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PEDIATRIC LETTER TO THE EDITOR

Is the ratio waist circumference to height (WHtR) of 0.5 a universal measure for abdominal adiposity in children and adolescents?

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In the January issue of the Journal, Inokuchi *et al.*[1] published reference values for waist circumference-to-height ratio (WHtR) for Japanese children and adolescents. They recommend age- and sex-specific reference values and preclude the use of a universal cutoff of 0.5, which was proposed by McCarthy and Ashwell ('keep your waist circumference to less than half of your height') for adults and children of both sexes and all ages.[2]

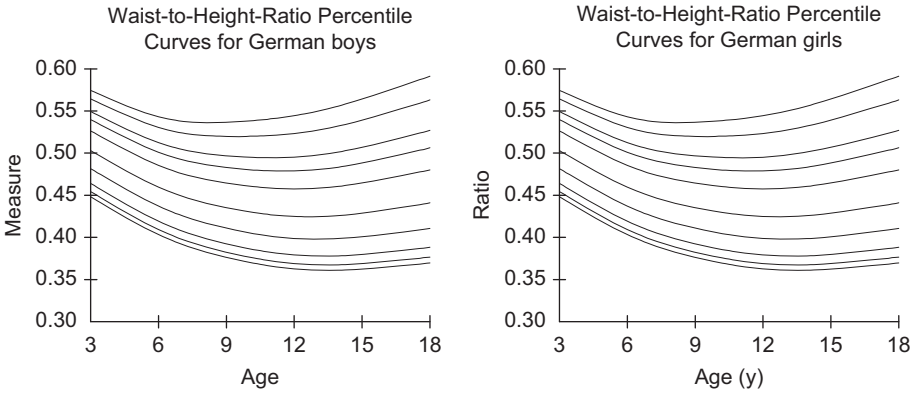

Figure 1. Waist circumference-to-height ratio percentile curves for the 3rd, 5th, 10th, 25th, 50th, 75th, 85th, 95th and 97th percentiles for males and females aged 3–18 years.

Table 1. Values for Box – Cox power *L*, the adjusted mean *M* and the coefficient of variation *S*, and the percentiles for 22 113 German males and females aged 3–18 years, based on the 1993–2007 surveys

Age *Males (percentiles)*	L	M	S	*– 1.88* *3*	*– 1.64* *5*	*– 1.28* *10*	*– 0.67* *25*	*0.00* *50*	*0.67* *75*	*1.04* *85*	*1.28* *90*	*1.64* *95*	*1.88* *97*
3	– 1.82	0.50	0.057	0.45	0.46	0.47	0.48	0.50	0.52	0.53	0.54	0.55	0.56
4	– 2.00	0.49	0.061	0.44	0.44	0.45	0.47	0.49	0.51	0.52	0.53	0.54	0.55
5	– 2.19	0.47	0.065	0.42	0.43	0.44	0.45	0.47	0.50	0.51	0.52	0.54	0.55
6	– 2.37	0.46	0.070	0.41	0.42	0.43	0.44	0.46	0.49	0.50	0.51	0.53	0.54
7	– 2.53	0.45	0.074	0.40	0.41	0.42	0.43	0.45	0.48	0.49	0.51	0.52	0.54
8	– 2.65	0.45	0.078	0.39	0.40	0.41	0.43	0.45	0.47	0.49	0.50	0.52	0.54
9	– 2.73	0.44	0.083	0.39	0.39	0.40	0.42	0.44	0.47	0.49	0.50	0.52	0.54
10	– 2.77	0.44	0.086	0.38	0.39	0.40	0.42	0.44	0.47	0.49	0.50	0.53	0.55
11	– 2.77	0.44	0.090	0.38	0.39	0.40	0.41	0.44	0.47	0.49	0.50	0.53	0.55
12	– 2.76	0.43	0.092	0.38	0.38	0.39	0.41	0.43	0.47	0.49	0.50	0.53	0.55
13	– 2.74	0.43	0.094	0.37	0.38	0.39	0.41	0.43	0.46	0.48	0.50	0.53	0.55
14	– 2.70	0.43	0.096	0.37	0.38	0.39	0.41	0.43	0.46	0.48	0.50	0.53	0.55
15	– 2.67	0.43	0.097	0.37	0.38	0.39	0.41	0.43	0.46	0.48	0.50	0.53	0.55
16	– 2.64	0.43	0.098	0.37	0.38	0.39	0.41	0.43	0.46	0.49	0.50	0.53	0.55
17	– 2.61	0.43	0.098	0.37	0.38	0.39	0.41	0.43	0.47	0.49	0.51	0.54	0.56
18	– 2.58	0.44	0.099	0.37	0.38	0.39	0.41	0.44	0.47	0.49	0.51	0.54	0.56
Females (percentiles)				*3*	*5*	*10*	*25*	*50*	*75*	*85*	*90*	*95*	*97*
3	– 1.15	0.50	0.066	0.45	0.45	0.46	0.48	0.50	0.53	0.54	0.55	0.56	0.57
4	– 1.32	0.49	0.070	0.43	0.44	0.45	0.47	0.49	0.51	0.53	0.54	0.55	0.56
5	– 1.49	0.47	0.073	0.42	0.42	0.43	0.45	0.47	0.50	0.51	0.52	0.54	0.55
6	– 1.65	0.46	0.078	0.40	0.41	0.42	0.44	0.46	0.49	0.5	0.51	0.53	0.54
7	– 1.81	0.45	0.082	0.39	0.4	0.41	0.43	0.45	0.48	0.49	0.5	0.52	0.54
8	– 1.96	0.44	0.086	0.38	0.39	0.4	0.42	0.44	0.47	0.49	0.5	0.52	0.54
9	– 2.08	0.44	0.090	0.38	0.38	0.39	0.41	0.44	0.46	0.48	0.5	0.52	0.54
10	– 2.16	0.43	0.094	0.37	0.38	0.39	0.41	0.43	0.46	0.48	0.5	0.52	0.54
11	– 2.21	0.43	0.098	0.37	0.37	0.38	0.40	0.43	0.46	0.48	0.49	0.52	0.54
12	– 2.24	0.42	0.101	0.36	0.37	0.38	0.40	0.42	0.46	0.48	0.5	0.52	0.54
13	– 2.26	0.42	0.104	0.36	0.37	0.38	0.40	0.42	0.46	0.48	0.5	0.53	0.55
14	– 2.27	0.43	0.106	0.36	0.37	0.38	0.40	0.43	0.46	0.48	0.5	0.53	0.56
15	– 2.26	0.43	0.109	0.36	0.37	0.38	0.40	0.43	0.46	0.49	0.51	0.54	0.56
16	– 2.25	0.43	0.111	0.36	0.37	0.38	0.40	0.43	0.47	0.49	0.51	0.55	0.57
17	– 2.23	0.44	0.113	0.37	0.37	0.39	0.41	0.44	0.47	0.5	0.52	0.55	0.58
18	–2.21	0.44	0.115	0.37	0.38	0.39	0.41	0.44	0.48	0.51	0.53	0.56	0.59

