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Spor Hekimliği Dergisi adına

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Spor Hekimliği Dergisi
Cilt : 39, S. 77-85, 2004

THE EFFECT OF BREAST FEEDING ON CHILDREN'S OBESITY AND ATHLETIC EXERCISE#

Athanasios G. VITAS*, Evaggelia NERANTZAKI**,
Konstantina CHOUCHOULI***, Andreas VITAS***,
Anatoli KARTERIDOU****

SUMMARY

In the current essay, we studied the hypothesis whether breast feeding (BF) can be related to the development of children's obesity (CO) and therefore to the difficulties in athletics of children in pre-school age. For this aim 324 children that were born during the period of 1998-2000 were examined. The type of nutrition, the social and financial state (SFS), the records and the body development were recorded, while the difficulties that occurred during sports activities were evaluated. In order to have a reliable evaluation of the factors mentioned above, the population was divided into two categories according to their birth weight and then its classification into three age groups followed. The statistical analysis was conducted by utilizing the SPSS v10 software package. In the first category 35 (21.6%) children with CO were recorded, and in the second 51 (31.4%). The mean value of BF fluctuated between 2.5±2.0 and 2.6±2.0 months (NS), in all groups. In the 100 meters speed race, children with CO had worse scores by 14% ($p=0.006$), compared to the best records of children of the same age. They had 21% ($p<0.005$) lower stretching activity records, were 12% ($p<0.04$) weaker in adjustment and participation in group sports, were 33% more prone to injuries during sports ($p<0.0001$), and displayed 16% ($p<0.05$) earlier fatigue. BF was related to significant

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This paper was presented at the 13th Balkan Sports Medicine Congress, April 29-May 2, 2004, Drama, Greece

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low risk of CO and higher athletic records, (r=0.61, p<0.001). BF seemed to be priceless in the strategy that aims CO prevention and the safe-satisfactory athletic activity of children 3-5 years old.

Key words: Breast feeding, children's obesity, exercise, low physical aptitude, preschool age

ÖZET

ANNE SÜTÜ İLE BESLENMENİN ÇOCUK OBEZİTESİ VE FİZİKSEL EGZERSİZ KAPASİTESİNE ETKİSİ

Bu çalışmada, anne sütü ile beslenmenin (BF) çocuk obezitesinin (CO) gelişmesi ile ilişkisi ve okul öncesi çağda egzersiz yapma zorlukları ile bağıntısı araştırıldı. Bu amaçla 1998 - 2000 yılları arasında doğan 324 çocuk incelendi. Beslenme tarzı, sosyal ve ekonomik durum (SFS), sportif dereceler ve vücut gelişimi kaydedildi. Sportif aktivitede yaşanan zorluklar irdelendi. Bu faktörlerin güvenilir bir değerlendirmesi için, popülasyon doğum kilosuna göre ikiye ayrıldı ve üç yaş sınıfına bölündü. İstatistiksel analiz SPSS v10 programı ile yapıldı. İlk gruptaki CO oranı %21.6 (N=35) iken, daha ağır doğan ikinci grupta %31.4 (N=51) idi. BF süreleri 2.5±2.0 ile 2.6±2.0 ay kadardı (NS). CO saptanan çocukların 100 m koşu değerleri yaşıtlarından %14 kadar (p=0.006) düşüktü. Sportif aktivitede en sık gözlenen zorluklar %21 oranında esneklikte (p<0.005), %12 oranında grup sporlarına katılmada (p<0.04), %33 oranında sportif yaralanmalarda (p<0.0001) ve %16 oranında erken yorulmada (p<0.05) saptandı. BF anlamlı ölçüde düşük CO riski ve yüksek atletik dereceler ile ilişkiliydi (r=0.61, p<0.001). Anne sütü ile beslenmenin, 3-5 yaş grubunda çocuk obezitesinin önlenmesi ve tehlikesiz, başarılı sportif aktiviteyi hedefleyen stratejilerde çok değerli olduğu gözlenmektedir.

***Anahtar sözcükler**: Anne sütü ile beslenme, çocuk obezitesi, egzersiz, düşük fiziksel beceri, okul öncesi çağ*

INTRODUCTION

Studies increasingly bring to light new data concerning the benefits of breast feeding (BF) on the intelligence index as well as on the immune system of children (1). Nowadays, large research groups all over the world assess data in an attempt to come to reliable conclusions about the possible short-term or long-term advantages of BF on human body weight (2).

Few strategies for the prevention of children's obesity (CO) are based on facts. Recently published studies warn us about the increased percentage of obesity in European countries and emphasize the importance of exercise and proper diet for the treatment of the disease. In our country, obesity evolves into a major national and social problem and it seems that it affects the Greek population from early childhood (3). The present study attempts to examine the hypothesis of whether BF is related to CO and consequently to skillfulness or difficulties in exercise of children in preschool age.

MATERIAL AND METHODS

The population sample consisted of 324 children that were born in Northern Greece during the years 1998-2000. Fluctuations in Body Mass Index (BMI), diet, physical activity, and family, social and financial status (SFS) were noted from children's birth until the completion of the study.

Child's obesity is defined as the ≥1.64 standard deviation (SD) score of body mass index (BMI) (ninety-five hundredth part, single-tailed) according to the national models of development, in children of four, five and six years old. The determination of the social and financial status of each family was performed by utilizing a geographically adjusted index, so as to estimate the deprivation category according to Carstairs (**a:** very good **b:** moderate **c:** bad) (4).

Athletic activity of children was evaluated by 100-meter simple race, in group sports (5x5 football, children games with balls and cubes) and in flexibility exercises (as warm-up before exercising). Initially the athletic performances of the children were recorded, and any difficulties that arose in athletic activities were evaluated. These results were assessed according to a standard assessment scale, expressed in percentages, for evaluating minors. The comparisons were always made using the mean best records of children of the same age. Children who had serious contraindications to athletic activities were excluded (e.g. history of retinal detachment, exacerbation of lower respiratory disease, trauma, epilepsy, aortic valve stenosis).

