51 - COMPARISON OF PHYSICAL FITNESS IN STUDENTS OF ANÁPOLIS-GO ABOUT PLANTAR ARCH FORMATION

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INTRODUCTION

The flat foot is a very common condition. It is known as " pes planus" or "fallen arches". This condition corresponds to the total or partial loss of the curvature of the foot caused by hypotonia of the flexor muscles of the toes. The low muscle tone leads to a loosening of ligaments, or plantar fascia, which changes the physiological curvature, resulting in structural damage to the functionality of the feet (ROSE; Welton; MARSHALL, 1985). It is characterized by a pronated position (inclination of the ankle bones inside) of the rear foot. Moreover, there is a decrease in the longitudinal plantar arch, extending from the toes to the heel, a condition in which most of the foot is in contact with the ground. Such overloading, besides producing calluses, imposes changes in gait, with consequent loss of balance and injuries in the impact areas (Garcia-Rodriguez et al., 1999).

There are also people with pes cavus (or supinated foot, or high arch) which tend to place the entire body weight to the medial side of the foot, as a result of the reduction or absence of the longitudinal arch of the foot. In these cases there is an excessive elevation of the longitudinal arch of the foot plantar base, from the toes to the heel. The exaggeration of this curvature is characterized by the weight distribution in just two points, calcaneus and metatarsal heads (BREWSTER; LARSON, 1940). In these cases often occurs an imbalance in the distribution of pressure points that can cause pain and calluses on the toe base (AMINIAN; Sangeorzan, 2008).

There is a high incidence of children who have some kind of change in the foot type and in the plantar arch and do not even know of this problem (PEZZAN et al., 2009; CORRÊA; PEREIRA, 2005). The feet are a common site of sports injuries, for harboring a large number of joints, ligaments and tendons, especially when they hold any anatomical abnormality (SMITH, WEISS, Lehmkuhl, 2001). Many injuries can occur in physically active individuals and athletes, from simple to very serious ones, simply due to their foot type (BARBOSA, CARVALHO, 2008).

To BRICOT (2004), the foot is a captivator and an adapter that receives information from muscles, joints and skin. It is a key element in the postural system since the foot is an external and internal sensitive body receptor.

According to Viladoct and Voegeli (2003) most athletes in events that involve running, have a discreet cavus foot, mostly due to a big demand of lower limb muscles, increasing muscle tone involving the plantar arch. However, they admit the existence of competitive athletes who have flat feet.

OBJECTIVE

Register in adolescent people practicing various sports, the incidence of flat, cavus, neutral and foot, comparing the components of physical fitness of young people according to their foot type.

METHODOLOGY

It was a positivist research with a quantitative approach, of descriptive nature, with the purpose of describing and registering the observed and analyzed events in order to correlate the facts without manipulating them (TRIVIÑOS, 1992).

The research sample included physically active adolescent people in different sports (soccer, athletics, swimming, karate), aged between 11 and 17 years, of both sexes. A total of 331 boys and 226 girls.

All of them were invited to participate in the study during their daily workouts. On a first visit it was explained the objectives and procedures of testing and the term of informed consent (TCLE) was sent to their parents or guardian. After receiving the authorization the testing was conducted to collect data during the training of volunteers. It was evaluated a maximum of 30 young people at a time, which took approximately 20 visits to get the sample of 557 individuals.

The plantigram test was used to register the feet surface touching the ground. After we calculated the plantar arch index, which establishes a relationship between the central and posterior regions of the foot.

Right after, it was measured their body mass (Filisola brand digital scale accurate to 50g), height (wall mounted Stadiometer WCS), triceps skinfolds and calf (Lange caliper.) For the calculation of body fat percentage (BF%) were adopted the equations presented by Slaughter et al. (1988) according to the sex.

Next, the flexibility was measured by the adapted form of the sit and reach test, which was carried out with the use of a measuring tape fixed to the ground (PROESP-BR 2007).

