93 - RELATIVE STRENGTH LEVEL OF ATHLETE OF BOTH SEXES IN SUB CATEGORIES - 15 AND SUB - 17 OF HANDBALL

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1. INTRODUCTION

In adolescence, the development of physical qualities offers support to learn and improve technical and tactical elements (THIENGO; Victor; FERREIRA, 2006). The method has the specific physical characteristic, motor skills and anthropometric profile, and also some physical quality (cardiorespiratory fitness, speed, flexibility, strength, endurance, coordination) (TENROLLER, 2004).

Handball is a sport that requires handling with great speed, especially in counter-attacks, and slower in defense situations, so as to be characterized intermittent efforts at random intervals and varying extent (CAPUTO et al., 2009). The characteristic of handball is conducting efforts of high intensity and short duration, emphasizing motor skills of speed and strength, especially quick and explosive forces.

On training theory, it is meant by force as a prerequisite for the income that allows opposes or overcome resistance. Referring to the sports movement, distinguishes whether the internal strength (performed by muscles, ligaments and tendons), and the external force (gravity, friction, wind resistance, are examples which act externally to the human body). The sports terminology differentiates the resilience of strength, the ability to quickly power and maximum strength. Rapid force capacity (power, explosive strength and speed strength) is the ability to overcome external resistance movement with speed of contraction (BARBANTI, 2001).

When muscle force is considered on an absolute scale, we have in general, men are stronger than women in all groups tested, regardless of the device used to measure it (MC Ardle et al., 1992). However, studies indicate that higher percentage seen in males, when it is considered distinct muscle groups, manifests differently.

Given the above subject the aim of this study was to relate the lower level of superior strength, and abdominal handball athletes of both sexes in the sub 15 and U17, which were present in the Paraná Cup Handball categories.

2. METHODS

The study complied with the resolution (466/12) issued by the National Health Committee. This research is descriptive quantitative cross. The study was conducted in Paraná Handball Cup in Cascavel in the year 2014. The sample were all participants Cup Paraná in 2014 in the sub categories and 15 sub 17.

The sample was 291 individuals, which were classified by sex and sports category. A total of 123 female and 168 male subjects was obtained. Of total females, 72 individuals belonged to sub 15 category, while 51 individuals belonged to the category under 17. Do all male, 104 were included in the sub 15 category and 64 individuals belonging to 17 sub category.

The evaluated variables were: time in the sport (TE) in years, body mass (BM) in kg, height (H), trunk-cephalic height (ATC), body mass index (BMI), lower limb strength (IMF) abdominal strength and endurance (FRA), strength and trunk flexibility (FFT), upper limb strength (FS).

Before the measurements of physical assessment, it was made a little history check for sex, age, time in sport, and the sport category. To measure weight a scale with a capacity of 200 kg and accurate to 100 grams was used. Total Height was measured by a wall stadiometer. BMI was calculated from the formula BMI = weight in kg / [height in m] ² = M². Nutrition for classification, we used the actual reference for adolescents aged 12 to 18 years available in Physical status: andinterpretationofanthropometry use. Report of a WHO Expert Committee. WHO Technical report series, 854.Geneva 1995.

Evaluation of Abdominal Strength and Endurance was held from abdominal exercises where the participant had to perform as many abdominal possible, up to a maximum of 75 at a rate of 20 repetitions per minute (ie, every 3 seconds an abdominal was played).

The jump in the vertical plane was performed on a smooth surface, three feet tall, graduated every two centimeters and chalk dust. The test was to jump as high as possible, being provided to the athlete flexing the leg and the arm swing for the execution of the jump (MARINS; Giannichi, 1998). The strength of the upper limbs was measured from the test of Extensions of Arms which evaluated the strength and endurance of the upper body. The test aims to complete the maximum number of extensions of arms, with a particular cadence (POLLOCK, ML; WILMORE JH, 1993).