Variables such as birth body weight and age were obliterated. The population was divided into two categories according to body weight at birth (1st category < 3500 g and 2nd category ≥ 3500 g) and classified into three age groups A, B, C (n=108x3) that corresponded to the birth

years of 1998, 1999 and 2000, respectively. The matching for the final consistency of the groups concerned the homogeneity of the sample.

Statistical analysis

The classification and the matching of children into categories, groups and subgroups was achieved by using the Access2000 method. Parameters were expressed as average values (AVG) and standard deviation (±SD). The statistical analysis of the qualitative observations was achieved using the Chi Square test (χ^2) and of the quantitative observations using the Student's t-test trials. The verification of all the statistical results was conducted by utilizing the Statistical Package for the Social Sciences (SPSS v10) software package.

Statistical reciprocation was used for the evaluation of the relation between obesity and BF, after adjusting it for gender, birth weight (BiW) and age group. The presence of linear correlation was evaluated by the Pearson's correlation coefficient trial. The limit of statistical significance was considered as $p<0.005$, every other possibility ($p>0.005$) was considered statistically non-significant (NS).

RESULTS

Each category consisted of 162 children (75 boys and 87 girls). The respective mean values and SD's for both categories, as well as the comparisons can be seen in Table 1.

Table 1. Physical characteristics of the subjects.

Categories	Boys	Girls	BiW g	BiH cm	BFmonths	MCAyears	BWkg	BHcm
1st (n=162)	75	87	3186 ± 120	50.8 ± 0.4	2.6 ± 2.2	3.8 ± 0.8	19.2 ± 5.7	100.4 ± 15.0
2nd (n=162)	75	87	3802 ± 235	52.6 ± 1.8	2.5 ± 2.0	3.8 ± 1.2	18.8 ± 4.4	99.6 ± 15.1
SS	NS	NS	p< 0.003	NS	NS	NS	NS	p< 0.04

In the 1st category the, SFS was **a** for 64 (39.5%), **b** for 72 (44.4%) and **c** for 26 (16.0%) children. In the 2nd category, the respective percentages were **a** for 31 (19.1%) children, **b** for 69 (42.5%) and **c** for 62 (38.2%) children. For the social and financial status comparison of the two categories, see Figure 1.

In the first category 35 (21.6%) children were recorded with CO and 51 (31.4%) in the second. As mentioned by the parents during the interviews,

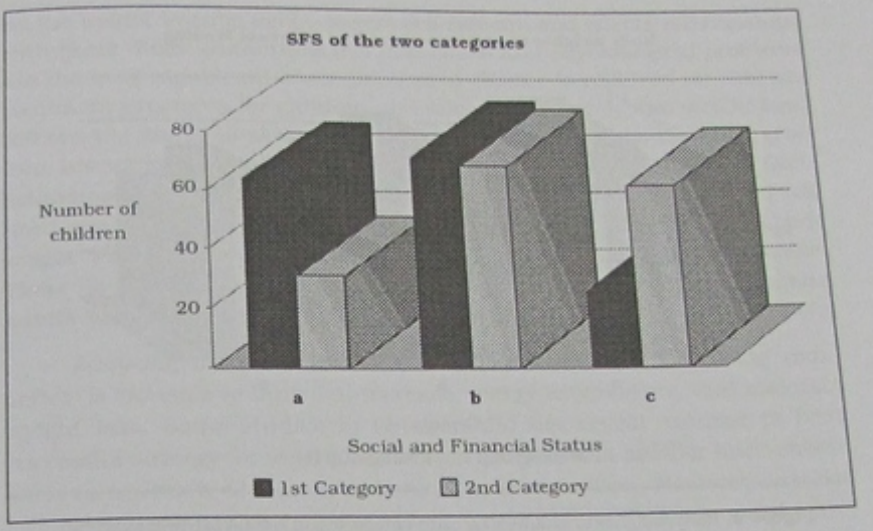

Figure 1. Social and financial status comparison of the two categories.

the physical activity of the children was similar between the two categories. The daily nutrition of the majority of children comprised mainly of three meals, whilst during the day they had snacks that seemed to be rich in carbohydrates and fat.

The mean values of BW of children of group **a** were 21.2±3.9 kg, of group **b** 20.1±3.1 kg and of group **c** 15.9±1.4 kg. The mean value of BF fluctuated between 2.5±2.0 and 2.6±2.0 months (NS) in all groups. In order to examine the effect of BF on children's body weight and therefore on their athletic behavior, each group was divided into two subgroups (after total matching of the variables): I and II. Subgroup I consisted of children that were never breast-fed or they were only breast-fed from 0 to 3 months, and, subgroup II consisted of children that were exclusively breast-fed for over three months. For the comparison of the body weights in each category and subgroup, see Figure 2.

Children that were not breast-fed or were only breast-fed for less than three months (subgroup I) weighed more, with statistically significant difference, than those of subgroup II. From 86 (26.5%) children with CO, 59 (68.6%) belonged to subgroup I and 27 (31.3%) to subgroup II, $p<0.002$.

