

VALIDITY OF COMMONLY USED CLINICAL TESTS TO DIAGNOSE AND SCREEN FOR SPINAL PAIN IN ADOLESCENTS: A SCHOOL-BASED COHORT STUDY IN 1300 DANES AGED 11–15 YEARS



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ABSTRACT

Objective: The overall aim of this study was to determine the ability of 2 selected clinical tests to detect or predict neck pain, mid back pain, and low back pain in a school-based cohort of Danish 11- to 15-year-olds.

Methods: A school-based 2-year prospective cohort study was conducted. Data were collected at the age of 11 to 13 (n = 1224) and 2 years later (n = 963). Spinal pain (neck pain, mid back pain, and low back pain) was assessed by an electronic survey completed during school time, and reference standard was defined as both lifetime prevalence and frequent pain as a proxy of severity. The tests included assessments of scoliosis, hypermobility, global mobility, intersegmental mobility, end range pain, and isometric endurance of back extensors. Sensitivity, specificity, negative and positive predictive values, and odds ratios were calculated for each test individually, and area under the receiver operating characteristic curve was calculated for evaluation of all tests combined.

Results: The sensitivity was low, and specificity was high for all tests at both baseline (age, 11-13 years) and follow-up (age, 13-15 years). When all tests were evaluated collectively in 1 model, the area under the receiver operating characteristic curve ranged from 0.60 to 0.65. None of the selected tests could predict incidence cases of neck pain, mid back pain, or low back pain.

Conclusion: Clinical tests commonly used in spinal screening in adolescents could not detect present spinal pain or predict future spinal pain. However, some statistically significant associations between spinal pain and tests involving a pain response from the participant were found. (*J Manipulative Physiol Ther* 2016;39:76-87)

Key Indexing Terms: *Adolescent; Back Pain; Diagnosis; Screening*

Low back pain is now the primary cause of years lived with disability worldwide,¹ the societal impact is high, and the costs are increasing.² There is growing evidence that back and neck pain originates during childhood and adolescence. Reports of lifetime prevalence proportion for back pain in adolescents vary widely with estimates up to 74%,³ but the cumulative incidence increases from childhood to reach adult levels around the age of 18 years.⁴ Already among adolescents,

consequences of back pain such as absence from school, health care seeking, and avoidance of sports activities are common.⁵⁻⁷ It is, therefore, highly desirable to develop preventive strategies for back pain, which may include early screening and testing.^{8,9}

The concept of examining the patient for physical signs of disease can be tracked back to the end of the 18th century.¹⁰ Clinical tests are used by health professionals and represent a natural part of a

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consultation and constitute in combination with an anamnesis the foundation for the clinical evaluation of the patient. Furthermore, some clinical tests are also assumed to identify measures predictive of health problems and are, therefore, also commonly used for screening purposes. In the case of spinal pain, the rationale is that pain may be related to biomechanical dysfunction, altered body structure, or body physique, which hypothetically can be detected by a clinical examination. Although such tests are commonly used in adolescence, the diagnostic and predictive values of commonly used clinical tests have to our knowledge not been determined.

The overall aim of this study was to determine the ability of 22 selected clinical tests to detect or predict neck pain (NP), mid back pain (MBP), and low back pain (LBP) in a school-based cohort of Danish 11- to 15-year-olds. The specific objectives for this study were as follows:

- (1) to determine the sensitivity and specificity of tests for scoliosis, hypermobility, global mobility, intersegmental mobility, end range pain, and isometric endurance of the back extensors in relation to NP, MBP, and LBP at age 11 to 13 years and at age 13 to 15 years;
- (2) to determine the positive and negative predictive values of these tests in relation to NP, MBP, and LBP 2 years later;
- (3) to determine the cross-sectional (at age 11-13 and again 2 years later) and longitudinal associations between the tests and NP, MBP, and LBP; and finally
- (4) to determine the area under the receiver operating characteristic curve (AUC) for all tests combined in cross-sectional and longitudinal analyses.

METHODS

Design and Setting

A 2-year prospective cohort study nested within the School site, Play Spot, Active transport, Club fitness and Environment (SPACE) study, which was a school-based, cluster-designed randomized controlled trial involving 14 schools in the Region of Southern Denmark was conducted. The main aim of SPACE was to investigate how physical environment combined with organizational initiatives could promote the engagement of physical activity in adolescents aged 11 to 13 years.¹¹

Ethics

Participation did not require parental consent, but the parents were informed that they could withdraw their child from the study at any time. The Regional Ethics Committee for Southern Denmark was advised about the study and

data collection. According to Danish law, a study that does not contain invasive tests or interventions aimed at individuals does not require ethics approval.¹² Approval from the Danish Data Protection Agency was obtained (no. 2010-41-5147).

Data Collection

Baseline data were collected from April to June 2010, and follow-up data from April to June 2012. Questionnaires (electronic survey) were completed individually and observed by teachers to prevent interaction between participants. The clinical examination was performed during school time in a gym close to the school. All tests were performed by licensed and experienced chiropractors except for the Sorensen test, which were performed by a research assistant. The tests were performed during 2 class hours (2 × 45 minutes) for each school class (approximately 20 participants) within a week after the questionnaire was completed. The assessors were blinded for the questionnaire data. All data were collected at both time points.

Participants

The study involved all 1348 fifth and sixth grade students. Participants who had missing spinal pain (NP, MBP, and LBP) data in the questionnaire or did not participate in any of the tests were excluded from the study.

Spinal Pain

Three identical questions were asked for the 3 spinal regions: neck, mid back, and low back. The first question was “Have you ever had neck pain?” (often/sometimes/once or twice/never). This was then repeated for the mid back and low back. A diagram with the spinal areas clearly shaded and labeled was shown alongside the questions. The questionnaire was developed and tested for feasibility, content validity, and item agreement between questionnaire scores and interview findings in 9- to 11-year-olds.¹³ *Lifetime prevalence* was defined as a report of “once or twice” or more frequent.

For the purpose of sensitivity analysis, another definition of spinal pain was used: “frequent pain” defined as a report of “often” vs “sometimes/once or twice/never” in the respective regions. This variable was used as a proxy for severity, as prior analysis of the data has shown that frequency and pain intensity were strongly associated.¹⁴

Clinical Tests

Based on interviews with practicing chiropractors and nurses performing screening at schools, as well as from the literature, we selected the clinical tests which were

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