132 - RELATIONSHIP BETWEEN BMI AND SITTING-RISING TEST IN STUDENTS OF THE BASIC GRADES

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INTRODUCTION

The Body mass Index (BMI) is an indicator of nutritional state based on the relationship between body mass and the height, and it is widely used, because of its simplicity in collecting data, do not depends on a high technology and neither to experimented evaluators (ANJOS, VEIGA and CASTRO, 1998; COLE et al, 2000; BINI et al, 2000; DANIELS et al, 2005).

In the last years, a bad relationship between body mass and height had become a phenomenon that worries the health professionals, due its association with cardiovascular diseases, hypertension, high level of cholesterol, diabetes and some kind of cancer (AGA, 2002; SWINBURN and EGGER, 2004; JAMES et al, 2004; LAWLOR and LEON, 2005).

Despite being possible that BMI presents some distortions due to sexual and ethnical differences or to the physical activity standard, the BMI is referenced in scientific literature as an indicator of nutritional state and corporal composition in epidemiological studies (RICARDO and ARAUJO, 2002; GUO et al, 2002; AAC, 2003).

The sitting-Rising Test (SRT) was proposed as a procedure able to evaluate how people seats and rises from the ground. These actions are considered simple movements that integrate the motor repertory of children and adults and demands muscle strength and power, flexibility of lower limbs, motor coordination, and it is dependent of the corporal dimensions (ARAUJO, 1999(a); ARAUJO, 1999(b); LIRA and ARAUJO, 2000; RICARDO and ARAUJO, 2001; LIRA, FARINATTI and ARAUJO, 2002).

The SRT consist on quantify how many supports (hands and/or knees on the ground or hands or arms on the knees) the volunteer uses to seat and to rise from the ground. It is attributed independent grades for each action – to seat and to rise. The maximum grade is 5 to each action, losing one point for every support and half point for each misbalance.

The association of BMI with SRT, had already been described in scientific literature, when Ricardo and Araujo (2001) concluded that the excess of body mass could difficult the actions of to seat and to rise in adults, especially in women, probably due to corporal composition characteristics evidenced by BMI.

Another trial conducted by Lira, Farinatti and Araujo (2002), where the objective was to study the influences of morfo-functionals variables in the sitting and rising actions through the SRT, they concluded that policemen aged between 18 and 45 years old, presented performance in SRT highly associated with their BMI.

The present paper aims to make a overview about the BMI of the students of the basic grades in a school in Belford Roxo City (RJ) and to verify its relationship with the results of SRT of these children.

METHODOLOGY

The studied sample was composed by 284 children and adolescents that studies in a private school of Belford Roxo City. All the students of this school were invited to participate in this research through a letter that was sent to the students' relatives, citing the criterions, objectives and the risks involved in the process. At the same time it was asked to the relatives to sign a Free and Clear Consent Term, so that the children could participate in the trial. From the total of 359 students of the basic grades, 302 sent back the Consent Term signed by their relatives, but 284 were submitted to the tests because only they performed the inclusion criterions.

The inclusion criterions were: 1) to send back the Consent Term assigned, 2) do not present any problem that, in the moment of the evaluation, should compromise the tests or the interpretation of the results, 3) to show up in the date, local and in the hour designed to the tests.

Between the 284 volunteers, 164 (58%) were male and 120 (42%) female. They presented 11,3 ± 3,4 years old (mean ± SD), varying from 6 to 17,5 years old, height of 149 cm ± 15 cm, varying from 110 to 182 cm, body mass of 45 ± 15,6 kg, varying from 15,2 to 102,6 kg. They still presented, BMI of 19,9 ± 4,4, varying from 11,7 to 36,5.

The body mass was taken through an electronical scale device, model TBF-401 (Tanita Co, Tokyo – Japan), with the volunteers barefooted and using light closes. The height was verified through a Cardiomed brand stadiometer (Brazil), and the students were evaluated barefooted in an erect position. These variables had a precision of 0,1 kg and 0,5 cm respectively, and it was accessed by an evaluator trained for procedure.

According to the protocol developed by Araujo (1999-a), the SRT was accessed in a sharp plane surface. The volunteers were barefooted and did not wear any clothes that could limit their movements. The evaluator was close, positioned in a diagonal way in order to have a better view of the test. It was done two tries to each volunteer. In the first one, the volunteer was instructed, very simply, to seat and rise from the ground with no help of hands, arms or knees, and without losing the balance. If the volunteer did not achieve a perfect performance, the evaluator should give more information, so that the volunteer could perform better on the second try.

