Clinical Perspective: How Do Clinical Test Results Differentiate Chronic and Subacute Low Back Pain Patients from “Non-Patients”?

MARKKU PAATELMA, MSc, PT¹; EIRA KARVONEN, MSc, PT²; JOUKO HEISKANEN, MD³

Low back pain (LBP) is one of the most common reasons for people to seek medical treatment in Western societies, with the majority of LBP sufferers having non-specific low back pain. This definition includes any type of back pain or referred leg pain or both that does not fall into the category of nerve root pain or serious spinal pathology¹.

Our limited understanding of underlying conditions for back pain is reflected in the common use of pain-duration-based groupings: LBP lasting for 6 weeks or less has been defined as *acute*, from 7 to 12 weeks as *subacute*, and for 12 weeks or more as *chronic* back pain^{2,3}. Still, classification according to LBP duration is questionable, because of evidence that

new, acute LBP is rare among adults and that most experiences of all LBP will reoccur⁴.

There is a consensus about the duration of the symptoms approach toward the standardization of back pain definitions for use in prevalence studies⁵. Although inter-country differences also exist in the management of LBP sufferers from differing cultural backgrounds, clinical guidelines in different countries are mostly based on the pain-duration classification (acute, subacute, and chronic), or a classification into a diagnostic triage: serious pathology or sciatic syndrome or non-specific LBP⁶.

Several physical characteristics have been associated with LBP development. Physiologic changes such as muscle dysfunction occur in the lumbar spine at the same time as do initial episodes of pain: changes that remain after the pain has subsided^{7,8}. Knowing the degree of relationship between each of these factors and LBP will guide prevention treatment strategies⁹. Pengel et al¹⁰ suggested placing more emphasis on change in pain and disability scores than on physical impairment. Substantial evidence also exists that psychosocial variables are strongly linked to the transition from acute to chronic LBP disability¹¹.

To date, there is only marginal literature that describes variations in clinical findings between duration-based classifi-

ABSTRACT: Our limited understanding of underlying conditions for back pain is reflected in the common use of pain-duration-based groupings. The aim of this paper was to investigate typical clinical tests used in examining low back pain (LBP) patients in order to discover how tests distinguish between chronic low back pain patients (CLBP) and subacute low back pain patients (SLBP) and if they distinguish these groups from those with no “patient status.” CLBP patients in this study were from a university hospital and SLBP patients were from five occupational health care centers. Control subjects were recruited from a university. Determination of the best predictors between CLBP and SLBP patients and between CLBP and SLBP patients and non-patients was made by a forward stepwise logistic model. A total of 157 subjects were included in the study. Of all the clinical tests, several tests in each category had high odds ratio, differentiating CLBP patients from controls. Only a few tests differentiated between CLBP and SLBP patients. The only clinical differences between SLBP patients and controls were in the mobility test and in one test of muscle tightness. The best predictor for CLBP was the lumbar spine flexion test. SLBP patients seemed to differ from the control group in lumbar flexion, in a specific anterior-posterior mobility test, and in tightness of hip flexor muscles. CLBP patients differed from SLBP patients in functional tests, in the presence of sensation in the feet, and in different pain provocation tests. Whether these tests are sufficiently sensitive to classify a more specific diagnostic or clinical subgroup remains untested, and further studies with clinical tests to differentiate among pathological conditions are necessary.

KEYWORDS: Clinical Tests, Low Back Pain, Odds Ratios, Orthopedic Manipulative Therapy, Sensitivity, Specificity

¹OMT-instructor, University of Jyväskylä, Jyväskylä, Finland

²OMT, University of Jyväskylä, Jyväskylä, Finland

³Medical Adviser in Rehabilitation, Metropolia Polytechnic, Helsinki, Finland

Address all correspondence and requests for reprints to: Markku Paatelma, markku.paatelma@tcr.fi

cations. Subsequently, the purpose of this study was to investigate typical clinical tests used in examining LBP patients in order to discover which tests distinguish between chronic low back pain patients (CLBP) and subacute low back pain patients (SLBP), and how clinical findings distinguish these groups from those with no “patient status”.

Methods

Design

The prospective non-randomized comparative design was approved by the ethics committees of Pirkanmaa Hospital District and the University of Jyväskylä. All participants gave their informed consent.