For data analysis we used descriptive statistics. Initially, it was assessed for each variable, except for the age in years, the normal distribution of errors in the analysis of variance (ANOVA) using the Shapiro-Wilk test proceeded and the visual analysis of outliers through boxplots. After evaluation of the normal distribution of residuals in the ANOVA, we proceeded to the Bartlett test to verify the homogeneity of variances for combinations between classes of sex, class and team sports (GL = 27), another prerequisite for application of ANOVA. For variables with normal distribution of residuals and homogeneity of variances of treatments, the effects of sex, sports category, the interaction between sex and sports category and staff were assessed using the F test, ANOVA considering the unbalanced data with the sum of squares type III. The simple effects of sex and sports category were compared by F test in ANOVA for unbalanced data. The average observed regarding the effect of staff have been grouped by the Scott-Knott test. Upon the occurrence of a statistically significant interaction between sex and sports category, its effects have been deployed hierarchically, settling a class of one factor to study the influence of another factor. The lsmeans related to significant effects ($p < 0.05$) sex, sports category and interaction between sex and sports category were presented through graphs in columns. In the absence of statistical significance in the ANOVA for the interaction effect between sex and sports category, was chosen for the presentation of means observed concerning the combinations between classes and sex classes of sports category, by means of tables. For the dependent variables that were not normally distributed or did not show homogeneity of variance of treatments, the effects of sex, sports category, the interaction between sex and sports category, and the effect of staff were checked by analysis of deviance (ANODE) , using the theory of generalized linear models. The degree of association between the dependent variables, including age (years) was assessed by Spearman correlation analysis. The 5% level of significance was adopted for all statistical tests. The analyzes were performed using the R Development Core Team (2013).

3. RESULTS

A sample of 291 individuals, which were classified by sex and sports category was collected. Four groups were formed

from the combination of two classes related to gender (female and male) and two classes of sports category (sub 15 and sub 17). A total of 123 female and 168 male subjects was obtained. Of total females, 72 individuals belonged to sub 15 category, while 51 individuals belonged to the category under 17. Do all male, 104 were included in the sub 15 category and 64 individuals belonging to 17 sub category.

In Table 1 is presented measures the average of the variables of age, weight, height, BMI and time in the sport of sub 15 and sub 17 categories of male and female.

Table 1. Means of variables observed by combining classes and sex classes of sports category, independent team (1)

Caracteristics	Female sub15	Female sub17	Male sub15	Male sub17	CV(%)
Age	13,40	15,69	13,85	15,61	9,05
Body Mass	55,74	62,90	62,19	72,56	21,93
Stature	160,75	164,38	170,49	176,46	5,61
Body Mass Index	21,49	23,24	21,35	23,22	16,89
Time at sport	2,67	4,68	2,83	4,70	56,64

(1)CV: coefficient of variation.

Table 2 presents the index of types of strength athletes of both sexes in different categories.

Table 2 presents means and standard deviations observed (in parentheses) the strength of upper limbs, lower limbs strength, abdominal strength and endurance, and strength and trunk flexibility by combining classes and sex classes of sports category, regardless of team.

Caracteristics	Female sub15	Female sub17	Male sub15	Male sub17
FMS (repetition)	4,34(3,41)	6,50(3,53)	9,73(4,81)	12,60(5,50)
FMI (cm)	2,53(0,17)	2,62(0,15)	2,75(0,19)	2,94(0,09)
FA (repetition)	18,89(12,43)	24,08(16,35)	31,14(17,05)	29,43(17,00)
FFT(cm)	26,90(3,40)	27,75(2,80)	25,62(3,91)	27,23(3,36)

Upper limb strength - (FMS), Strength of lower limb (IMF), abdominal strength and endurance (FA), strength and trunk flexibility (FFT)

Mean Higher Power for males was 124.2 replicates was 93.8% higher ($p < 0.05$) to the average female individuals, considering the categories sub 15 and sub 17, respectively. Mean Higher Power of individuals in the sub 17 repetitions were 49.8, equivalent to 29.5% higher ($p < 0.05$) to the average of 15 individuals from the sub, considering male and female, respectively (Table 3).

Table 3 presents values of adjusted means of least squares (lsmeans) of upper limb strength, according to the combinations of classes of sex and sports category, regardless of staff (1).

Sex	Sport Category	
	Sub 15	Sub 17
Female	$4,34^{bB}$	$6,50^{aB}$
Male	$9,73^{bA}$	$12,60^{aA}$

(1)lsmeansfollowed by different lowercase letters in the line and by different capital letters in the column differ from each other, for the F test of 5% of probability.