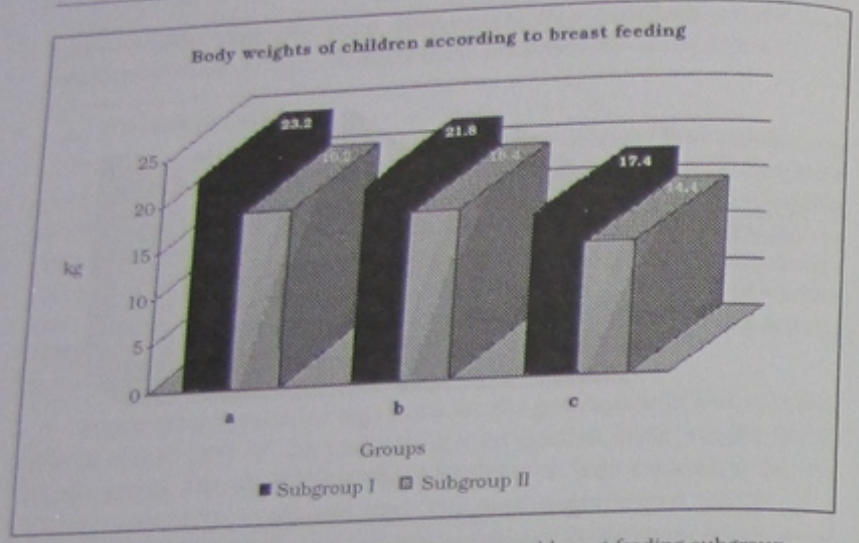

Figure 2. Body weights of children in each category and breast feeding subgroup.

Athletic activity of children in this study was limited. In the 100-meter race, children with CO were worse by 14% compared with the best records of children of the same age. Also, the main difficulties in athletic activities that were detected in those children, were weakness in stretching exercises by 21%, weakness in adjustment and participation in group sports by 12%, injury susceptibility during sports by 33% and early fatigue (faster corporal lassitude compared with children of same age, often accompanied also by negativism) or abstinence by 16%.

DISCUSSION

Until today, the known causes of CO (which is not uncommon in our country and is also becoming a major concern in other countries) are many: genetic predisposition, obese mother during pregnancy, excessive nourishment during infancy and childhood, food of low nutrients and high calories, untidy meal schedules, lack of physical activity, stress and certain medication to mention a few.

Obesity presents numerous problems for the child. In addition to increasing the risk of obesity in adulthood, childhood obesity is the leading cause of paediatric hypertension, is associated with type II diabetes mellitus, increases the risk of coronary heart disease, increases stress

on the weight-bearing joints, lowers self-esteem, and affects relationships with peers. Some authorities feel that social and psychological problems are the most significant consequences of obesity in children (5). Obesity treatment programs for children and adolescents rarely aim weight loss. Rather, the aim is to slow or halt weight gain, so to make the child grow into his or her body weight over a period of months to years. Dietz estimates that for every 20% excess of ideal body weight, the child will need one and one-half years of weight maintenance to attain ideal body weight (6). Early and appropriate intervention is particularly valuable. There is considerable evidence about childhood eating and exercise habits being more easily modified than that in adults (7).

Adopting a formal exercise program, or simply becoming more active, is valuable to burn fat, increase energy expenditure, and maintain weight loss. Some studies in children did not reveal exercise to be a successful strategy for weight loss unless coupled with another intervention, such as nutrition education or behaviour modification. However, exercise has additional health benefits. Even when children's body weight and fatness did not change following 50 minutes of aerobic exercise three times per week, blood lipid profiles and blood pressure did improve (8).

BF is a strategy with many benefits, added to its probable protecting action towards the risk of developing CO. Many probable mechanisms by which BF can supply protection towards CO have been proposed during the years. However, the data of previous studies do not reach a conclusion either due to the number of the children in the sample group or due to their failure in controlling variables (9).

From the analysis of present data, it appears that children of the Ist category had roughly the same BW with those of the IInd category, In this study BF seemed to be related to a significant low risk of CO development and higher athletic records ($r=0.61$, $p<0.001$).

Exercise and proper nutrition are traditional methods in facing CO since Hippocrates until nowadays. Available data indicate that high BMI impede considerably athletic activities of the childhood, therefore aggravating constantly CO. The above results match those of other studies with international validity. Long-lasting studies with extensive follow up reveal dramatic morbidity in the future. Some studies report that CO and its consequences in athletic behavior are related to social isolation and mental disorders (10,11,12).

We also report two important determinations about the relation between the social and financial status and CO: 16 (45.7%) of the 35 children with CO from the Ist category had SFS **c** (r=0.67, p<0.0002); and 32 (62.7%) of the 51 children with CO from the IInd category had SFS **c** social and financial status (r=0.72, p<0.00003). Furthermore, the social and financial status of the family contributed to the development of CO and affected the athletic results or skills of the children as well. Poor SFS was related reciprocally with higher incidence of CO, lower records, higher athletic difficulties. Some references rate injury as the most dangerous, and at the same time the most frequent obstacle in physical training of obese children. This was also a major concern in the present study (13).

From the 86 children with CO, 82 (95%) mentioned to consume additional food between the three main dinners, whereas in children with normal BMI 46 out of 238 (19.3%) behaved as such (p<0.0007). The additional occasional food (snacks, candies) between the three main dinners overloads a lot with calories the bodily weight of children and predetermine the appearance of CO.

CO is easier to prevent than to treat, and prevention focuses in large measure on parent education. In infancy, parent education should center on promotion of breastfeeding, recognition of signals of satiety, and delayed introduction of solid foods. In early childhood, education should include proper nutrition, selection of low-fat snacks, good exercise/activity habits, and monitoring of television viewing. In cases where preventive measures cannot totally overcome the influence of hereditary factors, parent education should focus on building self-esteem and address psychological issues (14).

CONCLUSIONS

Breast feeding appears to be invaluable in the strategy that aims CO prevention and the satisfactory athletic activity of children 4-6 years old. Lack or decrease (<3 months) of BF, seems to be related to CO as well as to low records and higher difficulties in athletics. Multifactor statistical analysis revealed that the lowest records (p<0.003) and the highest number of athletic difficulties (p=0.04) are noticed in less breast-fed children. The additional food between the three main dinners was found to predetermine the appearance of CO in the pre-school age children who were studied. Also, multivariate statistical analysis disclosed

that the social and financial status did not correlate with CO in the population sample that was studied.

