regional body water, Magnetic Resonance.

RELEVANT PARAMETERS OF ADOLESCENT SOCCER PLAYERS

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PURPOSE

The purpose of this work was to study the relevant characteristics that make young soccer players succeed in their sport.

MATERIALS AND METHODS

35 young soccer players were included in the study (aged 14). They underwent the following tests: 1. Anthropometric measures, 2. 30 m dash (flat and with 10 cones), 3. Endurance test and 4. Jump tests: squat jump, counter-movement jump and drop jump. The results were compared making two groups of players: group A: players who went on to the main category (Liga Vasca) and group B: players who did not progress to this category.

RESULTS

Players in group A were taller (172cm vs 162cm, p=0.00), heavier (60kg vs 52kg, p=0.014), and had bigger calf (35cm vs 33cm, p=0.032), elbow (6.66cm vs 6.27 cm, p=0.01) and wrist (5.44cm vs 5.05, p=0.01) measures. They also had bigger bone weight and muscle weight. Besides, they were faster in the flat 30m dash (3.94sec vs 4.27sec, p=0.008), and in the cone dash, but the latter was not statistically significant. There were no significant differences in the endurance test, however, players of group A had lower heart rates at the end of the runs and during the recovery period. Both groups had similar results in the jump tests.

CONCLUSIONS

Outstanding adolescent soccer players are bigger (taller and heavier), with higher muscle and bone weights, and they are also faster. They may also have better endurance. Smaller players, however, should not be completely discarded (nor discouraged), because their development and growth may be slower. Thus, these smaller players should be followed up periodically even in the event of playing in other lower category teams.

Key words: adolescence, soccer, physiology, anthropometry.

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ASSOCIATION BETWEEN SELF-REPORTED LEISURE-TIME PHYSICAL ACTIVITY, ANTHROPOMETRIC MEASUREMENTS AND CALTRAC MOTION DETECTION IN AN ELDERLY POPULATION

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PURPOSE

The Yale Physical Activity Survey (YPAS) is a questionnaire developed to measure current physical activity among older populations. Its internal validity remains to be clearly established and testing against adequate criteria for low intensity behaviors is needed. The purpose of this study was to validate a Spanish version of the YPAS in a population of older adults and to estimate its potential for application in routine physical activity assessment in the elderly.

METHODS

A group of 108 elderly subjects (aged from 61 to 80 yrs), considering themselves as healthy were recruited. The YPAS is an interviewer-administered questionnaire divided into two sections from which a total of eight indices are derived. The time for each activity reported in the YPAS was summed to create a total summary index, expressed in hours per week, for each YPAS checklist activity was multiplied by an intensity code and then summed for all activities to obtain an energy expenditure summary index, expressed as KJ/day. Percent body fat was assessed by skinfolds and subjects worn at the waist on the left side of the body a portable accelerometer (Caltrac) that gives energy expenditure from measures of the body accelerations.

RESULTS

Weekly total time and energy expenditure correlated positively with the Caltrac activity units and negatively with body mass. The YPAS activity dimension summary index and the individual index of leisure walk were significantly associated with the Caltrac units and negatively with the percentage of body fat. The summary index and the individual index of vigorous activity correlated significantly with the body mass index and the moving index with the Caltrac units. A positive association was found between body mass and sitting index.

CONCLUSIONS

Our results extend data obtained from the original validation study of the YPAS and contribute to better establish the internal validity of the questionnaire, showing significant correlations with anthropometric parameters and with a low intensity validation measure (Caltrac). The questionnaire seems to meet the requirements for a valid agespecific questionnaire for use with older people and could be considered a reliable measure of regular physical activity on a group basis.

Key words: physical activity, elderly, questionnaire, Caltrac.