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Test of manual working capacity and its relation to back pain: A prospective epidemiologic study

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A prospective survey of back pain was undertaken to test the hypothesis that tests of manual working capacity, appropriate to occupational health screening, would serve to identify those people in the population who are susceptible to low back pain. Totally, 2,891 subjects (1,150 females and 1,741 males) volunteered: viz., employees of the University of Liverpool, a technical college, hospitals, and of the ambulance and fire services.

On admission to the survey, subjects completed a questionnaire on previous and current back pain. They underwent arthropometric measurements, strength, lumbar mobility, handling skill, and lung function tests. One year later, a postal questionnaire was sent to all the subjects concerning back pain experienced in the 12 months since testing, and to which the response rate was 89 percent. The results of the survey have provided new data on the relationship between the tests and the experience of back pain before and after testing. The main predictor was a previous history of back pain. No predictive factors emerged from the battery of tests and measurements to identify new cases: i.e., those who had back pain for the first time in the course of the 12 months' follow-up period. That aspect of the hypothesis therefore remains unproved. But the test results and measurements served to improve the predictive value of a knowledge of the history of low back pain, particularly in those with either no history or a history of chronic pain.

A questionnaire on bronchitis and smoking was sent to 1,100 of the subjects. Replies were received from 880 and compared with the original test data. There was no relation between back pain and smoking, but those with frequent back pain had more chest symptoms. The

respiratory function tests were poor predictors of smoking habit, but were as reliable for the predication of back pain as the strength tests.

Ergonomics and training in nursing

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This study was planned to evaluate the effects of a system of patient handling instructions, including ergonomics, biomechanics, and teaching practice, by the students themselves. The first group received a traditional type of training in patient handling, and the second group received the training program developed for this study (40 hours teaching during 2.5 years' training) based on "The handling of patients: a guide for nurse managers," published in 1981 by the Royal College of Nursing of the UK. Assessment of handling skills was done from the video recording by the course instructor and the independent observer. The average marks are given in the following table:

	Course instructor	Independent observer
<i>Traditional training</i>		
Mean	0.48	1.14
SD	0.47	0.38
<i>Intensive training</i>		
Mean	1.25	1.45
SD	0.64	0.66
<i>Statistical significance between training groups</i>		
P	< 0.001	< 0.001

The marking of the independent observer was generally higher than that of the instructor, indicating the value of more than one assessment. Nevertheless, the study shows that the trained group had better handling skills than the control group.

Changes in stature during lifting work and recovery: A pilot study

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Because of fluid outflow, intervertebral discs lose height under compressive loading, and a reverse process takes place during rest. In our study, changes in stature of 5 healthy men and 5 healthy women were measured during rest and during work periods, consisting of a 15-minute rest period followed by a period of isometric and dynamic lifting activities, 30 minutes of continuous lifting, and 30 minutes of rest. During both rest periods the subjects lay supine with their legs elevated. The height was measured in a relaxed posture, specified for each subject with a special apparatus and controlled for reproducibility with microswitches.

The mean height loss from the end of the initial rest period to the end of the continuous work period was 8.3 mm, and the height regained during final rest was 7.2 mm. Both height loss and regain were fastest at the beginning of work and recovery, respectively. Changes in stature emphasize the importance of rest after and between periods of loading the spine. Our apparatus allows the determination of the duration of spinal loading and recovery periods in different exercise or work situations.

Estimation of spinal load at work using electromyography

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A four-channel portable system was developed to record the EMG activity of back muscles at work. The effects of muscle length and its changes on EMG were studied in the laboratory. The difference of EMG activities on left and right erector spinae muscles was studied to determine the value of the difference as an indicator of trunk rotations.

EMG activities of erector spinae muscles at L₁ and L₄ levels bilaterally were studied in 10 healthy subjects during static weight holding and lifting in symmetric and asymmetric postures. In symmetric postures, optoelectronic recordings of body postures were used to obtain a biomechanically computed muscle force estimate (BMF).