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PHYSICAL ACTIVITY OF ADOLESCENTS IN THESSALONIKI#

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SUMMARY

Nowadays, the use of instruments decreases manual work, and consequently the overwhelming majority of people follows a sedentary life. This lifestyle offers a lot of comfort, but leads to the reduction of energy expenditure. This reduction can be observed not only in adults but also in adolescents. The purpose of this study was to record physical activity of adolescents in Thessaloniki and their preferred activities. Such a study has not been conducted before in Greece. The sample constituted of 1003 high school students of mean age 14.62±1.53 years. The data was collected with the use of a specific questionnaire regarding their physical activity. According to our results, an important percentage of adolescents in Thessaloniki (30.9%) did not exercise at all. Boys exercised more than the girls: 78.0% and 60.4% respectively. The energy expenditure of exercise was higher for the boys compared to the girls. A significantly higher percentage of younger (<15yrs) adolescents exercised (73.5%) when compared with older (≥15yrs) ones (64.6%). Boys' preferred activities were basketball, football, cycling and volleyball, while girls preferred volleyball, basketball, aerobics and traditional dances. For the long-term maintenance of body weight, the modification of daily activities and the increase in daily energy expenditure are necessary, in order to improve health condition in adolescents and prevent obesity.

Key words: Physical activity, adolescents, sports

This paper was presented at the 13th Balkan Sports Medicine Congress, April 29-May 2, 2004, Drama, Greece

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ÖZET

SELANİK'Lİ ADOLESANLARIN FİZİKSEL AKTİVİTE ÖZELLİKLERİ

Günümüzde alet kullanımı el emeğini azaltmış, böylece insanların çoğunluğu sedanter bir yaşam sürmeye başlamıştır. Bu yaşam tarzı beraberinde konforu getirse de, enerji harcamasının düşmesine neden olmaktadır. Bu düşüş sadece yetişkinlerde değil, adolesanlarda da gözlenebilir. Bu çalışmanın amacı, Selanik'li adolesanların aktivite tercihlerini ve düzeylerini belirlemektir. Bu tür bir çalışma Yunanistan'da daha önce yürütülmemiştir. Popülasyonu 14.62±1.53 yaşlarındaki 1003 ortaöğrenim öğrencisi oluşturdu. Veriler fiziksel aktivitelere ilişkin özgün bir anket ile toplandı. Sonuçlara göre, Selanik'li adolesanların önemli bir kısmı (%30.9) hiç egzersiz yapmıyordu. Erkeklerin %78.0'i, kızların %60.4'ü egzersiz yapmaktaydı. Enerji harcaması erkeklerde daha yüksekti. Onbeş yaşından küçük adolesanların egzersiz yapma oranı (%73.5), daha büyüklerdekine göre (%64.6) anlamlı şekilde yüksekti. Erkekler basketbol, futbol, bisiklet ve voleybolu tercih ederken kızların tercih sırası voleybol, basketbol, aerobik ve geleneksel danslar şeklinde idi. Vücut ağırlığının uzun süreli korunması için günlük aktivitelerin değiştirilmesi ve enerji harcamasının arttırılması gereklidir. Böylece, adolesanların sağlık durumları düzeltilmiş olacak ve obezite engellenebilecektir.

***Anahtar sözcükler**: Fiziksel aktivite, adolesans, spor*

INTRODUCTION

An exercising individual, apart from obtaining an athletic body, develops a high degree of flexibility, muscular stamina and strength, aerobic capacity, speed, agility, balance, co-ordination, strength and speed of reaction (17,21). Physical activity in combination with reduction of energy intake in obese adolescents leads to the reduction of systolic blood pressure, pulse frequency and levels of insulin, as well as to the increase of insulin sensitivity (13). The prevention of ischemic illnesses should begin from the childhood, with the promotion of physical activity (19). Exercise promates this prevention, as it improves the lipidemic profile of adolescents (reduction of TG, LDL and increase of HDL) and at the same time decreases body fat, contributing to the prevention of obesity (7). Systematic aerobic exercise during adolescence protects from the appearance of coronary illnesses, as it increases serum HDL levels of athletes aged 11-18 years (10).

Furthermore, physical activity contributes to bone density maintenance, and particularly intense physical activity has positive effects on the bone density of adolescent girls (3). According to Anderson, balanced nutrition and physical activity of girls before and during puberty are very important factors for the achievement of higher bone density (4), as 50% of bone mass is acquired during the six years of puberty (15).

In our country, there is not a national record of physical activity of the adolescent population, neither of their preferred sports. The purpose of this study was to keep record of the physical activity of adolescents in the area of Thessaloniki in Northern Greece and of their preferred activities.

MATERIAL AND METHODS

The sample constituted of 1003 high school students aged 14.62±1.53 years, from junior high and high schools from the Eastern, Western and Central Thessaloniki. The selection of the sample was done randomly.

Participants were subjected to anthropometric measurements. Body weight was measured, in light clothing, with a digital scale with an accuracy of ±100 g (Secca 707, Secca Corporation, Columbia, USA). Height was measured, to the nearest 0.5 cm without shoes with the use of a stadiometer, with an accuracy of 0.5 cm (Secca 220, Secca Corporation, Columbia, USA). BMI was calculated by dividing weight (kg) by square of height (m^2). Triceps and subscapular skinfolds were measured, using a Harpenden skinfold caliper (British Indicator Ltd, London). Skinfolds were measured in duplicate and the average measurement was used. In case there was a discrepancy of above 10% between duplicate measurements, then the measurement was repeated. Body fat percentage was assessed according to Slaughter et al (20).

