Answer to the letter to the editor of Srijit Das et al. doi:10.1007/s00586-012-2165-7

Dariusz Czaprowski · Tomasz Kotwicki

Revised: 18 January 2012 / Published online: 31 January 2012
© Springer-Verlag 2012

Thank you for your favorable reception of our study: “Physical capacity of girls with mild and moderate idiopathic scoliosis: influence of the size, length and number of curvatures”. At the same time, we would like to refer to the comments contained in your letter.

With no doubt, idiopathic scoliosis is a three-dimensional deformity of the growing spine. Even if not perfect, the Cobb angle and the Bunnell clinical trunk rotation angle are the two most widely used parameters to assess deformity. In contrast, the parameters mentioned by the letter’s authors do not seem to have any potential to additionally “validate and strengthen the subject recruitment”: (1) clinical examination consisting of “leg length, pelvic and extremity symmetry” involves extra-spinal status; Adams forward bending test was used in our study to perform scoliometer measurements; “previous spinal surgery” obviously did not take place in our patients; (2) to our knowledge, the real time ultrasound or Auscan has not proved its value, the evoked reference of Lam et al. [3] being a review paper does not support this point of view.

While investigating the possible relationship between the physical capacity and the number of vertebrae involved in scoliosis, we have not found published studies to refer to. Why was it our intention to check the difference in the parameters defining the physical capacity (VO_2max and

PWC170 indicator) depending on the number of vertebrae, which make up the scoliotic curvature? Numerous authors emphasize the impaired mobility of the ribs and, in consequence, the chest in children with scoliosis [2, 9]. A negative influence of thoracic lordosis on the function of the respiratory system is mentioned [4, 10]. Furthermore, the necessity of spinal mobility assessment is emphasized, due to, among other things, its relationship to a reduced physical fitness [4, 8]. In view of the above factors, the number of vertebrae affected by scoliosis could be potentially connected with the physical capacity in a way, which has not been defined so far.

The PWC170 test was performed in accordance with the methodology described in the literature [1, 5]. The girls from both groups undertook two 5-min submaximal physical effort tests without a break, which would separate them. The test procedure did not involve a warm-up. The rate of pedals rotation (50/min) was maintained by observing the monitor displaying the current rate. Additionally, a metronome set at 100 beats per minute was used. The height of the seat and the handlebars was individually adjusted to each subject so as to obtain a stable sitting position (with no pelvic movement while pedalling), with the back straight and the knees bent slightly, when the pedals were in the low position. The metatarsal region of the feet rested on the pedals. Only after obtaining the required frequency of rotations was the appropriate load selected. Before the test was started, it was thoroughly explained to the girls. They could also become familiar with the equipment. All tests were performed after a rest in the sitting position (30 min). In accordance with the guidelines, in the 24-h period before the test, the girls did not undertake any physical activity with a load corresponding to the one in the test.

If physical capacity is compared in two or more groups, the level of physical activity of persons included in those

D. Czaprowski (✉)
Faculty of Physiotherapy, Józef Rusiecki University College
in Olsztyn, Bydgoska 33, 10-243 Olsztyn, Poland
e-mail: dariusz.czaprowski@interia.pl

T. Kotwicki
Department of Pediatric Orthopedics and Traumatology,
University of Medical Sciences in Poznań,
28th June 1958 no. 135, 61-545 Poznań, Poland
e-mail: kotwicki@ump.edu.pl

groups should be the same or as similar as possible. Both the girls with scoliosis and the girls from the control group participated in physical activity at school (3 times per week) and did not take part in any other form of physical activity. Children with scoliosis who underwent any form of individual therapy, in particular using methods aimed at improving function of the cardiopulmonary system and the chest mobility (Schroth, DoboMed), were excluded from the study. According to Koumbourlis, exercise intolerance in children with mild scoliosis may result from physical deconditioning [7]. Our study revealed that there was no difference in the VO_2max level and the value of PWC170 indicator between the girls with mild scoliosis and the girls from the control group, which may suggest that the pathological changes in the cardiopulmonary system are too small to induce negative effects in the case of mild deformations. This may confirm Koumbourlis's suggestion. Kesten et al. [6] suggest that lack of physical exercises causes reduction of VO_2max , though their observations are related to adults with moderate scoliosis. Without entering speculation area, we can only reveal our observations showing that a moderate deformation (and not the mild one) resulted in a significant reduction of the VO_2max (l/min) and PWC170 indicator (W; W/kg). In view of the homogeneity of the girls participating in the study in respect of their level of physical activity, it can be concluded that changes in the physical capacity occur in girls with moderate scoliosis (Cobb > 25).

References

1. Astrand PO, Rodahl K, Dahl HA, Stromme SB (2003) Textbook of work physiology. Physiological bases of exercise. Human Kinetics, Champaign, pp 273–297
2. Durmala J, Tomalak W, Kotwicki T (2008) Function of the respiratory system in patients with idiopathic scoliosis: reasons for impairment and methods of evaluation. *Stud Health Technol Inform* 135:237–245
3. Lam GC, Hill DL, Le LH, Raso JV, Lou EH (2008) Vertebral rotation measurement: a summary and comparison of common radiographic and CT methods. *Scoliosis* 3:16
4. Lewandowski A, Talar J (2005) Incorrect posture and fitness of children at school age in research of 23 junior high school in Bydgoszcz. *Pol J Sports Med* 21(2):99–110
5. Karpman VL (1987) Cardiovascular system and physical exercise. CRC Press, Boca Raton
6. Kesten S, Garfinkel SK, Wright T, Rebuck AS (1991) Impaired exercise capacity in adults with moderate scoliosis. *Chest* 99:663–666. doi:10.1378/chest.99.3.663
7. Koumbourlis AC (2006) Scoliosis and the respiratory system. *Paediatr Respir Rev* 7:152–160
8. Parent S, Newton PO, Wenger DR (2004) Etiology, anatomy and natural history. In: Newton PO (ed) Adolescent Idiopathic Scoliosis. American Academy of Orthopaedic Surgeons, Rosemont, pp 1–9
9. Weiss HR (1991) The effect of an exercise program on vital capacity and rib mobility in patients with idiopathic scoliosis. *Spine* 16(1):88–93
10. Winter RB, Lovell WW, Moe JH (1975) Excessive thoracic lordosis and loss of pulmonary function in patients with idiopathic scoliosis. *J Bone Jt Surg* 57-A:972–977