The cardiorespiratory endurance test was done by a run / walk of 1609 meters in the shortest time possible. The evaluated were asked to try to sustain a rapid pace as long as possible. The maximum volume of oxygen uptake and utilization (VO2máx.) was estimated by the formula of Cureton et al. (1995).

To measure the explosive power of lower limbs was used a horizontal jump test. Each person had two attempts, and it was registered the best result, with the measurement taken from the heel that was closest to zero (PROESP BR-2007).

The "shot 20m" test was used to identify the displacement speed and sprint speed. Already agility (speed with change of direction) was tested with the square test (PROESP BR-2007).

We conducted a descriptive statistic including as mean, standard deviation, absolute and relative frequency for the sample characterization. The comparison between groups was made using a one-way ANOVA, considering the variables of physical performance. For these procedures we used the statistical program SPSS for Windows (statistical package for the social sciences) version 17.0.

RESULTS AND DISCUSSION

We identified 26 volunteers with flat feet and two cavus feet that were considered pathological. These volunteers were excluded from the study, so there were 529 young people left. Overall 86 (16.2%) had cavus foot, 219 (41.4%) were detected with neutral pronation and the remaining 224 (43.4%) young people have flat feet.

There was a high incidence of flat feet as stated above. However it must be remembered that the plantigram test considers feet with a flat foot tendency up to the flat foot in its maximum in the same category.

As for the other variables collected, both sexes showed an average above benchmarks considered healthy for physical fitness which is consistent with the fact that all of them are physically active on a regular and systematic basis.

Tabela 1. Descriptive characteristics of the sample

Variables	Boys (n=321)	Girls (n=208)
General		
Age (years)	14.2 ± 1.7	14.3 ± 2.1
Height (cm)	164.5 ± 10.6	159.5 ± 9.4
Body mass (kg)	56.8 ± 14.0	52.2 ± 11.2
Body fat percentage	16.69 ± 3.47	25.32 ± 3.17
Physical Fitness		
Square test (seconds)	5:81 ± 1:01	6:3 ± 1:51
Shot of 20m (seconds)	3:51 ± 1:8	4:9 ± 1:60
Aerobic endurance (min)	7:29 ± 1:08	9:41 ± 1:20
$VO_{2máx}$ (mL/kg/min)	49,9 ± 4,9	42,9 ± 3,5
Sit and reach (cm)	21,9 ± 4.9	26,7 ± 3.5
Horizontal jump (cm)	184,2 ± 10,9	149,1 ± 16,8

In which: $VO_{2máx}$ = Maximum oxygen consumption (estimated).

In Table 1 it can be seen that on average the assessed individuals are close to the reference values considered "healthy." However, since they are young people who regularly participate in systematic physical activity with competitive intent, the results were less than expected and that girls obviously had lower results than the boys.

In Table 2 it is shown the ratio of the percentage distribution by type according to the foot type classification made with the plantigram. One can observe a higher incidence of cavus foot in swimming over the other variables, as well as a higher incidence of flat feet in athletics.

Individuals with pes cavus were significantly worse than the others in agility. In the measurement of displacement speed with people with neutral pronation showed the worst performance. The less time spent to reach the 1609m and VO2max. were individuals with flat feet. They also showed a better explosive power of the lower limbs, identified by the horizontal jump test. As for flexibility there was no significant difference between groups.

Table 2. Incidence of foot and ankle deviations sorted by sport

Genre	Cavus	Neutral	Flat	Total
Swimming	22 (16,5%)	25 (18,8%)	86 (64,7%)	133 (100,0%)
Martial Arts	7 (5,6%)	39 (31,4%)	78 (63,0%)	124 (100,0%)
Athletics	5 (3,3%)	37 (24,5%)	109 (72,2%)	151 (100,0%)
Soccer	8 (6,7%)	20 (16,5%)	93 (76,8%)	121 (100,0%)
Total	42	121	366	529

Tabela 3. Comparação da aptidão física de acordo com o tipo de pisada.