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Based on our reference values from 22 113 German children and adolescents aged 3–18 years we would like to support the use of age- and sex-specific WHtR: As displayed in Figure 1, the ten percentile curves between the 3rd and 97th percentiles demonstrate substantial variance by age, sex and WHtR percentile, starting with 0.45 for the 3rd percentile and with 0.56 for the 97th percentile in both genders. Ethnicity should be added as a fourth variable, as displayed by the disparate shapes of the nine percentile curves of the 6–18-year-old Japanese youths.[1]

As shown in Table 1, median WHtR value was 0.509 among 3-year-old children, which decreased continuously in boys until 14 years (0.462) and in girls until 13 years (0.424), whereas at the beginning of overweight (85th percentile) 3-year-old boys had a median WHtR value of 0.546 and girls 0.548, which continuously decreased to 0.482 at 15 years in boys and to 0.479 at 11 years in girls. Among severely obese children (97th percentile), at 3 years boys had a median WHtR value of 0.583, with a nadir of 0.549 at 12 years and a re-increase to 0.562 at age 18, while girls started with 0.587, with a nadir of 0.536 at 8 years and a maximum of 0.597 at 18 years.

Median WHtR was higher in German boys and girls (0.46 and 0.46, respectively, at 6 years; 0.43 and 0.44, respectively, at 18 years) compared with Japanese boys and girls (0.44 and 0.43, respectively, at 6 years; 0.44 and 0.40, respectively, at 18 years). These disparities increased in both genders, with increasing overweight and obesity at the 95th percentile at age 6 years being 0.53 among German boys and girls compared with 0.49 and 0.48, respectively, in their Japanese counterparts, and 0.53 and 0.63, respectively, in 18-year-old males and females in Germany vs 0.49 and 0.45 in Japanese adolescents. The prevalence of abdominal adiposity defined by WHtR $\geqslant$0.5 was 18.7%/1.9% in 6 – 17-year-old Japanese males/females and 11.6%/11.2% in German males/females. At the 85th, 90th, 95th and 97th percentiles the prevalence for Japanese boys/girls was 56.0/24.5, 42.4/17, 25.4/10.1 and 16.0%/6.9% and that in German boys/girls 0.4/0.2, 35.3/27.6,100/95.3 and 100%/100%, respectively.

Overall, WHtR is considerably higher in German than in Japanese children and adolescents, which is consistent with the lower waist circumference (WC) values in Japanese youth.[3] At the 90th percentile (recommended by the International Diabetes Federation as a cutoff for the new definition of the metabolic syndrome in young people[4]) the comparison of age- and gender-specific WC percentiles among youth from 12 countries demonstrates strong disparities up to 21 cm in boys and 25 cm in girls.[3]

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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