Exercise's energy expenditure for each participant was obtained from the exercise hours multiplied by the energy cost of each activity, using the tables of Ainsworth et al (2).

RESULTS

Participants' characteristics are shown in Table 1.

A significantly higher ($p<0.05$) percentage of younger (<15yrs) adolescents exercised (73.5%) when compared with older (≥15yrs) ones (64.6%). Adolescents' preferred activities are given in Table 2.

Table 1. Participants characteristics according to exercise.

	Boys	Girls
N	495	508
Age (yrs)	14.6 ± 1.5	14.7 ± 1.6
Weight (kg)	64.1 ± 13.4	56.8 ± 9.5
Height (m)	1.71 ± 0.10	1.64 ± 0.07
BMI (kg/m^2)	21.9 ± 3.4	21.2 ± 3.0
Body fat (%)	24.0 ± 9.6	24.4 ± 5.9
Non-involvement in sports (%)	22.0	39.6
Involved in sports (1-4h/wk) (%)	37.2	31.7
Involved in sports (>4h/wk) (%)	40.8	28.7
Exercising for pleasure (1-4h/wk) (%)	27.9	30.6
Exercising for pleasure (>4h/wk) (%)	25.5	21.3
Exercising for championship (1-4h/wk) (%)	18.6	6.3
Exercising for championship (>4h/wk) (%)	15.4	6.9
Exercising for good physical condition (%)	50.3	29.7
Exercising for body weight reduction (%)	27.7	30.7
Exercise's energy expenditure (kCal)	208.4 ± 164.6	131.2 ± 110.4

Table 2. Sports in which boys and girls participate (h/wk).

	Boys				Girls			
	1-4		>4		1-4		>4	
	N	%	N	%	N	%	N	%
Basketball	167	33.7	61	12.3	74	14.6	11	2.2
Volleyball	42	8.5	7	1.4	103	20.3	17	3.3
Football	120	24.2	43	8.7	5	1.0	-	-
Handball	9	1.8	7	1.4	10	2.0	3	0.6
Waterpolo	4	0.8	2	0.4	2	0.4	1	0.2
Tennis	9	1.8	-	-	21	4.1	1	0.2
Table tennis	16	3.2	4	0.8	5	1.0	-	-
Track and field	11	2.2	5	1.0	16	3.1	15	3.0
Swimming	15	3.0	14	2.8	15	3.0	17	3.3
Diving	-	-	1	0.2	4	0.8	-	-
Gymnastics	-	-	-	-	9	1.8	3	0.6
Artistic gymnastics	-	-	-	-	9	1.8	1	0.2
Bicycling	35	7.1	24	4.8	15	3.0	12	2.4
Sailing	7	1.4	2	0.4	3	0.6	-	-
Weight lifting	12	2.4	4	0.8	2	0.4	-	-
Skiing	6	1.2	1	0.2	8	1.6	1	0.2
Judo	6	1.2	-	-	1	0.2	-	-
Wrestling	2	0.4	-	-	-	-	-	-
Karate	19	3.8	2	0.4	9	1.8	-	-
Aerobics	1	0.2	-	-	48	9.4	11	2.2
Traditional dances	7	1.4	-	-	48	9.4	1	0.2
Modern dances	1	0.2	-	-	24	4:7	2	0.4
Mountaineering	12	2.4	1	0.2	10	2.0	-	-
Rowing	14	2.8	11	2.2	16	3.1	6	1.2

DISCUSSION

According to the results of this research the mean value of body mass index was within the normal range for both boys and girls (21.9 and 21.2, respectively). The mean value of both boys' and girls' body fat (24.0% and 24.4%, respectively) was within the normal limits, for their gender and age (14). An important ratio of adolescents in Thessaloniki exercised (30.9%). Boys' preferred sports were basketball, football, cycling and volleyball, while girls' preferred activities were volleyball, basketball, aerobics and traditional dances.

Today, sedentary lifestyle offers a lot of comforts but leads to the reduction of energy expenditure. About 30% of the English population follows a sedentary life (13), while the corresponding percentage in the USA is higher (50%). Only 20-25% of the children and adolescents exercise. However, 85% of their families believe that their children are in good physical condition (19).

In the present research, more boys than girls were found to be exercising. The mean energy expenditure due to exercise was higher for males (208kcal) compared with females (131kcal). Only 40.8% of the boys and 28.7% of the girls were involved in sports more than four hours weekly. Exercise for championship (1-4 hours weekly) was reported by 18.6% of the boys and 6.3% of the girls. Exercise for championship (above four hours weekly) was reported by15.4% of the boys and 6.9% of the girls. Motives to exercise were to have good physical condition and body weight reduction, which are in agreement with other researchers' results.

According to Bratteby et al, the mean proportion of high and maximum intensity activities to total energy expenditure is significantly higher in boys (4.6%), compared to girls (1.6%) (7). Many researchers share the opinion that male adolescents exercise more often than their female counterparts (3,6,8,10,15,16). Females adolescents of younger age report higher physical activity in comparison with older ones (15), while males display the opposite approach (8). All these observations are in accordance with the results of the present study, where we report a significantly higher percentage of younger adolescents who exercise (<15yrs), when compared with older ones. Similarly, other researchers support the idea that after the age of 15 years old, physical activity decreases (12,18). Thus, at the age of 17 years adolescents had a reduction of 48% in attendance in physical activity classes in high school (1,17).

Consequently, when submitted to the pull test exercise, 30% of the boys and 50% of the girls could not execute even a single pull. This can be attributed to the fact that half of the young persons exercised systematically and only a quarter of the girls exercised as to sweat (5,11).