Variables	Cavus (n=42)	Neutral (n=121)	Flat (n=366)
Physical Fitness			
Square test (seconds)	6:22 ± 1:25*	5:53 ± 1:05	5:33 ± 0:58
Shot of 20m (seconds)	4:03 ± 1:56	4:59 ± 1:90*	4:00 ± 1:89
Aerobic endurance (min)	8:29 ± 1:68	8:48 ± 1:57	8:01 ± 2:29*
$VO_{2máx}$ (mL/kg/min)	40,2 ± 4,2	41,3 ± 3,8	45,5 ± 6,5*
Sit and reach (cm)	23,9 ± 7.7	23,7 ± 6,5	23,7 ± 6,9
Horizontal jump (cm)	164,9 ± 15,8	169,5 ± 18,5	174,6 ± 21,8*

In which: $VO_{2máx}$ = Maximum oxygen consumption (estimated).* represents a probability < 0,05.

Individuals with flat foot probably had a better aerobic performance because several of the volunteers practiced athletics and had flat feet, obviously they also had better aerobic capacity. This goes against the results presented by Viladoct and Voegeli (2003) and Figueiredo (2009) who found a higher incidence of pes cavus in individuals better conditioned aerobically. However, these authors evaluated adults with a longer training and a potentially greater muscle tone.

CONCLUSION

It was concluded that there is a predominance of flat feet among the evaluated, and these had a better aerobic capacity and strength of lower limbs. The variable speed, with individuals with underpronation and neutral pronation showed up statistically equal. The neutral pronation represented the worst performance in speed.

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COMPARISON OF PHYSICAL FITNESS IN STUDENTS OF ANÁPOLIS-GO ABOUT PLANTAR ARCH FORMATION

ABSTRACT

Due to the condition of the plantar arch being a limiting factor for physical fitness in adolescent people, it was established as objective of this work to register, in adolescent people practicing various sports, the incidence of flat, cavus and neutral foot, comparing the components of physical fitness of young people according to the foot type. The study was conducted with a sample of 331 boys and 226 girls. The variables measured were body fat percentage (% BF) (triceps + calf), aerobic endurance test (1600m), agility (square test), displacement speed (shot 20m), flexibility (modified form of the sit and reach test) and explosive power (horizontal jump test). All measurements and classifications were according to the protocol (PROESP BR-2007). The foot type evaluation was done by the plantigram test. Comparison between the three groups, concerning the variables of physical performance, was through a one-way ANOVA. It was identified 26 volunteers with flat feet and two cavus feet that were considered pathological. These volunteers were excluded from the study. The remaining 529 youngs had 14.2 3.1 years, %BF = 16.69 3.47 to boys and 25.32 3.17 for girls. Overall 86 (16.2%) had cavus foot, 219 (41.4%) were detected with neutral pronation and the remaining 224 (43.4%) young people have flat feet. Individuals with pes cavus were significantly worse than the others as to agility. In the measurement of displacement speed with people with neutral pronation showed the worst performance. The less time spent to reach the 1609m and VO2max. were individuals with flat feet. They also showed a better explosive power of the lower limbs, identified by the horizontal jump test. As for flexibility there was no significant difference between groups. It was concluded that there is a predominance of flat feet among the evaluated, and these had a better aerobic capacity and strength of lower limbs. The variable speed, with individuals with underpronation and neutral pronation showed up statistically equal. The neutral pronation represented the worst performance in speed.

KEYWORDS: pes planus, pes cavus, physical fitness, plantar arch, physical performance.

