09 - COMPONENTS OF PHYSICAL FITNESS AND ITS RELATION WITH NONSPECIFIC LOW BACK PAIN IN SCHOOL TEENS IN THE COLÉGIO DE APLICAÇÃO - ACRE, BRAZIL

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INTRODUCTION

The physical activity has decreased as a result of life being progressively easier due to the comfort and modernity. The current lifestyles are marked by the global phenomenon of new technologies, leading teens to indulge in multiple experiences in the virtual world that make them increasingly sedentary. The inactivity among young people, contributes to the emergence of hypo kinetic diseases (LOHMAN et al., 2006; IGNARO et al., 2007) growing throughout the world (SULEMANA et al., 2003), as well as in Brazil (OEHLSCHLAEGER et al. 2004).

Among the diseases caused by physical inactivity, we may refer to non-specific low back pain (NLBP) often observed in teenagers, repeatedly due to their own lifestyle. Because back pain manifests in various conditions, it becomes difficult to determine its etiology. Its cause can be associated with involvements such as physical inactivity (TSUJI et al., 2001) and reduced flexibility and muscular strength (BATTIÉ et al., 1990; NADLER et al., 2001; TAKALA & VIIKAI-JUNTURA, 2000).

The poor performance on physical fitness tests, reflecting on not meeting the health criteria adopted by different test batteries (GUEDES, 2007) indicates that the reduced flexibility (JONES et al., 2005; MIKKELSSON et al., 2006) reflect higher risk of involvement by health problems, in the case of back pain.

The conservation of adequate flexibility parameters in the hamstring region appears to be an important aspect for the prevention of back pain. According to FELDMAN et al., (2001), adolescents may experience pain in the lumbar region, with prevalence rates of 17.2%, and in some cases lead to the inability to perform normal activities, or even to the use of drugs.

The strength/endurance refers to the ability of the muscle or group of muscles, to sustain repeated contractions for a certain period of time (WILMORE & COSTILL, 1993). Appropriate indices of strength/endurance prevent postural problems, joint and musculoskeletal disorders. Weaknesses in these components indicate low back pain and risks of localized fatigues (CLAUSEN, 1973; GEORGE et al. 1996). ACCORDING TO THE AMERICAN COLLEGE OF SPORTS MEDICINE (ACSM) (1996), and although lacking scientific evidence, a low strength/resistance in the abdominal muscles has been related to the etiology of low back pain of muscular origin. The strength/endurance and flexibility, being weak, can trigger serious musculoskeletal disorders that result in considerable pain and discomfort (POLLOCK & WILMORE, 1993).

Among the various components that characterize the physical fitness of an individual, cardio respiratory capacity has been considered one of the most important, both for athletes and for individuals who need a physical activity as health promotion (ACSM 1991). Adequate levels of cardio respiratory capacity in adolescence are associated inversely with cardiovascular and metabolic risk factors (TWISK et al., 2002); LEFEVRE et al., 2002) and are directly related to an increase in participation in sports, regular physical activities, high demanding on physical activity jobs and healthy lifestyle in adult life (PATE et al., 2006).

Another important factor of physical fitness is the body mass index (BMI), which is an important factor in determining health.

The present study aimed to investigate the relation of some components of physical fitness, with the prevalence of nonspecific low back pain (NLBP) in school children and adolescents.

METHODOLOGY

Study design and participants

149 students (86 boys and 63 girls) aged 11-17 years participated in this randomized cross-sectional study. A convenience sample of this study was recruited by students enrolled in the Colégio de Aplicação, elementary and high school. This school works as lab for pedagogical experiences and practices of the Federal University of Acre, in the city of Rio Branco. The entrance to the school is through public lottery, featuring the college within a socio-economic mix.

86 female (58%) and 63 male (42%) participants with the general characteristics shown in Table 1.

Table 1. General characterization of the sample between sexes

	Total (N = 149)	Girls (N = 86)		Boys (N = 63)		
		Min-Max	M (Dp)	Min-Max	M (Dp)	P Values
Age	13.8 (1.9)	11 - 17	13.9 (1.9)	11 - 17	13.5 (1.8)	0.214
Weight (Kg)	52.8 (12.6)	34.0 - 102.9	52.7 (12.0)	28.8 - 92.6	52.9 (13.6)	0.910
Height (cm)	1.57 (0.09)	1.38 - 1.76	1.56 (0.07)	1.35 - 1.81	1.59 (0.10)	0.040*
IMC (Kg/m^2)	21.2 (3.8)	15.5 - 36.5	21.5 (3.7)	13.5 - 32.1	20.7 (4.0)	1.211

* $P < 0.05$ Significant differences between girls/boys.