The mean lower strength for males was 8.7 cm equivalent to 12.2% higher ($p < 0.05$) to the average female individuals, considering the categories sub 15 and sub 17, respectively. The mean lower strength of the individuals under 17 were 3.56 cm and 6.91% higher ($p < 0.05$) to the average of 15 individuals from the sub, considering male and female, respectively (Table 4).

Table 4 presents values of adjusted means of least squares (lsmeans) Strength in the lower limbs, according to the combinations of classes of sex and sports category, regardless of staff (1).

Sex	Sport Category	
	Sub 15	Sub 17
Female	$2,53^{bB}$	$2,62^{aB}$
Male	$2,75^{bA}$	$2,94^{aA}$

(1)lsmeansfollowed by different lowercase letters in the line and by different capital letters in the column differ, the F test at 5% probability.

The mean abdominal strength and resistance (FA) for male subjects was 64.85% higher ($p < 0.05$) to the mean FA female subjects, whereas the sub 15 (Table 5) category.

Table 5 presents values of the least-squares adjusted means (lsmeans) of abdominal strength and endurance, according to the combinations of classes of sex and sports category, independent staff (1).

Sex	Sport Category	
	Sub 15	Sub 17
Female	$18,89^{B}$	24,08
Male	$31,14^{A}$	29,43

(1)lsmeansfollowed by a different uppercase letters in the column differs from each other, by the F test,in a probability level of 5%.

The average strength and flexibility stem (FFT) to female subjects was 5.00% higher ($p < 0.05$) to the mean FFT males, whereas the sub category of 15. Individuals under 17 showed mean value 6 28% higher ($p < 0.05$) than subjects of the sub 15, whereas the male elements (Table 6).

Table 6 presents values adjusted least squares means (lsmeans) of stem strength and flexibility, in accordance with the combinations of classes of sex and sports category, independent staff (1).

Sex	Sport Category	
	Sub 15	Sub 17
Female	$26,90^{A}$	27,75
Male	$25,62^{bB}$	$27,23^{a}$

(1)Ismeansfollowed by different lowercase letters in the line and by different capital letters in the column differ, the F test at a probability level of 5%.

In Table 7 the results were inconsistent in the relationship between lower limb strength and abdominal strength and endurance is reversed (negative sign) and low magnitude, indicating that, although not as intense, the higher values of strength in the lower limbs correspond with the lower abdominal strength, considering the combination of masculine and vice versa for the sub 17 category.

Table 7 presents the estimates of Pearson correlation coefficients between upper limb strength (FMS), lower limb strength (jump test), abdominal strength and endurance (FRA) and strength and trunk flexibility (FFT) according to the combinations of sex and sports category of individuals.

Variables	Female sub15	Female sub17	Male sub 15	Male sub 17
FMS xFMI	-0,15NS	0,36NS	0,19NS	0,03NS
FMS x FA	0,42***	0,42*	0,45***	0,40**
FMS x FFT	-0,02NS	-0,13NS	-0,03NS	0,02NS
FMI x FA	0,10NS	0,44*	0,05NS	-0,33*
FMI x FFT	0,02NS	0,10NS	-0,04NS	0,33*
FA x FFT	0,19NS	-0,06NS	0,10NS	-0,26NS

FMS- Force upper limbs, Lower IMF-Force members, FFT- Flexibility and strength of trunk, abdominal Force FA - Code of significance: * p ≤ 0.05; ** P≤0,01; *** P≤0,001, NS p <0.05.

The interesting results in all the combinations of classes of classes of sex and sports category, the relationship between force to the upper limbs and abdominal strength and endurance. Direct associations (positive signs) and low to medium magnitude (value of the correlation coefficient (r) ranging from 0.40 to 0.45), suggesting that the higher values of strength of upper limbs correspond higher values of Abdominal Strength that is, the increase in strength of the upper limbs provides positive correlated response (increase) in the abdominal force and vice-versa. Coefficient of correlation followed by NS (not significant) indicate that the sample coefficient estimates are not valid estimators of their population correlation coefficients, ie, do not serve as estimates (numeric values should be disregarded).

4. DISCUSSION OF RESULTS

Regarding the purpose of the study was to verify the strength index of handball athletes was found that the average of repetitions in the bending test was considered weak for all categories of both sexes, according to the reference: Pollock; Wilmore, (1993). When compared with the sexes was found that males was 93.8% higher (p <0.05) to the average female individuals, considering the categories sub 15 and sub 17, respectively. Among the categories is observed that sub-17 category was 29.5% higher than the sub 15.