VOÛTE PLANTAIRE ET SON INFLUENCE SUR CONDITION PHYSIQUE À L'ÉCOLE D'ANÁPOLISGO

RESUME

Car la condition de la voûte plantaire peut être un facteur limitant pour la condition physique chez les adolescentes, a été établi comme objectif de cette d'étude, enregistrer chez les adolescents qui pratiquent différents sports de l'incidence des pieds plats, pieds creux, neutre, en comparant les composantes de la condition physique des jeunes suivant le type de gradins. L'étude a été menée auprès d'un échantillon de 331 garçons et 226 filles. Les variables mesurées étaient le pourcentage de graisse corporelle (% GC) (triceps + mollet), test d'endurance aérobie (1600m), l'agilité (test au carré), la vitesse de déplacement (tiré à 20 mètres), la flexibilité (s'asseoir et atteindre modifiée) et force explosive (saut horizontale). Toutes les mesures et les classifications ont été selon le protocole (PROESP BR-2007). L'évaluation du type de démarche a été effectuée en utilisant la conception du pied au tampon encreur. Pour les comparaisons statistiques entre les trois groupes concernant les variables de la performance physique, une analyse de variance (Anova) a été utilize.Nous avons identifié 26 bénévoles ont les pieds plats et deux pieds de forme pathologique, pied creux. Ceux-ci ont été exclus de l'étude. Les 529 autres jeunes étaient de 14,2 ± 3,1 ans, %GC = 16,69% ± 3,47% pour les garçons et 25,32% ± et 3,17% pour les filles. En général 86 (16,2%) avaient des pieds creux, en 219 (41,4%) avec le pied meurtri neutre et 224 (43,4%) plat du pied. Individus portant le pied creux étaient significativement plus mauvais que l'autre à l'agilité. Pour la vitesse, les individus avec neutres meurtri a montré les pires résultats. Le moins de temps passé à répondre au mieux aux 1600m et VO2max. étaient des personnes ayant les pieds plats. Ils ont également joué mieux la puissance explosive des membres inférieurs, identifié par le test de saut horizontal. Le réduction du temps passé à répondre au 1600 mètres et au mieux VO2max étaient des personnes ayant les pieds plats. Ils ont également joué mieux la puissance explosive des membres inférieurs, identifié par le test de saut horizontal. En ce qui concerne la flexibilité a pas de différence significative entre les groupes. Il a été conclu qu'il ya une prédominance des pieds plats chez évalués, et ceux-ci avaient une meilleure capacité aérobique et la force des membres inférieurs. Pour la vitesse, les personnes avec les piétinées plat et neutre apparu statistiquement égale. Improvement piétiné neutre représenté la vitesse pire performance.

MOTS CLÉS: pieds plats, pieds creux, forme physique, voûte plantaire, performance.

DIFERENTES FORMACIONES DEL ARCO (EMPEINE) PLANTAR Y SU INFLUENCIA SOBRE LA APTITUD FÍSICA DE ESCOLARES DE ANÁPOLIS (GOIÁS)

RESUMEN

Debido a que la condición del arco plantar o empeine puede ser un factor limitante para la aptitud física de los adolescentes, se estableció como objetivo de este trabajo el registrar la incidencia de pies planos, cavos y normales en adolescentes practicantes de varias modalidades deportivas, comparando los componentes de la aptitud física de los jóvenes

