

Scheuermann's disease had a greater body mass index (BMI) in relation with the control group (Mann-Whitney test, $p = 0,000$), as well.

The two groups were comparable according to age (Mann-Witney test, $p = 0,605$). However, there was no correlation between weight ($r = -0,019$, $p = 0,801$), height ($r = 0,052$, $p = 0,493$) and BMI ($r = -0,048$, $p = 0,532$) with the magnitude of kyphotic curve. Multivariate analyses also did not reveal significant correlations between weight ($p = 0,226$) and height ($p = 0,782$) with the magnitude of kyphotic curve.

Conclusion: The patients with Scheuermann's disease had significant greater weight and height in relation with the control group. However no significant association was revealed between weight and height with the magnitude of kyphotic curve, which is in contrast with their involvement in the mechanical theory of Scheuermann's disease pathogenesis.

SP 4

WILL WE NEED PATIENT SPECIFIC SPINE MODELS?

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Background: The differences in vertebral size between patients can be large: between 11 and 18 years vertebrae grow 25% in size and interindividual differences in vertebral size can be up to 20%. Although it is generally recognised that this will have an effect on the mechanical behaviour of the spine, little research has been done on how large this effect is. These effects are important considerations in the treatment of spinal disorders such as scoliosis.

Purpose: We studied how differences in vertebral size influence the mechanical behaviour of the spine.

Methods: We used a computational model of a human motion segment. As the flexibility of the motion segments is dominated by the behaviour of the discs, the vertebral endplates were modelled as rigid bodies. The disc was modelled as an annulus of a base material with fibres in a symmetrical pattern around a hydrogel-like nucleus. The mechanical behaviour of the resulting model compared very well to data found in literature. Parameters that change during growth and are likely to have a mechanical effect on the spine (width, depth, disc height and nucleus size) were varied over a physiological range.

Results: A 12.5% (25%) wider disc increased the stiffness in axial compression and flexion-extension by approximately 10% (20%). Lateral bending stiffness increased by 38% (85%) and axial rotational stiffness increased by 28% (59%).

A 12.5% (25%) deeper disc increased the stiffness in axial compression and lateral bending by approximately 13% (25%). Flexion-extension stiffness increased by 39% (86%) and axial rotational stiffness increased by 27% (54%).

A 12.5% (25%) higher disc lowered the stiffness in axial compression, lateral bending, flexion-extension, and axial rotation all by approximately 14% (23%).

A 40% larger nucleus lowered the stiffness in axial compression, lateral bending, flexion-extension, and axial rotation all by approximately 9%.

Conclusions: The changes in size that typically occur during growth or are present as interindividual differences cause dramatic changes in the stiffness of the spine. This presents some interesting challenges for the treatment of spinal disorders and biomechanical studies of the spine. As modern treatment techniques for scoliosis intend to stimulate the spine to regain normal curvature without severely impairing its flexibility, the forces applied to the spine must be well balanced with the mechanics of that spine, thus necessitating patient specific spine models.

SP 5

EFFECTS OF SCHOOL BACKPACK CARRYING ON SAGITTAL AND FRONTAL TRUNK ALIGNMENT IN ADOLESCENTS

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Background context: Backpack carrying is considered a risk factor for developing back pain not only in the school period but also during holidays.

Purpose: To investigate the influence of backpack carrying on the spine curves, shoulder level, trunk and back pain in schoolchildren.

Study design: Cross-sectional study

Methods: 1263 students aged from 12 to 18 years, who carried backpacks over one or both shoulders to the school, were included in this study. All adolescents were asked for dorsal (DP) and/or low back pain (LBP) during the school period and during holidays. The Debrunner's Kyphometer and the Scoliometer were used to indirectly measure the craniocervical angle (CCA), thoracic kyphosis, and lumbar lordosis and shoulder level shift on the frontal plane (biacromial line, BL). All data was statistically analyzed with logistic and multinomial logistic analysis, t-test, Wilcoxon and chi-square tests.

Results: Backpack carrying decreased CCA ($P < 0.001$) and increased BL-shift ($P < 0.001$), and coronal ($P < 0.001$) plus sagittal ($P = 0.029$) shift of the upper trunk. Girls suffer 5.6 ($P = 0.001$) times more from DP than boys. Students, carrying backpacks asymmetrically are more likely to suffer from DP ($P = 0.035$) and LBP ($P = 0.014$), compared with those carrying backpacks symmetrically. For each BMI-unit increase a student is on average 10% less likely ($P = 0.047$) to suffer from DP and 10% more likely ($P = 0.046$) to suffer from LBP. A student is more likely to suffer from DP ($P = 0.034$) and LBP ($P = 0.004$) as the difference in coronal trunk shift between loaded with backpacks and unloaded trunk increases. High intensity pain (VAS > 3) is more likely to occur in girls ($P = 0.015$), students who carry backpacks asymmetrically ($P = 0.015$), students with high frontal trunk shift ($P = 0.005$) or great difference in frontal trunk shift between loaded and unloaded spine ($P = 0.012$). Girls ($P = 0.050$), and students who carry backpacks asymmetrically ($P = 0.006$) are more likely to suffer from back pain in holidays. The duration of backpack carrying is also positively correlated ($P = 0.047$) to back pain during holidays.

Conclusion: Backpack carrying resulted in a forward lean of the upper trunk, and a decrease of cervical lordosis. Asymmetrically backpack carrying forced adolescents to rise the backpack bearing shoulder and simultaneously to shift the upper trunk contralaterally. These changes seem statistically to increase the incidence of back pain in the school period and during the holidays, particularly in girls. It is recommended that schoolchildren carry backpacks symmetrically with two straps.

SP 6

LONG-TERM FOLLOW-UP OF FUNCTIONING AFTER SPINAL SURGERY IN PATIENTS WITH RETT SYNDROME

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Background: The Rett syndrome is associated with neurological form of scoliosis and has a typically long C-shaped thoracolumbar kyphoscoliosis. Prospective long-term follow-up studies for patients with neuromuscular scoliosis and Rett syndrome in relation to the patient's total situation are rare, and the results often focus on the angle of the scoliosis. But the interests of the parents differ. They have questions about the girl's continued functioning postoperatively.