Corroborating with the study Lima et al. (2012) it was concluded that most of the components of physical fitness of adolescents Handball practitioners irrespective of their category is in bad levels in the upper and lower muscle strength. The research also concluded that the level of physical fitness does not differ by category adolescents evaluated in this study, given that this differs from the study. Contrary study Caputo et al. (2009) with schoolchildren, aged between 12 and 16 years, of both sexes, practicing handball indicate that boys have higher levels for upper limbs.

Regarding lower for males was 8.7 variable force equivalent to 12.2% higher (p <0.05) to the average female individuals cm, considering the categories sub 15 and sub 17, respectively. The mean lower strength of the individuals under 17 were 3.56 cm and 6.91% higher (p <0.05) to the average of 15 individuals from the sub, considering female and male, respectively.

Chapter et al. (2009) reported higher results of lower limb strength in males compared to females, which in fact was also confirmed in this study. Regarding abdominal strength average for male subjects also demonstrated greater on 64.85% of the female sex, considering the category sub 15. Not showing the difference between sex under 17 category.

Study of Farias et al. (2012) the strength of the abdominal endurance athletes showed an average correlation with explosive power of lower limbs as a result justified by various forms of technical gestures and movements performed in sports, which requires good abdominal strength. The study showed also that between the levels of power of lower and upper limbs there was a high positive correlation, suggesting a gradual development of athletes, respecting the needs of the force handball sport. Then one realizes that although the methods used are not the same, the results between the present study and the study cited come to the same conclusion.

The main finding of the study was found on inconsistent results regarding the relationship between lower limb strength and abdominal strength endurance is reversed (negative sign) and low magnitude, indicating that, although not as intense, with larger values of Force lower limbs correspond with the lower abdominal strength. Considering the combination of masculine and vice versa for the U17 category. With this, it is clear that the upper abdominal strength and are most important to the sport of Handball compared to lower strength and higher values of strength of upper limbs correspond higher values of abdominal strength, ie, the increase in force upper limbs provides positive correlated response (increase) in the abdominal and vice versa force.

Levandosk et al. (2008) with the aim of describing some variables of body composition and fitness related performance school athletes in Handball was observed that the results were superior, upper limb strength was (27.55 repeats), abdominal strength (43.64 repetitions), lower strength (2.21 meters); and testing obtaining values below average. Compared with the study. These data compared to the present study it was observed that only the lower limb tests athletes participating Copa Parana had higher values.

5. CONCLUSION

In relation to the objective it was found that athletes of both sexes participants in the Copa Parana handball in the categories sub 15:17, found themselves below the level recommended by the reference variable Strength of lower abdominal and upper limbs. While finding of the present study was that the highest values of strength of the upper limbs correspond to the highest values abdominal force, in the increase in strength of the upper limbs provides positive correlated response (increase) in the abdominal force and vice-versa.

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RELATIVE STRENGTH LEVEL OF ATHLETE OF BOTH SEXES IN SUB CATEGORIES - 15 AND SUB - 17 OF HANDBALL

ABSTRACT

The objective of the study was to relate the level of superior, lower strength, and abdominal handball athletes of both sexes in the sub 15 and U17, which were present in Paraná Cup Handball categories, sample of 291 individuals, which were classified by sex and sports category. Four groups were formed from the combination of two classes related to gender (female and male) and two classes of sports category (sub 15 and sub 17). The evaluated variables were: time in the sport (TE) in years, body mass (BM) in kg, height (H), trunk-cephalic height (ATC), body mass index (BMI), lower limb strength (IMF) abdominal strength and endurance (FRA), strength and trunk flexibility (FFT), upper limb strength (FS). The analysis was performed based on descriptive statistics. At higher values of strength of the upper limbs correspond to the highest values of the abdominal force, by the way, the increase in strength of the upper members provides a positive correlated response (increase) in the abdominal and back strength.

KEYWORDS: Handball. Upper and lower strength. abdominal strength.