de acuerdo con el tipo de pisada. El estudio fue elaborado con una muestra de 331 chicos y 226 chicas. Las variables mensuradas fueron el porcentaje de grasa corporal (%G) (tríceps + pantorrilla), la resistencia aeróbica (prueba de 1600m), la agilidad (prueba del cuadrado), la velocidad de desplazamiento (tiro de 20 m), la flexibilidad (test de sentar y alcanzar modificado) y la fuerza explosiva (salto horizontal). Todas las medidas y clasificaciones fueron realizadas segundo el protocolo (PROESP-BR, 2007). La evaluación del tipo de pisada se realizó a través del plantigrama. La comparación entre los tres grupos, en lo referente a las variables de desarrollo físico, se realizó a través de una ANOVA one way. Fueron identificados 26 voluntarios con los pies planos y dos con los pies cavos de forma patológica. Estos fueron excluidos del estudio. Los 529 jóvenes restantes tenían 14,2 3,1 año, %G= 16,69 3,47 para los chicos y 25,32 3,17 para las chicas. En general, 86 (16,2%) presentaron pie cavo; 219 (41,4%) pie con pisada neutra o normal y 224 (43,4%), pie plano. Los individuos con pie cavo estaban significativamente peor que los demás en agilidad. En lo tocante a la velocidad de desplazamiento, los individuos con pisada normal presentaron el peor desempeño. El menor tiempo empleado para alcanzar los 1.600 m y el mejor VO2máx. fueron de los individuos con pies planos. Este grupo también mostró mejor fuerza explosiva de los miembros inferiores, identificada por la prueba del salto horizontal. En lo referente a la flexibilidad, no hubo diferencia significativa entre los grupos. Fue posible concluir que existe predominancia de pies planos entre los individuos evaluados y que éstos presentan una mejor capacidad aeróbica y de fuerza explosiva de los miembros inferiores. Para la variable agilidad, los individuos con pisada plana y neutra se mostraron iguales estadísticamente. La pisada neutra o normal presentó el peor resultado en cuanto a velocidad.

PALABRAS CLAVE: pie plano, pie cavo, aptitud física, arco plantar, desarrollo físico.

COMPARAÇÃO DA APTIDÃO FÍSICA EM ESCOLARES DE ANÁPOLIS-GO DE ACORDO COM A FORMAÇÃO DO ARCO PLANTAR

RESUMO

Devido a condição do arco plantar poder ser um fator limitante para aptidão física de adolescentes, foi estabelecido como objetivo deste trabalho registrar em adolescentes praticantes de várias modalidades esportivas a incidência de pés planos, cavos e neutros, comparando os componentes da aptidão física dos jovens de acordo com o tipo de pisada. O estudo foi conduzido com uma amostra de 331 rapazes 226 moças. As variáveis mensuradas foram percentual de gordura corporal (%G) (tríceps+panturrilha), resistência aeróbia (teste de 1600m), agilidade (teste do quadrado), velocidade de deslocamento (tiro de 20m), flexibilidade (sentar e alcançar modificado) e força explosiva (salto horizontal). Todas medidas e classificações foram conforme o protocolo (PROESP-BR, 2007). A avaliação do tipo de pisada se deu através do plantigrama. A comparação entre os três grupos, quanto às variáveis do desempenho físico, foi através de uma ANOVA one way. Foram identificados 26 voluntários com pés planos e dois com pés cavos de forma patológica. Estes foram excluídos do estudo. Os demais 529 jovens tinham 14,2 3,1 anos, %G= 16,69 3,47 para os rapazes e 25,32 3,17 para as moças. No geral 86 (16,2%) apresentaram pé cavo, em 219 (41,4%) pé com pisada neutra e 224 (43,4%) pé plano. Indivíduos com pé cavo estavam significativamente pior que os demais quanto à agilidade. Quanto à velocidade de deslocamento os indivíduos com pisada neutra apresentaram o pior desempenho. O menor tempo gasto para cumprir os 1600m e o melhor VO2máx. foram dos indivíduos com pés planos. Estes também desempenharam melhor a força explosiva de membros inferiores, identificada pelo teste de salto horizontal. Quanto à flexibilidade não houve diferença significativa entre os grupos. Foi possível concluir que há predominância de pés planos entre os avaliados, e estes apresentaram uma melhor capacidade aeróbia e de força explosiva de membros inferiores. Para a variável agilidade, indivíduos com pisada plana e neutra apresentaram-se iguais estatisticamente. A pisada neutra representou o pior desempenho de velocidade.

PALAVRAS-CHAVE: pé plano, pé cavo, aptidão física, arco plantar, desempenho físico.