Still, according to the same protocol, the volunteer started the test with the maximum score of 5 points for each action (to seat and to rise), and it was discounted one point for each support (hand, arm, knee) and half point for every perceptible misbalance (table 1). It was allowed to cross the legs to perform the required movements, but it was not allowed to lie back when sitting or to help with the hands arms or knees.

TABLE 1: Possible results on SRT

Points	Seat	Rise
5	no support	no supports
4,5	1 misbalance	1 misbalance
4	1 support	1 supports
3,5	1 support e 1 misbalance	1 supports e 1 misbalance
3	2 supports	2 supports
2,5	2 supports e 1 misbalance	2 supports e 1 misbalance
2	3 supports	3 supports
1,5	3 supports e 1 misbalance	3 supports e 1 misbalance
1	4 supports	4 supports
0,5	4 supports e 1 misbalance	4 supports e 1 misbalance
0	more than 4 supports or with the evaluator's help	More than 4 supports or with the evaluator's help

From: Ricardo and Araújo (2001)

The BMI was calculated using the mathematics equation: body mass / height2 (kg / m2).

The volunteers were classified in normal, over weighted and obese according to the table developed by the International Obesity Task Force (IOTF) (WHO, 1998), with cutoff points to BMI based on gender and age (table 2), presented by Cole et al. (2000). This table is used as a world reference, because it was created according to data of many countries, including Brazil, and because it presents cutoff points for overweight and obesity for children and adolescents related to the cutoff points for adults.

TABLE 2: Standards for BMI based in age and gender

AGE (years)	OVERWEIGHT BMI higher than		OBESITY BMI higher than		AGE (years)	OVERWEIGHT BMI higher than		OBESITY BMI higher than	
	MALE	FEM	MALE	FEM		MALE	FEM	MALE	FEM
6	17,55	17,34	19,78	19,65	12	21,22	21,68	26,02	26,67
6,5	17,71	17,53	20,13	20,08	12,5	21,56	22,14	26,43	27,24
7	17,92	17,75	20,63	20,51	13	21,91	22,58	26,84	27,76
7,5	18,16	18,03	21,09	21,01	13,5	22,27	22,98	27,25	28,20
8	18,44	18,35	21,60	21,57	14	22,62	23,34	27,63	28,57
8,5	18,76	18,69	22,17	22,18	14,5	22,96	23,66	27,98	28,87
9	19,10	19,07	22,77	22,81	15	23,29	23,94	28,30	29,11
9,5	19,46	19,45	23,39	23,46	15,5	23,60	24,17	28,60	29,29
10	19,84	19,86	24,00	24,11	16	23,90	24,37	28,88	29,43
10,5	20,20	20,29	24,57	24,77	16,5	24,19	24,54	29,14	29,56
11	20,55	20,74	25,10	25,42	17	24,46	24,70	29,41	29,69
11,5	20,89	21,20	25,58	26,05	17,5	24,73	24,85	29,70	29,84

From: Cole et al. (2000)

In order to make an overview about BMI, the volunteers were divided by gender and then the sample was separated in groups according to the table 2 and classified in groups: normal (N), over weighted (Ow), and obese (Ob). The N group was composed by the volunteers that presented BMI lower than the cutoff point for overweight, according to the table of age and gender. The Ow group was composed by the volunteers that presented BMI equal or higher than the cutoff point for overweight and lower than the cutoff point for obesity. The Ob group represented the volunteers that had BMI equal or higher than the cutoff point for obesity.

After that, the sample divided by gender, was once more divided by the scores of SRT, like this: volunteers with scores equal to 5/5 (=5/5) and volunteers with results lower than 5/5 (<5/5). The first group was composed by the volunteers that had score 5 in the both actions of the SRT, and the second group represented the volunteers that did not get the maximum score in those motor actions. So, it could be possible to observe the influence of the body mass excess, measured by BMI, and make a relationship with the performance of the volunteers in the SRT.

The descriptive statistics was applied to analyze the mean, the steady deviation, the maximum and minimum values and the variation coefficient. In order to verify the association between the SRT and BMI, it was used the inferential statistic, through the Spearman Correlation Coefficient, of the SPSS 11 statistical pack.