RELATION DU NIVEAU DE LA FORCE DES ATHLÈTES DE LES DEUX SEXES DANS LES CATÉGORIES – SOUS-15 E SOUS-17 DE HANDBALL

RÉSUMÉ

L'objectif de l'étude était de rapporter le niveau de la force supérieure, inférieure et abdominale des athlètes de handball avec le deux sexes dans les catégories sous-15 et sous-17, qui étaient présents à Paraná Handball Cup. Échantillon de 291 personnes, qui ont été classés par sexe et par catégorie sportive. Quatre groupes ont été formés à partir de la combinaison de deux classes liées au genre (féminin et masculin) et deux classes de catégorie sportive (sous-15 et sous-17). Les variables évaluées sont les suivantes: temps dans le sport (TE) en années, la masse corporelle (BM) en kg, stature (H), longueur cranio-caudale (ATC), l'indice de masse corporelle (IMC), la force des membres inférieurs (FMI) , la force et l'endurance abdominale (FRA), la force et la flexibilité du tronc (FFT), la force des membres supérieurs (FS). L'analyse a été effectuée sur la base des statistiques descriptives.Les valeurs plus élevées de force des membres supérieurs correspondent aux valeurs les plus élevées de la force abdominale, en d'autre termes, l'augmentation de la force des membres supérieurs fournit réponse corrélée positive (augmentation) de la force abdominale et vice versa.

MOTS-CLÉS: Handball. Force Supérieure et inferieur. L'endurance abdominale.

RELACIÓN DEL NIVEL DE FUERZA DE ATLETA DE AMBOS LOS SEXOS EN LAS CATEGORÍAS SUB 15 Y SUB 17 DE BALONMANO

RESUMEN

El objetivo de este estudio que fue relacionar el nivel de fuerza superior, inferior y abdominal de atletas de balonmano de ambos los sexos en las categorías sub 15 y sub 17, que se encontraban presentes en la Copa Paraná de balonmano. Amuestra de 291 individuos, los cuales fueran clasificados por sexo y categoría deportiva. Se formaran cuatro equipos, constituidos por la combinación de dos clases referentes al sexo (femenino y masculino) y dos clases de categoría deportiva (sub 15 y sub 17). Los variables evaluados fueran: tiempo en el deporte (TE) en años, masa corporal (MC) en Kg, Talla (TAL), altura tronco-cefálica (ATC), índice de masa corpórea (IMC), fuerza de miembros inferiores (FMI), fuerza y resistencia abdominal (FRA), fuerza y flexibilidad de tronco (FFT), fuerza de miembros superiores (FS). El análisis se dio a partir de estadística descriptiva. A los mayores valores de fuerza de miembros superiores corresponden a los mayores valores de fuerza abdominal, o sea, el aumento en la fuerza de miembros superiores proporciona respuesta correlacionada positiva (aumento) en la fuerza abdominal y viceversa.

PALABRAS LLAVE: Balonmano. Fuerza Superior e inferior. Resistencia abdominal.

RELAÇÃO DO NÍVEL DE FORÇA DE ATLETA DE AMBOS OS SEXOS NAS CATEGORIAS SUB – 15 E SUB – 17 DE HANDEBOL

RESUMO

O objetivo do estudo que foi relacionar o nível de força superior, inferior e abdominal de atletas de handebol de ambos os sexos nas categorias sub 15 e sub17, que se encontravam presentes na Copa Paraná de Handebol. Amostra de 291 indivíduos, os quais foram classificados por sexo e categoria esportiva. Formaram-se quatro grupos, constituídos pela combinação de duas classes referente ao sexo (feminino e masculino) e duas classes de categoria esportiva (sub 15 e sub 17). As variáveis avaliadas foram: tempo no esporte (TE) em anos, massa corporal (MC) em kg, estatura (EST), altura tronco-cefálica (ATC), índice de massa corpórea (IMC), força de membros inferiores (FMI), força e resistência abdominal (FRA), força e flexibilidade de tronco (FFT), força de membros superiores (FS). A análise se deu a partir de estatística descritiva. Aos maiores valores de força de membros superiores correspondem os maiores valores de força abdominal, ou seja, o aumento na força de membros superiores proporciona resposta correlacionada positiva (aumento) na força abdominal e vice-versa.

PALAVRAS-CHAVE: Handebol. Força Superior e inferior. Resistência abdominal.