In conclusion, our study revealed that 30.9% of the adolescents in Thessaloniki did not exercise (22.0% of the boys and 39.6% of the girls). In order to prevent obesity in adolescence, many changes are requisite in school education, in the general national health policy as well as in the environment that adolescents grow. For the long-term maintenance of body weight, the modification of daily activities and the increase in daily energy expenditure are necessary, which will help improving health condition in general.

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THE EFFECT OF A WEIGHT TRAINING PROGRAM ON THE AFFECTIVE STATUS OF RECOVERING SUBSTANCE ABUSERS#

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E. KIOUMOURTZOGLOU ***, G. KAPRINIS*

SUMMARY

The effects of a weight training program on depression in a group of chemically dependent adults was investigated. The subjects (N=18) were inpatients rehabilitatied for substance abuse (Therapeutic Community) for one year. They were randomly assigned to two groups. The experimental group (N=12) received a weight training program (bodybuilding) of three days per week for eight weeks. The control group (N=6) received no exercise treatment over the 8-week period. Pre- and posttest measures included the BDI-II questionnaire. The bodybuilding program did not produce a significant decrease in depressive symptoms.

Key words: Depression, weight training program, substance abuse, exercise

ÖZET

BİR AĞIRLIK ANTRENMANI PROGRAMININ MADDE BAĞIMLILIĞI TEDAVİSİ GÖRENLERİN HASTALIK DURUMUNA ETKİSİ

Bir ağırlık antrenmanı programının kimyasal madde bağımlılığı bulunan yetişkinlerdeki depresyona etkisi araştırıldı. Denekler (N=18) madde kullanımı nedeniyle bir yıldır yatarak tedavi görenlerdi (toplu tedavi grubu).

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Rastgele olarak iki gruba ayrıldılar. Deneysel grup (N=12) bir ağırlık antrenmanı programını (vücut geliştirme) sekiz hafta boyunca üç kez uyguladı. Kontrol grubu (N=6) bu süre boyunca herhangi bir egzersiz yapmadı. Test öncesi ve sonrasında Beck Depresyon Envanteri (BDI-II) uygulandı. Sonuç olarak, vücut geliştirme programı depresyon semptomlarında anlamlı bir gerilemeye neden olmadı.

***Anahtar sözcükler**: Depresyon, ağırlık antrenmanı, madde bağımlılığı, egzersiz*

INTRODUCTION

Two important organizations, namely the American National Institute of Mental Health (NIMH) (26), and the International Society of Sports Psychologists (ISSP) (20) investigating the influence of exercise on the psychological disposition of people claimed that exercising seems to reduce mild or moderate depression (28). Many studies investigated the influence of exercise on the symptoms of adult, teenage and infantile clinical depression (11,13,19,21,22). The influence of aerobic exercise (running) (5,17,18,23,24,29,33) was also studied, as well as the influence of anaerobic exercise on the decrease of depression (13,27,35). A series of researches performed on depressed individuals using the BDI scale (Beck Depression Inventory) revealed symptoms improvement through participation in aerobic programs (8,17,25,33). Improvement of depression levels in two groups was reached through mixed programs of exercise (aerobic – anaerobic) (24,27).

In groups of substance abusers (alcohol), aerobic exercise seemed to have helped in reducing depression (15,31,37). A positive influence of sports on substance abusers with a mixed protocol (aerobic and anaerobic exercise) is cited in the studies by Palmer et al (30), and Caplan (9). Collingwood et al (10) concluded that depression decreased after an aerobic exercise program applied on substance abusers. Franklin (16) conducted a similar study, the findings of which revealed only influence on the participants' physical condition and not on their depression levels.

MATERIAL AND METHODS

The purpose of this study was to investigate the influence of exercise with increased resistance (weight lifting) on the depression level in members of a restricted detoxification from drugs program, in which 18 men participated voluntarily. Two groups were formed, the experimental

group (N=12, average age of 29.4 years) and the control group (N=6, average age of 25.7 years). During the study, four members of the experimental group left due to health reasons, so the experimental group ended up with eight individuals of an average age of 30.4 years. The program's total duration was eight weeks. The exercise frequency was three times per week, with multiple variable intensity sets of maximal and sub-maximal intensity.

For the present study, the BDI – II scale (Beck Depression Inventory) (1,4,32) was used to measure the level of depression. This is a scale that can trace the degree of depression in normal (34) and clinically depressed populations (7), and has been used in substance abusers too (3). The reliability of internal cohesion varies between 0.48-0.86 for the clinical groups and between 0.60-0.90 for the non-clinical population. The validity in relation to an external criterion of clinical diagnosis is satisfactory (12).

RESULTS

In order to analyze the results of the questionnaire BDI-II, an independent t-test trial was conducted for both groups. T-test results for the experimental and control groups at the beginning of the study revealed that the BDI mean average initially of the two groups was 0.64±0.47 and 0.46±0.33 respectively. Further analysis showed that there were no statistically significant differences between the two groups in the initial BDI-II readings ($t=0.78$, $df=12$, two-tailed $p=0.45$). T-test results for the two groups following after the experimental intervention disclosed that the mean average values were 0.48±0.51 (experimental group), and 0.41±0.47 (control group). There were no statistically significant differences between the two groups in the final readings either ($t=0.30$, $df=12$, two-tailed $p=0.77$). Based on the t-test results for the dependent groups it was concluded that there was no statistically significant differences between the mean averages [$t(0.73)=0.49$, $p>0.05$] of the experimental group before and following the intervention. The results for the control group were similar [$t(0.53)=0.62$, $p>0.05$].