Clinical data was recorded in structured questionnaires, which were completed by students. The students agreed to participate in this study and their parents gave their approval and informed consent, in accordance with the Declaration of Helsinki. All methods and study procedures were approved by an Institutional Scientific Council of the University of Coimbra, Portugal.

After the selection process, conducted according to age group, students were invited to a preliminary meeting in which

they were informed about the nature, risks and benefits of the study. Also in this meeting, participants completed the Roland-Morris Disability Questionnaire (RMDQ). A second meeting was scheduled for evaluation of variables on the battery tests program FITNESSGRAM® (THE COOPER INSTITUTE FOR AEROBICS RESEARCH, 2002).

Low back pain

The nonspecific low back pain was evaluated with a direct question at the time of assessment ("At this moment do you feel any pain or discomfort in the lower back (lumbar) or prolongation of the legs?"), If the answer was "yes", the participants were asked to mark in an image the location of pain (PELLISÉ et al., 2009; JONES & MACFARLANE, 2009).

Roland-Morris Disability Questionnaire (RMDQ)

Adapted and validated for the Brazilian population (JUNIOR et al., 2010). The RMDQ is a simple tool that evaluates the inability of pain, consists of 24 questions with dichotomous responses (yes / no). The final score is the sum of the 'yes' responses, with zero corresponding to a person without any complaints, while 24 correspond to a person with very severe limitations.

Evaluation of motor and aerobic components

Fitnessgram ® Battery Tests

This is an education program of physical fitness aimed at children and young people in primary and secondary schools. This program establishes the protocol for applying the tests that compose the whole battery, characterized by being specific to children aged 5 to 17 years old (SARDINHA, 2002). This battery of tests proposed to assess three components of health related physical fitness (HRPF): aerobic fitness, body composition and muscle fitness.

The program evaluates the performance in three distinct areas, the first in which the student "Needs Improvement", the second identifying the "Healthy Fitness Zone" and the last "Above the Healthy Fitness Zone" (NES, 2002). This estudy included the following tests of the Fitnessgram ®:

Test Sit-and-Reach (SR): used as an indicator of the flexibility of the lumbar area (CHILLON et al., 2010) and hamstrings (CASTRO-PIÑERO et al., 2009). Consists in the achievement of the specified distance in the Flexibility Healthy Fitness Zone for the right and left sides of the body.

- Evaluation of abdominal strength/resistance (ABD): it was proposed to carry out the test reaching the largest possible number of abdominal crunches to a maximum of 75, at a specified rate. A mattress and a track with scale (75 x 11.5 cm) were used as tool. While a student performed, another observed possible performance errors.

- Evaluation of trunk flexibility/strength: it was included in the study because it is possible to establish a close relationship between their fitness and the health of the lumbar, especially with a functional spinal alignment in this region. It consists of the elevation of the top of body 30 cm from the ground and maintaining it until they take the measurement, with the motion performed in a slow and controlled manner. The maximum result should be of 30 cm. While some flexibility is important, it is not advisable to encourage hyperextension.

- Cardio Respiratory Assessment (shuttle run): In the shuttle test, the student had to travel a distance of 20 meters, in opposite directions, at an increasing speed in consecutive periods of one minute (to the sound of a beep). Students run the stipulated area and touch the line at the beep; if they arrive before, they have to wait the signal to restart the race; should follow the same procedure until they are not able to reach the line. Initially, the running speed will be very slow, increasing over time. The space used was the school's yard.

Anthropometry

To assess body composition it was used the Body Mass Index (BMI). Height was measured to 0.1 cm in the vertical position, without shoes, and using a standard stadiometer. Body weight was measured barefoot in light clothing on a calibrated beam scale (Filizola PL 200, Brazil), with an accuracy of close to 100 grams. BMI was determined by calculating the ratio of the body weight in kilograms by height in squared meters. Anthropometric measurements were performed in separate rooms to ensure privacy of the participants.

Statistical Analysis

A descriptive analysis of the results was performed with the support of the Statistical Package for the Social Sciences for Windows (SPSS, Inc. Chicago, IL, USA), software version 20.0, by means and standard deviations (M ± SD) for the continuous variables (BMI, trunk extension, sit-and-reach left and right abdominal, shuttle run and RMDQ. The confidence interval was 95%. For the comparison of categorical variables (between groups without NLBP, and with NLBP) with a multivariate analysis of covariance (MANOVA). The confidence level of $p < 0.05$ was used as statistically significant for all analyzes.

RESULTS

The participant characteristics are described in Table 02, which identifies the group "with nonspecific low back pain" (with NLBP, N = 90) and group "without nonspecific low back pain" (without NLBP, N = 59).

