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THE PROPORTION OF LEGS TO TRUNK IN GIRLS WITH IDIOPATHIC STRUCTURAL SCOLIOSIS

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In previous studies it has been established (Willner 1974, 1975) that children with scoliosis are taller than average. This could be demonstrated in boys as well as in girls and in functional as well as in structural scoliosis.

In a study including girls only it could be demonstrated that cases of idiopathic adolescent structural scoliosis were taller than average even if the shortening caused by the deformity was not accounted for. In contrast, girls with juvenile or infantile scoliosis did not deviate from the average in this respect.

Although it is common knowledge that scoliosis is related to growth there are no previous observations of this difference in stature, nor are there any observations of body proportions in children with scoliosis.

The objective of the present study was to find out whether the increase in height observed in children with scoliosis was general or confined to the spine thereby disturbing the body proportion in these children.

MATERIAL AND METHODS

The study included 164 girls with adolescent idiopathic scoliosis, all confirmed radiographically, treated at the Department of Orthopaedic Surgery, Gothenburg, during the years 1963–1971. These cases have been described previously (Willner 1975). The measurements of body height were obtained at the time of the first visit before any treatment had been given. Only cases in whom the scoliosis exceeded 20° according to the measuring method of Cobb (1948) were included. All the measurements were performed by the same investigator.

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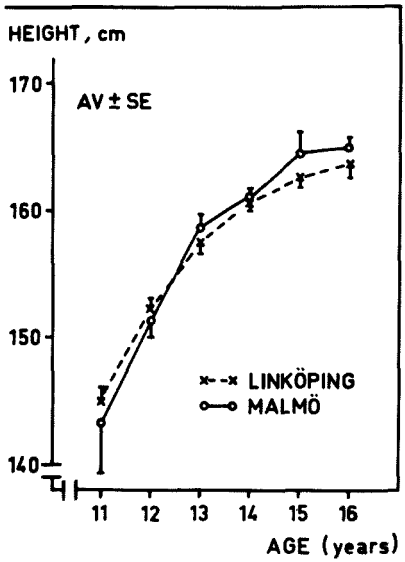

Figure 1. Comparison between total heights in control girls in the present study and girls tested to be representative of the growth pattern in Sweden (Willner 1974).

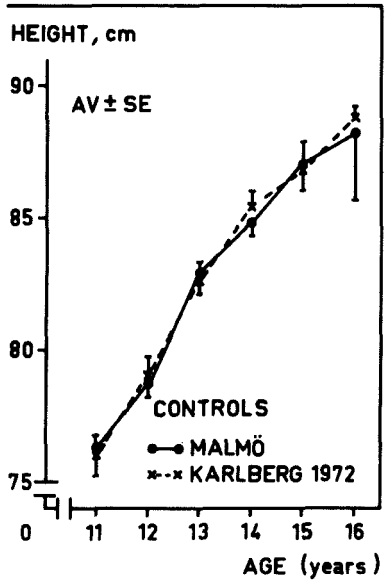

Figure 2. Comparison of sitting heights of girls, comparing controls in the present study and data by Karlberg (1972).

In the children previously sampled to serve as controls in studies of height (Wilner 1974, 1975) only the height in standing was recorded. For the purpose of the present study, therefore, 201 children, pupils in the schools of the city of Malmö, were measured. The standing height of these children agreed well with the control children previously used (Figure 1) and, therefore, also with several other height studies of children in Scandinavia (Willner 1974). Furthermore the sitting height of the Malmö sample agrees well with the data obtained by Karlberg et al. (1972) (Figure 2). Therefore it was felt that the body proportion of the scoliosis girls in Gothenburg and the normal girls in Malmö could be compared.

All the girls, scoliosis and controls, were measured not only in a standing but also in a sitting position with sitting height being the height of the trunk and the head measured with the girls sitting on a flat chair in an erect position and was defined as the distance from the surface of the seat of the chair to the top of the

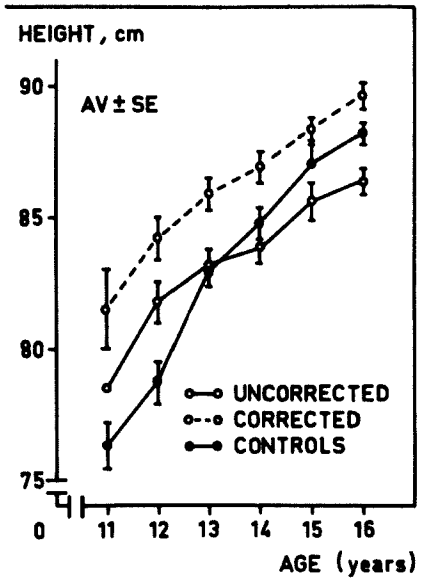

Figure 3. Comparison of sitting heights of girls with idiopathic adolescent scoliosis and controls.