RESULTS

Tables 3 and 4 show the descriptive statistic of the sample, divided by gender:

TABLE 3: Descriptive statistic of the male volunteers (n=164)

	AGE (years)	MASS (kg)	HEIGHT (m)	BMI	SRT
Mean	11,2	45,1	1,49	19,7	9,4
Stead Deviation	2,4	14,2	0,15	3,8	0,9
Maximum	15	91	1,82	29,9	10
Minimum	6	15,2	1,10	12,6	4
Variation coefficient	21,4%	31,6%	10,3%	19,5%	9,8%

TABLE 4: Descriptive statistic of the female volunteers (n=120)

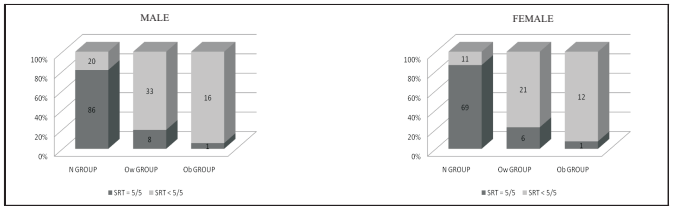
	AGE (years)	MASS (kg)	HEIGHT (m)	BMI	SRT
Mean	11,3	44,9	1,47	20	9,5
Stead Deviation	2,4	17,2	0,13	5,1	0,8
Maximum	17,5	102,6	1,71	36,5	10
Minimum	6,5	20,7	1,16	11,7	6
Variation coefficient	21,4%	38,2%	9%	25,4%	8,6%

Among the male volunteers, 106 (64,6%) were classified, according to the BMI, as belonging to the N group, 41 (25%) from the Ow group, and 17 (10,4%) from the Ob group. According to the SRT results there was 95 (57,9%) male volunteers classified as =5/5 and 69 male volunteers classified as <5/5.

Among the female volunteers, 80 (66,7%) were classified, according to the BMI, as belonging to the N group, 27 (22,5%) from the Ow group, and 13 (10,8%) from the Ob group. According to the SRT results there was 76 (63,3%) female volunteers classified as =5/5 and 44 (36,7%) classified as <5/5.

The figure 1 shows how is composed the N, Ow and Ob groups, based on the results of the SRT among the male and female volunteers.

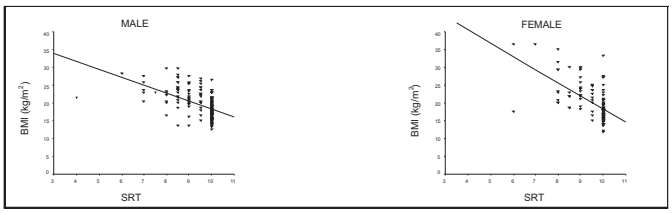
FIGURE 1: Composition of the N, Ow and Ob groups, according to the SRT results.



In order to analyze the relationship between volunteer's BMI and their results in the SRT, it was used the Spearman Correlation Coefficient, since SRT is a qualitative ordinal variable. It was found, that for the volunteers of both gender, a correlation index of r = - 0.62 (with significance level of p <0,01).

Based in these data it was elaborated the dispersion graphics (FIGURE 2), that represents the distributions of the results of the SRT, according to the BMI, for each gender.

FIGURE 2: SRT results dispersion, according to BMI, for each gender



The direction of the line of regression plus the negative results of the Spearman Correlation Coefficient demonstrates that there is an inverse relationship between BMI and SRT to both genders.

DISCUSSION

In the last decades, the prevalence of corporal mass excess among the youth had a significant growth in many countries, including Brazil, (WANG, MONTEIRO and POPKIN, 2002), and changes in the physical activity model had come together with this tendency (MONDA and POPKIN, 2005).

In a study with adolescents from 34 countries, it was observed that the probability of overweight decreases when the physical activity rises. This fact was observed in 29 of the 34 countries. In 22 of the analyzed countries in this study, the corporal mass excess was less prevalent when the time spent on TV watching decreased (JANSSEN et al., 2005).

According to Ebbeling, Pawlack e Ludwig (2002), the interventions that aim to prevent and treat the children obesity goes through acts more complex than simply increasing the time spent in daily exercises. The better strategies involve all the family, the school, and the whole community.

Sulemana, Smolensky and Dejian (2006) agree that there is a significant and inverse relationship between physical activity and the BMI. Similar relationship was found in the present study, where the results of the tests showed that the motor performance, represented by SRT, tended to decrease among the volunteers with higher BMI.

The effects of corporal mass excess is well known, and it constitutes an important risk factor to pathologies like arterial hypertension, dislipidemics, diabetes, coronary diseases, psico-social disturbs and muscle-skeletical diseases (EKCEL, 2005; BARNES and PUJOL, 2004; NATIONAL TASK FORCE, 2000). Nowadays, a relationship between these effects and some daily duties (like sitting, rising, lying down, walking, climb stairs) are about to be done, and in which way they could influence in the motor autonomy and in quality of life, is a question to be answered.