In the table we can see that the NLBP group compared to the group without NLBP, shows statistically significant lower values for the variables SA (the lower right and left limbs), abdominal strength/resistance, trunk extension and shuttle run, and higher values in the test Rolland-Morris ($P < 0.5$).

Tabel 2. Multivariate analysis between groups

VARIABLES	Total (N = 149)	WITHOUT NLBP (N = 59) F: 31 M: 28	WITH NLBP (N = 90) F: 55 M: 35	*P (values)*
BMI (Kg/m^2)	21,20	21,0±3,9	21,0±3,9	0,625
T Ext (cm)	18,83	20,3±5,2	17,9±4,8	**0,005***
SR rll (cm)	26,37	26,6±7,4	26,4±6,5	0,771
SR LLL (cm)	25,94	26,5±7,4	25,6±6,5	0,450
ABD$^+$	23,98	27,4±16,4	21,7±13,4	**0,023***
Shuttle^{++}	32,55	36,1±14,7	30,2±11,4	**0,007***
RMDQ(yes/no)	5,21	3,6±2,6	6,3±3,8	**0,001***

BMI = body mass index; T Ext = trunk extension, SR RLL = Sit-and-Reach right lower limb; SR LLL = Sit-and-Reach left leg; ABD = $^+$ (number of repetitions);$^{++}$ (number of turns); RMDQ = Roland Morris Disability Questionnaire. * Significant difference to the level of significance of $\alpha \leq 0.05$.

DISCUSSION

As shown in the results, this study identified a greater degree of trunk extension in the group without NLBP compared to the group with NLBP, demonstrating that lower back pain can be one of the factors that affect how the movement of flexibility/strength of the stabilizing muscles of the back. Our results are in agreement with other studies that relate the decrease in strength with low back pain (MOREAU et al., 2001; SJØLIE & LJUNGGREN, 2001; ANDERSEN et al., 2006; PARTY, 2010).

Regarding abdominal strength/resistance, we found that the group with NLBP has a decreased degree compared to the group without NLBP, meaning that the lower the muscle strength, the greater the lumbar complaints by subjects. In this sense, we can see that the reduction in strength/endurance of the stabilizing muscles of the spine, both the extensor and flexor, presents an association with symptoms of low back pain. MOLFROID (1997) mentions in his study that the extensor muscles are composed mainly of type I fibers, very important to withstand long periods in a position with low levels of activity, thus the importance of the force of resistance.

According to the ACSM (1996), a low strength/endurance of the trunk, and other etiological factors contribute to the development of low back pain of muscular origin. As for KENDALL & MACCREARY (1986), the muscles of the lower back is seldom weak and for them lumbar pain is due to the weakness of the abdominal muscles. For MORROW et al. (1994), the strength/endurance and flexibility have a well established relationship with a good health.

With regard to BMI, the values are slightly higher in females, as shown in Table 1. When comparing the BMI of the group with NLBP with the group without NLBP, no relevant differences were found. This result corroborates other studies conducted with children and adolescents (GRIMMER & WILLIAMS, 2000; WEDDERKOPP et al., 2003; WATSON et al., 2003; RODACKI et al., 2005; LEBOEUF-YDE et al., 2006; HESTBÆK et al. , 2006; MATTILA et al., 2008), however, HESTBAECK et al., (2006), showed a positive association between low back pain and high body mass index.

Another component of physical fitness researched was the flexibility of the spine and hamstrings muscles, through the test of sit-and-reach. In both sexes were found results below the indicated "healthy zone" of the Fitnessgram; however no significant differences were showed between the groups with and without NLBP. A study by DOREA et al., (2008); RONQUE et al., (2007), demonstrate that representative samples of Brazilian children, between 42% and 49% of boys and 24% to 55% of girls do not meet the health criteria established for the test "sit-and-reach."

Being easy to use in the school context, the shuttle run test is very useful in the assessment of student groups (MALINA et al, 2004a). In this study we found a significant positive association between aerobic fitness evaluated with the shuttle run test and NLBP, which found that children and adolescents who experience pain, travel less distance. MASIERO et al., (2008), emphasize that moderate physical activity are the most recommended for the protective effect of low back pain, lying on high activities, a higher prevalence of the pain thus justifying that the study participants presenting NLBP cannot travel long distances.

In the same sense we also found significant differences between the NLBP and RMDQ (0.001), where the group of students who felt pain scored much higher than their peers. According to FELDMAM et al., (2001) adolescents may have pain that lead to the inability to perform normal activities. KASPIRIS et al., (2010) found in their study that 91.5% of participants showed a restriction on at least one of the 24 activities proposed by the RMDQ.