Subjects

A total of 157 subjects were asked to participate, and all subjects expressed an interest. Eighty-two women and 75 men, from 18 to 68 years of age, were recruited through one hospital and a number of occupational health centers and university departments. Based on the inclusion criteria, 55 subjects were selected for the CLBP group. For this group, subjects were selected from a population of primary-care patients in the city of Tam-

pere, Finland. The inclusion criteria were LBP lasting more than 3 months, with or without radiating pain to one or both legs. Each subject was sent for an orthopedic surgeon's consultation at Tampere University Hospital in order to evaluate whether spinal surgery was needed. If there was an acute need for spinal operation or other red flags, patients were not referred for this study.

For the SLBP group, 47 subjects were recruited from five occupational health care centers in the city of Jyväskylä, Finland. Inclusion criteria were employment, age 18 to 65, with current LBP with or without radiating pain to one or both lower legs. The back-pain episode could be the first or recurrent LBP, the last episode lasting less than 3 months. Exclusion criteria were pregnancy, back pain surgery less than 2 months earlier, or serious pathology as evidenced by the frequency of red-flag screening (age, cauda equina syndrome, cancer, fractures, spinal infections, ankylosing spondylitis, significant or progressive neurological deficit or both, or other systemic illness)¹².

For the control (non-patient) group, 55 subjects were recruited from the University of Jyväskylä in Finland. None had any medical low back diagnosis nor had a history of medical or physiotherapeutic low back treatment during the

previous year. In this control group, exclusion criteria were the same as for the SLBP group: serious pathology as evidenced by the frequency of red-flag screening (age, cauda equina syndrome, cancer, fractures, spinal infections, ankylosing spondylitis, significant or progressive neurological deficit, or both, or other systemic illness) as based on the criteria of Bigos¹². All subjects' characteristics at baseline measurement are given in Table 1.

Procedure

Severity, location of pain, and symptoms of the LBP were assessed in a short interview. Type of employment, absence from work, and episodes of LBP during each subject's lifetime were recorded. After having interviewed the subjects, physiotherapists specializing in orthopedic manual therapy performed 45 selected clinical tests on all these subjects, without having access to any medical records. These tests are commonly used during clinical examinations of LBP patients.

Overall, 14 physiotherapists were involved in examination of the subjects. Their years of clinical experience in management of LBP ranged from 5 to 16 years (mean 10.5). All physiotherapists were specialists in orthopedic manual

TABLE 1. Characteristics of the subjects

	CLBP	SLBP	Controls	Significance
Number of Subjects	55	47	55	NS
Age (yr.)				
Range	18–68	22–60	21–60	
Mean, SD	42.3 (11.6)	44.6 (10, 2)	37.5 (8, 1)	NS
Gender (female/male)	31/24	18/29	33/22	0.05 (CL [‡] , Co/SL)
Number of LBP Episodes				
0	1 (2%)	3 (7%)	20 (37%)	0.05 (Co [‡] , CL/SL)
1–5	12 (22%)	23 (49%)	27 (49%)	NS
6–10	22 (40%)	12 (25%)	4 (7%)	0.05 (CL, Co/SL [‡])
More Than 10	20 (36%)	9 (19%)	4 (7%)	0.05 (CL, Co/SL)
Type of Work				
Light	41 (77 %)	42 (89%)	52 (94%)	NS
Heavy	14 (23%)	5 (11%)	3 (6%)	NS
Sick Leave at Baseline				
Number of Subjects (%)	23 (42%)	6 (12%)	0	0.05 (CL, Co/SL)

CLBP = chronic low back pain; SLBP = subacute low back pain; NS = not significant

[‡] CLBP group; [‡] SLBP group; [‡] Control group; LBP = low back pain

therapy (OMT), which involves a post-graduate examination in Nordic countries. Prior to this study, all physiotherapists were taught by the OMT specialist, with 22 years of experience in this field, how to perform the specific clinical tests the same way. The physiotherapists were unaware of the ongoing study.

The clinical tests were divided into six classes as follows: functional tests, inspection, mobility assessment, muscle-tightness, neurological and neurodynamic, and pain-provocation tests (Table 2). In all tests, the decision was binary: results were either negative (normal finding) or positive (pathologi-

cal finding). An identical assessment form was used for all patients, with categories always in the same sequence. The examination sequence lasted 30 minutes in total. These tests were performed with great care, so that the patients' underlying condition would not have changed during the examination. Those tests that were symmetrical (for instance, lumbar spine lateral flexion to right and left) were recorded as positive if flexion in one or both directions was abnormal. The number of tests analyzed was thus 31. The order in which the tests and measures were assessed within each category was based on the patient's positioning considerations (standing, supine, lying on one side, prone, or lying on the other side).