The association of BMI and the SRT, observed in this study with children and adolescents, were also found when Ricardo and Araujo (2001) and Lira Farinatti and Araujo (2002) studied samples with higher age. This fact suggests that the relationship between MBI and SRT is not dependent of the age.

CONCLUSION

In the studied sample, the volunteers that were classified as over weighted or obese, presented more difficulties in the motor actions evaluated by SRT than the volunteers that were classified as normal. It indicates that the corporal mass excess should influence, in a negative way, in the ability to perform basic motor actions.

The relation between BMI with SRT (r = - 0,62) is, according to Sigmund (2004) considered as a high medium correlation, suggest that higher values of BMI compromises, at least in part, the volunteers` performance in SRT.

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RELATIONSHIP BETWEEN BMI AND THE SITTING-RISING TEST ON STUDENTS OF BASIC GRADES

ABSTRACT

The Body Mass Index is an indicator of the nutritional state based on the relationship of body mass and the height. When a bad relationship occurs, it should become a phenomenon that worries the health professionals, because of its association with cardiovascular diseases. The Sitting-Rising Test was idealized as a procedure to evaluate how people seats and rises from the ground. The association of Body Mass Index and the Sitting-Rising Test in adults indicates that the excess of body mass increases the difficulty in performing these motor actions. The aim of this paper was to make an overview about Body Mass Index of students of a basic school in Belford Roxo City (RJ) and to verify its relationship with the Sitting-Rising Test results of these children. The 284 students (164 male and 120 female) was evaluated about their body mass using an TBF-401 model bioimpedance scale device (Tanita – Japan) and about their height using an Cardiomed brand stadiometer (Brazil).It was used the International Obesity Task Force cutoff points for overweight and for obesity. The Sitting-Rising Test was conducted, according to the protocol developed by Araujo (1999), by a trained person. In order to verify the relationship between the variables, it was used the Spearman Correlation Coefficient. According to the Body Mass Index, the male volunteers was considered normal in 64,6%, over weighted in 25% and obese in 10,4% of the cases. To the female volunteers, it was found: normal = 66,7%, over weighted = 22,5% and obese = 10,8%. The Spearman Correlation Coefficient (r = - 0,62), the same value for both gender, suggests that body mass excess can influence, in a negative way, in the performance of fundamental motor actions.

KEY WORDS: Obesity, Children, Body Mass Index.

L'ASSCIATION ENTRE L' INDICE DE MASSE CORPORELLE ET LE SITTING-RISING TEST CHEZ LES ÈLÈVES DE L'ÉCOLE PRIMAIRE

RESUMÉ

L'indice de masse corporelle est un indicateur de l´état nutritionnel basé sur la relation entre la masse corporelle et la taille. Ce rapport devient un phénomène préoccupant pour tous les professionnels de santé, lorsque défavorable du fait de sa relation aux maladies cardiovasculaires. Le Sitting-Rising Test a été proposé pour évaluer la capacité des individues à exécuter les actions de s´asseoir et de se lever a partir du sol. L´association entre l´indice de masse corporelle et le Sitting-Rising Test chez les adultes indique que l´excès de masse corporelle rend difficile ces actions motrices. L´objective de cette étude est de dresser le profil de l'indice de masse corporel des élèves de l école primaire de la ville de Belfort Roxo (RJ) et vérifier sa relation avec les résultats du Sitting-Rising Test de ces enfants. La masse corporelle a été évaluée pour 284 élèves (164 du genre masculin et 120 du genre féminin) utilisant une balance de la Bio impédance (modèle TBF-401) (Tanita – Japon), aussi que la taille avec une estadiometre (Cardiomed – Brésil). Les valeurs de référence de la International Obesity Task Force ont été prises en compte pour évaluer les résultats du surpoids et d´obésité. Le Sitting-Rising Test a été réalisé selon le protocole d´Araújo (1999), par un professionnel dûment habilité. Le Coefficient de Spearman a été utilisé pour évaluer la corrélation entre les variables. Les volontaires du genre masculin, d´après l'indice de la masse corporelle, ont été considérés normaux pour 64,6%, en surpoids pour 25% et obèses pour 10,4%. Pour le genre féminin, 66,7% de volontaires on été considérées normales, 22,5% en surpoids et 10,8% obèses. Le coefficient de corrélation de Spearman (r= - 0,62), équivalent pour les 2 genres, suggère que l´excès de masse corporel peut influencer d´une façon négative la capacité à développer les activités motrices fondamentales.