CONCLUSION

Through this research we can see a negative correlation between low back pain and muscle resistance strength, meaning that the lower muscle endurance strength, the greater the lumbar complaints presented by the subjects. Given the high prevalence of low back pain in this population and the protective effect of muscular strength and endurance, as well as the flexibility, the health professionals and physical education teachers, should consider the modifiable risk factors, implementing prevention programs that include the work of the muscles of the spine and abdominals to prevent present and future low back pain.

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COMPONENTS OF PHYSICAL FITNESS AND ITS RELATION WITH NONSPECIFIC LOW BACK PAIN IN SCHOOL TEENS IN THE COLÉGIO DE APLICAÇÂO - ACRE, BRAZIL

ABSTRACT

Back pain is a common problem in the adult population, and it is becoming a serious health problem among adolescents. The aim of this study was to investigate the association of some components of physical fitness, with the prevalence of nonspecific low back pain (NLBP) in school children and adolescents. The sample consisted of 149 subjects, from 6th to 12th grade, 86 female (58%) and 63 male (42%) with a mean age of 13.5 ± 1.8. The evaluation comprehended symptoms of pain, functional disability of pain through the Roland-Morris Disability Questionnaire (RMDQ), body composition by anthropometric measurement, motor evaluation (flexibility and muscular strength) and the aerobic followed the protocol defined by Fitnessgram ® . The sample was divided into 2 groups: "With Nonspecific Low Back Pain" (with NLBP) and "Without Nonspecific Low Back Pain (without NLBP). Statistical procedures consisted of descriptive analysis, using means and standard deviations (M ± SD) for continuous variables (BMI, trunk extension, sit-and-reach left and right abdominal, shuttle test and RMDQ). The confidence interval was 95%. The MANOVA test was performed for the comparison of categorical variables between groups. The main results showed that the group with NLBP had statistically significant lower values for the variables of flexibility (the lower right and left limbs), abdominal strength / resistance, trunk extension and shuttle test, and higher values in the Rolland-Morris test (P <0.5).

(*) All procedures reported are in accordance with the Declaration of Helsinki, 1975, and obtained a favorable opinion of the Scientific Committee of FCDEF (Faculty of Sport Sciences and Physical Education University of Coimbra) for its realization.

KEYWORDS: Low back pain, fitness, school children and adolescents.

COMPOSANTES DE LA CONDITION PHYSIQUE ET SA RELATION AVEC LA LOMBALGIE ÉCOLE LES ADOLESCENTS NON SPÉCIFIQUES DANS COLÉGIO DE APLICAÇÃO – ACRE, BRÉSIL

RÉSUMÉ

Mal de dos est un problème fréquent dans la population adulte , et est devenu un grave problème de santé à l'adolescence. Le but de cette étude était d'étudier l' association de certaines composantes de la condition physique , avec la prévalence de la non spécifique douleur au bas du dos (IDD) chez les enfants et les adolescents scolaires. L'échantillon se composait de 149 sujets , 86 (58%) femmes et 63 (42%) étaient de sexe masculin avec un âge moyen de 13,5 ± 1,8 , de la 6e à la 12e année. Nous avons évalué les symptômes de la douleur, l'incapacité fonctionnelle de la douleur par l'inventaire Roland - Morris Disability Questionnaire (RMDQ) la composition corporelle en mesure anthropométrique , moteur évaluation (force musculaire) et aérobie suivi le protocole défini par Fitnessgram ® . L'échantillon a été divisé en 2 groupes : «Avec le mal de dos non spécifique Low" (avec IDD) et «non non spécifique Back Pain Low (sans IDD) . Statistique analyse consistait analyse descriptive , utilisant des moyens et des écarts types (M ± écart-type) pour les variables continues (IMC , extension du tronc , des sit- and- atteindre navette de course abdominale gauche et à droite et RMDQ) . L'intervalle de confiance est de 95% . Pour la comparaison des variables catégorielles entre les groupes , nous avons utilisé l'analyse multivariée de la covariance (MANOVA) . Les principaux résultats ont montré que le groupe avec l'IDD a des valeurs significativement plus faible pour les variables de flexibilité (en bas à droite et à gauche) , la force / résistance abdominale, extension du tronc, course vaievem, et des valeurs plus élevées dans le test Rolland- Morris (P < 0.5) .

(*) Toutes les procédures présentées ici sont conformes à la Déclaration d'Helsinki de 1975, et obtenu un avis favorable du comité scientifique de FCDEF (Faculté des Sciences du Sport et de l'Education Physique Université de Coimbra) paire leur réalisation.