The BMF increased with increasing flexion of the trunk, but the EMG activity stopped increasing beyond 30° at the L₄ level and at L₁ even before, because the force of an elongated muscle is mainly developed passively. BMF peaks were almost similar in lifting and lowering, but EMG activity peaks were significantly higher when lifting than when lowering, showing that muscles produce greater forces when working eccentrically than when working concentrically. When the load was handled with the trunk rotated, there was significantly more activity in the contralateral back muscles than on the side of the rotation, suggesting that the asymmetry of the EMG activity is an indicator of an asymmetric work posture.

The adolescent back: A field survey of 370 Finnish schoolchildren

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The aim of this study was to screen nontraumatic neck and/or back symptoms in healthy schoolchildren with a standardized physical examination method applicable in schools. We also studied postural faults especially in the sagittal plane, spinal mobility, and strength of the muscles and associations between the findings and various background factors. The material comprised 370, 11-17-year-old schoolchildren, and was distributed evenly between the age-groups and sexes. Some children underwent radiographic examination, mainly in order to exclude Scheuermann's disease.

One fifth of the subjects had symptoms that were mostly mild and localized in the low back, associated especially with sitting and physical activity. Symptoms increased with age; they were more frequent in girls than in boys. Six percent of the children had more chronic symptoms. Hollow low back induced frequent symptoms, as did long round back and upper round back if combined with poor abdominal muscle strength. The most common postural fault was a mild long round back, accompanied by tight hamstring muscles and poor abdominal muscle strength, whereas hollow back was often combined with tight iliopsoas muscles and weak abdominal muscles. Hamstring tightness was common in boys and could begin as early as at 11 years. Hamstring tightness was often combined with weak abdominal muscles and decreased spinal flexion mobility. Subjects pursuing physical activities more seldom had muscular tightness.

Predictability of neural compression in cervical myelography from plain radiographs

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The purpose of our study was to find out if the presence and degree of neural compression at different cervical levels seen in myelography could be predicted from plain radiographic measurements. Plain lateral radiographs and myelograms of 43 consecutive patients with cervical disc disease at a neurosurgery department were analyzed. Midsagittal diameter at the middle level (SDm) and inferior border (SDi) of the vertebra were measured from the plain radiograph in the neutral and extended positions by 2 independent observers. The myelographic findings were graded by 2 independent neuroradiologists into four categories, of which the first three represented root compression and the fourth root and cord compression. Significant (Grades 2-4) myelographic abnormalities were found in patients with either small midsagittal diameters or a SDi/SDm ratio below 0.90. The predictability of the measurements was best for men at the C4 and C5 levels. The neutral position and extension gave similar results. The clinical application of the findings is the following: if a patient with clear-cut symptoms of root or cord compression has a narrow cervical spinal canal or low SDi/SDm ratio at the level of the symptoms, the clinician is encouraged to refer him for further examinations.

Lumbar disc syndrome in Finland

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The prevalence of lumbar disc syndrome (herniated disc or typical sciatica) and its contribution to disability and need for medical care were studied as part of the "Mini-Finland Health Survey." A sample of 8,000 persons representative of the Finnish population and aged 30 years or over were invited to the examination, and 7,217 (90 percent) participated. On the basis of medical history, symptoms and standardized physical examination, herniated lumbar disc or sciatica was diagnosed in 5.1 percent of the men and in 3.7 percent of the women ($P = 0.0005$). Half of these patients were assessed to need medical care, over 80 percent of which was considered to be adequately met. One third of all the patients with lumbar disc syndrome had been previously hospitalized because of it, and one fifth of the patients had undergone lumbar surgery. At least slight disability was found in almost 60 percent of the patients, although severe functional limitations were rare. About 6 percent of work disability in the population was estimated to be attributed to the lumbar disc syndrome.