MOTS CLÉS: Obésité, Enfants, Indice de la Masse Corporelle

RELACION DEL IMC COM EL TESTE DE SENTAR-LEVANTAR EN ALUMNOS DEL FUNDAMENTAL

RESUMEN

El indicador de Masa Corporea es un indicador del estado nutricional basado em la relación entre la masa corporea y la estatura. Dicha relación, cuando desfavorable revierte em un fenómeno que viene inquietando los profesionales del area de salud, debido a su asociación con enfermedades cardiovasculares. El teste de Sentar-Levantar ha sido propuesto como un procedimiento capaz de evaluar la destreza con la cual los individuos desempeñan las acciones de sentar y levantar del suelo. La asociación del Indicador de Masa Corporea con el teste de Sentar-Levantar en adultos indica que el exceso de masa corporea dificulta esas acciones motoras. Este estudo tuvo como objeto de diseñar el perfil del Indicador de Masa Corporea de los alumnos del Fundamental de una escuela de Belford Roxo (RJ) y verificar la relación de este con los resultados del Teste de Sentar-Levantar de estas criaturas. Los 284 estudiantes (164 del sexo masculino y 120 del sexo femenino) han sido evaluados em relación a la masa corporea a travez de uma balanza de bioimpedancia modelo TBF-401 (Tanita – Japon) y en relación a la estatura con un estadiometro de marca Cardiomed (Brasil). Han sido utilizados los puntos de corte para sobrepeso y obesidade preconizados por la International Obesity Task Force. El Teste de Sentar-Levantar ha sido realizado de acuerdo con el protocolo de Araújo (1999), por um profesional entrenado para este fin. Para verificar la correlación entre las variaciones se utilizó el Coeficente de Correlación de Spearman. Los voluntarios del sexo masculino, segundo el Indicador de Masa Corporea, han sido considerados normales en el 64,6%, sobrepesados el 25% y obesos en el 10,4% de los casos. Para el sexo femenino fueron consideradas normales 66,7%,

sobrepesadas 22,5% y obesas 10,8% de las voluntarias. El Coeficiente de correlación de Spearman (r = - 0,62), igual para ambos los sexos, sugiere que el exceso de masa corporea puede influenciar de manera negativa en la capacidad para desarrollar acciones motoras fundamentales.

PALABRAS CLAVE: Obesidad, Niños, Indicador de Massa Corporea

RELAÇÃO DO IMC COM O TESTE DE SENTAR-LEVANTAR EM ALUNOS DO ENSINO FUNDAMENTAL

RESUMO

O índice de Massa Corporal é um indicador do estado nutricional baseado na relação entre a massa corporal e a estatura. Essa relação, quando desfavorável, torna-se um fenômeno que vem preocupando os profissionais da área da saúde, devido sua associação com doenças cardiovasculares. O Teste de Sentar-Levantar foi proposto como um procedimento capaz de avaliar a destreza com que os indivíduos executam as ações de sentar e levantar do solo. A associação do Índice de Massa Corporal com o Teste de Sentar-Levantar em adultos indica que o excesso de massa corporal dificulta essas ações motoras. Este estudo teve como objetivo traçar o perfil do Índice de Massa Corporal dos alunos do ensino fundamental de uma escola de Belford Roxo (RJ) e verificar a relação deste com os resultados do Teste de Sentar-Levantar destas crianças. Os 284 estudantes (164 do gênero masculino e 120 do gênero feminino) foram avaliados em relação à massa corporal através de uma balança de bioimpedância modelo TBF-401 (Tanita – Japão) e em relação à estatura com um estadiômetro da marca Cardiomed (Brasil). Foram utilizados os pontos de corte para sobrepeso e obesidade preconizados pela International Obesity Task Force. O Teste de Sentar-Levantar foi conduzido, segundo o protocolo de Araújo (1999), por um profissional treinado para este fim. Para verificar a correlação entre as variáveis foi utilizado o Coeficiente de Correlação de Spearman. Os voluntários do gênero masculino, segundo o Índice de Massa Corporal, foram considerados normais em 64,6%, sobrepesados em 25% e obesos em 10,4% dos casos. Para o gênero feminino foram consideradas normais 66,7%, sobrepesadas 22,5% e obesas 10,8% das voluntárias. O Coeficiente de correlação de Spearman (r = - 0,62), igual para ambos os gêneros, sugere que o excesso de massa corporal pode influenciar de forma negativa na habilidade em desempenhar ações motoras fundamentais.

PALAVRAS CHAVE: Obesidade, Crianças, Índice de Massa Corporal.

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