MORPHOLOGICAL CHARACTERISTICS AND HEALTH STATUS OF 8-19-YEAR OLD GIRLS

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INTRODUCTION

Changes in lifestyle, associated with constant use of digital technologies in all areas of social activity and communication, have had a significant impact on the health-related physical fitness of children and adolescents. The most children and adolescents did not reach the recommended by the WHO physical activity guidelines of 60 min of physical activity per day even before the COVID-19 pandemic. **The aim of this study was to analyze the main factors which have the most impact on the body composition and health status, as well as to evaluate overweight and obesity levels of girls and adolescents between the ages of 8 and 19 by using WHO references.**

METHODS

This study consisted of 202 pupils from 8 to 19 years of age (mean age of 12.1 ± 3.5) from different schools in Sofia, Bulgaria. Height was measured by using SECA height measure. A standardized protocol for analyses with the InBody120 body composition analyzer was used for all participants. The following parameters were recorded: Body Mass Index (BMI), weight, body fat mass (BFM), present body fat (PBF), waist-to-hip ratio (WHR), growth score, obesity degree (normal range between 90-110), protein, minerals, fat free mass (FFM), skeletal muscle mass (SMM), total body water (TBW), and basal metabolic ratio (BMR).

RESULTS

The recorded parameters of all participants in this study are presented in Table 1. The coefficient of variation was very good (CV ≤ 10) for the parameter height and WHR; good (CV 10-20) for growth score and obesity degree, and acceptable for (CV 20-30) age, BMI and BMR.

Table 1. Anthropometric and morphological parameters of the 8-19-year-old girls

Parameters	Mean ± SD	Coefficient of Variation
Age [years]	12.1 ± 3.5	28.9
Height [cm]	150.1 ± 15.0	10.0
Weight [kg]	42.5 ± 15.0	35.4
BMI [kg/m^2]	18.8 ± 4.0	21.0
Total Body Water [L]	24.1 ± 7.9	32.7
Protein [kg]	10.3 ± 9.5	92.2
Minerals [kg]	8.3 ± 13.4	160.6
Body Fat Mass [kg]	9.1 ± 5.5	60.8
Fat Free Mass [kg]	25.8 ± 13.9	54.0
Skeletal Muscle Mass [kg]	15.3 ± 6.1	39.6
Percent Body Fat [%]	21.0 ± 8.2	38.8
Basal Metabolic Ratio [kcal/24h]	1080.1 ± 232.4	21.5
Waist-to-Hip Ratio	0.81 ± 0.05	6.1
Growth Score [points]	88.9 ± 16.1	18.1
Obesity degree	95.2 ± 17.3	18.2

The mean BMI of the 8-19-year-old girls was 18.8 ± 4.0 kg/m^2, which was within the 'normal' weight category (18.5–24.9 kg/m2) defined by the WHO (WHO, 2000). The BMI Z-scores were calculated based on the WHO references for children and adolescents between the ages of 5 and 19 years of age, where normal Z-score is defined between -2SD and 1SD, overweight is >1SD and <2SD, obesity >2SD, and thinness > -2SD (WHO, 2007). The individual BMI Z-scores of the children in our study showed that 73.8% of the girls were within the 'normal category', 3.5% were assessed as 'thin', 17.3% were 'overweight', and 5.4% were 'obese'.

The factor analysis component matrix is presented in Table 2. The analysis identified 3 factors which were named depending on the anthropometric, morphological, age- and metabolic-related parameters included in them (with a factor score above 0.700). The three factors derived from the correlation matrix had a total of 95.48% explained variance. The first factor accounted for 59.2%, which was the largest possible variance in the data set. The second factor accounted for 29.6% and the third for 6.6%.

Table 2. Factor analysis of the anthropometric and morphological parameters for 8-19-year-old girls

Parameters	Factor 1	Factor 2	Factor 3
Age	.004	-.078	-.786
BMI	.834	.220	.503
Weight	.816	.306	.488
Total Body Water (TBW)	.342	.079	.862
Protein	-.099	-.992	.062
Minerals	-.119	-.993	-.007
Body Fat Mass (BFM)	.891	.273	.314
Fat Free Mass (FFM)	.205	.945	.238
Skeletal Muscle Mass (SMM)	.231	.908	.321
Percent Body Fat (PBF)	.888	.312	.216
Basal Metabolic Rate (BMR)	.345	.110	.858
Waist-to-Hip Ratio (WHR)	.942	.096	.170
Growth Score	-.922	.146	.232
Obesity degree	.815	.308	.488

CONCLUSION

The anthropometric parameter height showed a strong relation with the other parameters from the analysis of body composition. The anthropometric parameters of obesity had the most significant impact on the analyses of the body composition and health status in the children and adolescents. All three factors are important in building the morphological characteristics of children and adolescents.

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