Table 1. Comparison of sitting height in girls with idiopathic adolescent scoliosis and controls.

Age years	Sitting height (cm)								
	Scoliosis						Controls		
	Corrected			Uncorrected					
	Mean	n	SD	Mean	n	SD	Mean	n	SD
11 (10.5–11.5)	81.5	4	3.1	78.5	4	3.5	76.3	28	4.6
12 –	84.2	19	3.9	81.8	19	4.2	78.7	27	4.0
13 –	85.9	30	2.9	83.2	30	3.3	82.9	44	3.6
14 –	86.9	38	3.6	83.9	38	3.9	84.8	35	3.4
15 –	88.3	32	3.0	85.6	32	3.7	87.0	17	3.4
16 –	89.6	26	2.4	86.4	26	2.6	88.2	50	3.1
17 –	89.5	15	3.2	85.3	15	3.4			

head of the child. The sitting height was also corrected for the shortening of the spine caused by the scoliosis and in accordance with the method of Bjure et al. (1968). For comparison between controls and scoliosis the sitting height and the ratio of the sitting height to the difference between the total height and the sitting height were used.

Table 2. Comparison of the ratio between the sitting height and the total height minus the sitting height in girls with idiopathic structural adolescent scoliosis and controls.

Age	Sitting height/total height minus sitting height											
	Scoliosis								Controls			
	Corrected				Uncorrected							
	Mean	n	SD	SE	Mean	n	SD	SE	Mean	n	SD	SE
11	1.08	4	0.05	0.03	1.04	4	0.06	0.03	1.08	28	0.04	0.01
12	10.9	19	0.06	0.01	1.06	19	0.05	0.01	1.08	27	0.05	0.01
13	1.10	30	0.06	0.01	1.08	30	0.12	0.02	1.10	44	0.04	0.01
14	1.09	38	0.06	0.01	1.06	38	0.07	0.01	1.12	35	0.05	0.01
15	1.10	32	0.06	0.01	1.07	32	0.06	0.01	1.12	17	0.03	0.01
16	1.13	26	0.05	0.01	1.09	26	0.05	0.01	1.14	50	0.05	0.01
17	1.11	15	0.07	0.02	1.09	15	0.07	0.02				

RESULTS

The sitting height corrected for the influence of the deformity was significantly greater in girls with scoliosis than in controls (Table 1 and Figure 3). The uncorrected heights were also greater than in the controls but only in young girls. In the latter case the proportion, expressed as the ratio between the trunk and the height not accounted for by the trunk, differed in that the trunk contributed less to the total height in girls with scoliosis (Table 2). However, when the shortening was accounted for, the corrected ratios in girls with scoliosis and in the controls agreed well indicating that the increase in height was equally distributed between legs and spine.

DISCUSSION

The variable, sitting height, used in the present study is the sum of the heights of the pelvis, the spine and the head. Growth of the head may be neglected in that the annual growth between the ages of 8 and 17 in girls is no more than 0.2 centimetres (Simmons 1944). The pelvis contributes no more than about 18 per cent of the total sitting height (Anderson et al. 1965). For the purpose of the present study, therefore, the sitting height may be regarded as a parameter of the length of the spine, and the difference between total height and sitting height as a parameter of leg length.

Tupman (1962) and Tanner (1961) agreed that during adolescence the rate of growth was greater in the spine than in the legs and the findings of the present study support this concept in that with increasing age not only the controls but also the cases with scoliosis demonstrate an increasing sitting height in relation to the total height. Duval-Beaupère (1970 and 1971) failed to demonstrate any deviation in total height or sitting height in children with scoliosis. From previous studies it is known that, at least in Sweden, children with scoliosis are taller than the average population (Willner 1974, 1975). One may have suspected that despite this, deviation from normal was specifically confined to the spine itself. However, in the present study it is demonstrated that at least the legs and the spine have the same length proportion as in the healthy child.

SUMMARY

The sitting height and its relationship to total height was compared for 164 girls with idiopathic adolescent structural scoliosis and 201 age-matched healthy controls. It was demonstrated that although girls with scoliosis were taller than controls the relationship between trunk and legs was undisturbed.

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