COMPONENTES DE APTITUD FÍSICA Y SU RELACION COM EL DOLOR LUMBAR INESPECIFICO EN ADOLESCENTES ESCOLARES DEL COLEGIO DE APLICACION – ACRE, BRASIL

RESUMEN

Dolor lumbar o lumbalgia es un problema común en la población adulta, lo que está convertiendose en un grave problema de salud en la adolescencia. El objetivo del presente estudio fue examinar la relación de algunos componentes de la aptitud física, con la prevalencia de dolor lumbar inespecífica (DLI) en niños y adolescentes en edad escolar. La muestra estuvo constituída por 149 individuos, siendo 86 (58%) del sexo feminino e 63 (42%) del sexo masculino,con una media de edad de 13,5±1,8, del 6º a lo 12º año de escolaridad. Fueron evaluadas la sintomatología del dolor, la funcionalidad del dolor mediante el inventario Roland-MorrisDisability Questionnaire (RMDQ) la composición corporal, atraves de la medición antropometrica, la evaluación motora (flexibilidad y fuerza muscular) y la aerobia que sigue el protocolo definido por el Fitnessgram®. La muestra estuvo dividida en 2 grupos: “com Dolor Lumbar Inespecífica” (con DLI) y “sin Dolor Lumbar Inespecífica (sin DLI). Los procedimientos estadísticos consistieron en la analisis descriptiva, mediante las médias e desviación Estandar (M ± DE) para las variables contínuas (IMC, extensión del tronco, sentarse-y-alcanzar derecho y izquierdo, abdominal, corrida do vaivém e RMDQ. El intervalo de confianza fue de 95%. Para la comparación de las variables categóricas entre los grupos, fue utilizado el test Manova. Loss principaless resultados evidenciaron que el grupo con DLI presenta valores menores estadísticamente significativos para las variables de flexibilidad (miembros inferiores derecho y izquierdo), fuerza/resistencia abdominal, extensión del tronco y vaivém, y valores mayores en el test de Rolland-Morris (P< 0,5).

(*) Todos los procedimientos relatados aquí están de acuerdo con la declaración de Helsínque, de 1975, e obtuvieron parecer favorable del comite científico de la FCDEF (Faculdade de Ciências del Desporto e Educación Física Universidad de Coimbra) para su realización.

COMPONENTES DA APTIDÃO FÍSICA E SUA RELAÇÃO COM A DOR LOMBAR INESPECÍFICA EM ADOLESCENTES ESCOLARES DO COLÉGIO DE APLICAÇÃO - ACRE, BRASIL

RESUMO

Dor lombar é um problema comum na população adulta, e está a tornar-se um grave problema de saúde na adolescência. O objetivo do presente estudo foi verificar a associação de alguns componentes da aptidão física, com a prevalência de dor lombar inespecífica (DLI) em crianças e adolescentes escolares. A amostra foi constituída por 149 indivíduos, sendo 86 (58%) do sexo feminino e 63 (42%) do sexo masculino, com uma média de idades de 13,5±1,8, do 6º ao 12º ano de escolaridade. Foram avaliadas a sintomatologia de dor, a incapacidade funcional da dor através do inventário Roland-Morris Disability Questionnaire (RMDQ) a composição corporal, pela medição antropométrica, a avaliação motora (flexibilidade e força muscular) e a aeróbia (vaivém), seguiu o protocolo definido pelo Fitnessgram®. A amostra foi dividida em 2 grupos: “com Dor Lombar Inespecífica” (com DLI) e “sem Dor Lombar Inespecífica (sem DLI). Os procedimentos estatísticos consistiram em

análise descritiva, por meio de médias e desvios-padrão (M ± DP) para as variáveis contínuas (IMC, extensão de tronco, sentar-e-alcançar direito e esquerdo, abdominal, corrida do vaivém e RMDQ). O intervalo de confiança foi de 95%. Para a comparação das variáveis categóricas entre os grupos, foi utilizado análise multivariada de covariância (Manova). Os principais resultados evidenciaram que o grupo com DLI apresenta valores menores estatisticamente significativos para as variáveis de flexibilidade (membros inferiores direito e esquerdo), força/resistência abdominal, extensão de tronco e vaivém, e valores maiores no teste de Rolland-Morris (P< 0,5).

(*) Todos os procedimentos aqui relatados estão de acordo com a declaração de Helsínque, de 1975, e obtiveram parecer favorável do comité científico da FCDEF (Faculdade de Ciências do Desporto e Educação Física da Universidade de Coimbra) para sua realização.

PALAVRAS-CHAVE: Dor lombar, aptidão física, crianças e adolescentes escolares.