DISCUSSION

Based on the initial readings a 57% of the participants had mild to severe depression, while at the end of eight weeks 50% of all the participants in the study had mild to moderate depression. Based on the mean averages, and the typical deviations for the two groups there

is a great variation in the depression levels of the participants of the two groups. This is not strange though, because it has been noted that substance abusers present frequently such distribution during therapy for Major Depression Disorder (3). There are data, which reveal that in a sample of male abusers, 70% had a score of more than 14, and a 50% had a score of above 21 in the BDI-II scale (6). It has to be stressed that there was no other diagnosis tool for the emotional state of the study participants apart the BDI-II evaluation. Another reason why we should approach the study results with reservation is the fact that a series of everyday situations can change the scale score. Various studies have disclosed that people who are undergoing a detoxification program present equal or higher BDI-II mean averages than populations undergoing therapy according to Axis I (DSM-IV) (2,36), as well as that they present higher mean averages compared with other clinical populations, as people with stress disorder 1, or people who are considered normal (14).

In the present study, data processing showed that there is no reduction of the depression level (which according to the study was shown to be mild to moderate) in either the experimental group or the control groups. This finding is in opposition with the results from two large organizations [namely, the American National Institute of Mental Health NIMH (26), and the International Society of Sport Psychology (20)], which after reviewing numerous research concluded that exercise seems to influence positively mild and average depression. In a study conducted by Collingwood et al. (10), an aerobic exercise program seemed to decrease depression in a group of teenagers who were undergoing detoxification programs. Mutrie (27) observed non-decrease of depression in an anaerobic exercise group when he used an aerobic and anaerobic exercise program. The present study results do not agree with those of Palmer and associates (30), who used a mixed exercise protocol (aerobic and anaerobic exercise – cyclic training) in 45 patients who were undergoing a detoxification program, and who proved that depression was reduced in all individuals participating in the exercises, with a notably statistically significant decrease only in those who were exercising with the anaerobic program (weight lifting).

The main conclusion is that the eight week bodybuilding program we used did not produce a significant decrease in depressive symptoms of the chemically dependent adults.

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COMPARISON OF FOOT POSITION AND SOME ANTHROPOMETRICAL DIMENSIONS FOR PRESCHOOL CHILDREN IN CRETE (HERAKLION) AND BELGRADE#

E. VASSILIADIS*

SUMMARY

To compare the position of foot (flat feet) in relation to body weight and body height in children of preschool age (5-6 years) in both towns was the main object of the study. The sample comprised 273 children. The variables utilized were body weight, body height and footprints. Comparisons were made in terms of age, gender, left/right foot position, and place of residence. For the statistical processing of results, four indices were utilized: mean, standard deviation, coefficient of variation, range. The analysis revealed that children from Belgrade manifested higher figures for body weight and body height, and lower figures for flat-feet in comparison with their counterparts from Heraklion. On the basis of the results, we concluded that the application of a special kinesitherapy programme (branch of physical education) is required to help obstructing and obliterating the development of flat-feet in the children of Heraklion.

Key words: Foot position, anthropometry, preschool children, flatfeet

ÖZET

GİRİT (HERAKLION) VE BELGRAD'LI OKUL ÖNCESİ ÇAĞDAKİ ÇOCUKLARIN AYAK POZİSYONU VE ANTROPOMETRİK ÖLÇÜMLERİNİN KARŞILAŞTIRILMASI

Ayak pozisyonunun (düztabanlık) vücut ağırlığı ve boya göre Heraklion ve Belgrad'da yaşayan okul öncesi (5-6 yaş) çağındaki çocuklarda

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karşılaştırması bu çalışmada hedeflendi. Örneklem 273 çocuktan oluşuyordu. Karşılaştırmalar yaş, cinsiyet sol/sağ ayak pozisyonu ve yaşanan yere göre yapıldı. İstatistiksel analiz için ortalama standart sapma, varyasyon katsayısı ve veri aralığı kullanıldı. Sonuçta Belgrad'lı çocukların Heraklin'dekilerden daha uzun ve ağır oldukları; düşük oranda düztaban oldukları gözlendi. Buna göre, özel bir kineziterapi programının bir uygulaması (beden eğitimi dalı) Heraklion'daki çocuklarda düz tabanlığın gelişmesini engellemek ve azaltmak için gerekli görünmektedir.

***Anahtar sözcükler**: Ayak pozisyonu, antropometri, okul öncesi çağı çocuk, düztabanlık*

INTRODUCTION

The phylogenetic evolution of the human being is also marked by the evolution of the shape of the leg. The latter changed from an auxiliary grasp organ to a permanent organ for support and motility of the human frame. Consequently, walking became a most important biological and social function for man. The particular evolutionary engineering of the human leg ascribes to humans a distinct place among all other inhabitants of the animal kingdom.

The majority of researchers in the field have identified three stages in flat-feet: **I.** Minor flat-feet: this is associated with lack or retraction of muscles and also is referred to as *pes valgus* (the longitudinal arch is absent). **II.** If no corrective measures are taken, then the flexible *pes valgus* foot, which is severely deformed as a result of damage to the connective tissue and muscle, will further deteriorate to a condition known as *pes plano valgus*. **III.** The third stage is known as pes *transverso-planus* where there is a marked loss of functionality in the muscles and joints of the foot, which results in total obliteration of the arc and retraction of the metatarsal heads.

Numerous research work on flat-feet conclude that the condition describes a deformity in the human frame. This deformity afflicts 50 - 80% of people in urban centers and is more common in adult females as well as in children. This issue has been investigated in children of school age, in athletes and students of sports academies, but less in children of preschool age.

Preschool training centers, kindergartens and children-stations could provide fertile ground for multifaceted physical and psychological

support in relation to all kinds of physical deformity. The Yugoslavian Institute of Physical Education & Sports Medicine has monitoried and analyzed physical deformities in children at preschool age since 1983. Researchers report that the percentages of flat-feet among children drop with the application of well-designed physical exercises (orthotics management programmes) in the course of their physical growth. Such programmes are non-existent in Greece, particularly on the island of Crete, where there is a plethora of children's stations and kindergartens. In addition, the staff of these stations care not trained to tackle the issue of physical deformities. This research, in support of the recommendations of researchers who have studied the condition of flat-feet, underlines the necessity for close cooperation between specialized physical education instructors and kindergarten instructors.

The object of the present research is to investigate the relationship between foot position, body weight, and body height in children of preschool age from two different countries: Belgrade (Yugoslavia) and Heraklion (Crete, Greece).

MATERIAL AND METHODS

The sample comprised 273 children of 5-6 years, from Belgrade and Heraklion, Crete. The Heraklion sample comprised 122 children of which 54 were 5 years old and 68 were 6 years old. The Belgrade sample comprised 151 children: 71 of which were 5 years old and 80 of which were 6 years old. The variables assessed were body height (BH), body weight (BW), plantogram of left foot (PLF) and plantogram of right foot (PRF).

BH was measured by asking the subject to stand straight with the head positioned such that the Frankfurt plane is horizontal, feet are together, and knees are straight, and the heels are in contact with the vertical surface of the stadiometer. The values were recorded to the nearest 0.5 cm.

BW was measured by asking the subjects to stand on a scale (accurate to 0.5 kg) wearing lightweight indoor clothing. The footprints were assessed using the Thomson plantogram, which is considered to be one of the most accepted method of assessing flat feet. Results are represented in percentages of obliteration of the foot arc (I: 1-30% obliteration, II: 31-60%, and III: over 61%).

For statistical purposes; mean, standard deviation, coefficient of variation, and range are given.

RESULTS

The results of the study, as well as the comparative analysis of the results, are presented below in terms of BH, BW and the position of the foot and obliteration of the arc are given in Tables 1-4.

From the comparison of BH and BW figures with to respect the two towns, we can conclude that the 5-year old children of Belgrade are slightly taller and heavier than the children of Heraklion of same age. In total, the children of Belgrade manifest a lower grade of flat feet in relation to the children of Heraklion. Grade I is more prevalent in children of Belgrade while both grades I and III are prevalent in Heraklion.

Comparing BH and BW figures of children from the two towns, we can conclude that the 6-year old children of Belgrade are slightly taller and heavier than the children of Heraklion of same age. It can be also said that the 6-year old children of Belgrade manifest a lower grade of flatfeet in comparison to their counterparts of Heraklion.

Table 1. Anthropometric comparison of 5-year old children of Belgrade and Heraklion.

Variable	Town	M	S	V	X_{min}	X_{max}	R
BH	Belgrade	112.9	4.9	4.3	100.5	125.5	25.0
	Heraklion	111.1	6.0	5.4	100.0	122.0	22.0
BW	Belgrade	20.07	3.18	15.84	15.0	30.0	15.0
	Heraklion	19.67	2.93	14.89	15.0	26.5	11.5

Table 2. Comparison of flatfeet grade of 5-year old children of Belgrade and Heraklion.

Grade of flatfeet	Town	PLF		PRF	
		fd	%	fd	%
I	Belgrade	38	53.5	40	56.3
	Heraklion	18	33.3	18	33.3
II	Belgrade	10	14.1	7	9.9
	Heraklion	8	14.8	10	18.5
III	Belgrade	15	21.1	11	15.5
	Heraklion	24	44.4	20	37.0
Total	Belgrade	63	88.7	58	81.7
	Heraklion	50	92.6	48	88.9
Mean	Belgrade	30.9		26.5	
	Heraklion	46.3		42.2	

Table 3. Anthropometric comparison of 6-year old children of Belgrade and Heraklion.

Variable	Town	M	S	V	X_{min}	X_{max}	R
BH	Belgrade	120.3	5.4	4.5	108.5	133.5	25.0
	Heraklion	117.2	4.5	3.8	108.5	130.0	21.0
BW	Belgrade	23.38	3.98	17.04	16.0	36.0	20.0
	Heraklion	22.24	3.93	17.66	16.0	40.0	24.0

Table 4. Comparison of flatfeet grade of 6-year old children of Belgrade and Heraklion.

		PLF		PRF	
Grade of flatfeet	Town	fd	%	fd	%
I	Belgrade	41	51.3	37	46.3
	Heraklion	21	30.9	31	45.6
II	Belgrade	10	12.5	10	12.5
	Heraklion	12	17.7	9	13.2
III	Belgrade	7	8.8	8	10.1
	Heraklion	29	42.7	23	33.8
Total	Belgrade	58	72.5	55	68.8
	Heraklion	62	91.2	63	92.7
Mean	Belgrade	19.9		19.6	
	Heraklion	47.4		41.3	

CONCLUSIONS

1. The children of Belgrade, irrespective of age, are taller and heavier in comparison to their counterparts from Heraklion. The boys are taller and heavier comparing with girls in both towns.

2. The boys in Belgrade and Heraklion manifest higher mean flatfeet grades than girls in the respective towns, except in the sample of Heraklion for the age of five years where the mean values for boys and girls are the same.

3. Irrespective of age, the left foot is more prone to flat-feet condition than the right foot.

4. On the average and irrespective of age, the children of Heraklion manifest a higher grade of flat feet than their counterparts in Belgrade. The difference between the children in these towns increases with age, i.e. the arc in the 6-year olds of Belgrade tends to be corrected, but not

in the children of Heraklion of the same age, in which flatfeet grade stays the same.

5. Grade I flatfeet is prevalent in Belgrade, while Grades I & III are prevalent in Heraklion.

We can propose that five- and six-year old children with flatfeet from Heraklion, and from Greece in general, should go through a systematic corrective programme (orthotics). However, before such programme is applied, kindergarten instructors should receive the required training, as is the case with their colleagues from Belgrade.

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