TABLE 2. Test categories

Type of Test	Specific Test
Functional tests	Walking Undressing Walking on toes Heel walking Squat and rise
Inspection tests	Posture of low back Posture of feet Posture of knees Length difference of lower limbs Distribution of hair on lower back
Mobility tests	Lumbar spine right lateral flexion Lumbar spine left lateral flexion Lumbar spine right rotation Lumbar spine left rotation Lumbar spine extension Lumbar spine flexion Specific PA (posterior-anterior) mobility Mobility of right hip Mobility of left hip
Muscle tightness	Hamstring tightness right Hamstring tightness left Piriformis tightness left Iliopsoas tightness right Iliopsoas tightness left
Neurological and neurodynamic tests	Slump (pain provocation test in sitting) SLR (left straight leg raise) (Laseque) SLR (right straight leg raise) (Laseque) Reflexes (right patella tendon) Reflexes (left patella tendon) Reflexes (right Achilles tendon) Reflexes (left Achilles tendon) Babinski right Babinski left Sensation in feet (right) Sensation in feet (left) Ely's test right (n. femoralis) Ely's test left (n. femoralis)
Pain provocation tests	Heel drop Kibler's skin-roll test Interspinoas ligament sensitivity Transverse process pressure right (unilat PA) Transverse process pressure left (unilat PA) Sacro-iliac joint pressure right Sacro-iliac joint pressure left

Test Reliability

Prior to this study, intertester reliability and test-retest reproducibility of all clinical tests were analyzed for in all test categories. Two physiotherapists specializing in OMT performed all the clinical tests independently during the same day/s by examining 15 volunteer LBP patients from occupational health; this tested intertester reliability. Test-retest reliability was evaluated by examining the same stable patients after one week. The 70% agreement level and 0.40 in Kappa were adopted as the minimum criteria for acceptable intra- and intertester reliability. As suggested by Potter and Rothstein, this level of agreement should be the minimum criterion for any test to be considered clinically meaningful¹³. The results of intertester reliability are presented in Table 3 and intratester reliability in Table 4. In all tests, intratester reliability exceeded 70% agreement and 0.40 Kappa level, but intertester reliability did not reach that level in inspection tests (Kappa and agreement) nor in muscle tightness tests (Kappa alone).

Data Analysis

Statistical analyses were performed with SPSS software, version 14.0. Percentage agreement and the Kappa statistic were used to test intra- and intertester reliability in clinical tests. The results were

TABLE 3. Intertester Kappa values and agreement percentages

Test	Intertester Kappa	Intertester Agreement %
Functional tests		
Mean (SD)	0.9 (0.13)	99.2 (2.37)
Inspection tests		
Mean (SD)	0.2 (0.19)	52.1 (17.57)
Mobility tests		
Mean (SD)	0.5 (0.15)	82.3 (8.71)
Provocation/alleviation tests		
Mean (SD)	0.4 (0.25)	74.4 (13.79)
Muscle tightness tests		
Mean (SD)	0.3 (0.32)	79.2 (12.06)
Stability tests		
Mean (SD)	0.5 (0.17)	80 (10.11)
Neural and neurodynamics tests		
Mean (SD)	0.4 (0.28)	82.2 (11.70)

SD = standard deviation

TABLE 4. Intratester Kappa-values and agreement percentages

Test	Intratester Kappa	Intratester Agreement %
Functional tests		
Mean (SD)	0.9 (0.13)	99.2 (2.37)
Inspection tests		
Mean (SD)	0.4 (0.27)	70.7 (14.96)
Mobility tests		
Mean (SD)	0.5 (0.22)	76.7 (15.40)
Provocation/alleviation tests		
Mean (SD)	0.4 (0.26)	85 (10.99)
Muscle tightness tests		
Mean (SD)	0.7 (0.23)	89.2 (8.68)
Stability tests		
Mean (SD)	0.6 (0.18)	82.5 (11.82)
Neural and neurodynamics tests		
Mean (SD)	0.5 (0.28)	85 (12.21)

SD = standard deviation

expressed as means and standard deviations (SD). Determination of the best predictors of chronic and subacute LBP was by a forward stepwise logistic model. The odds ratio (OR), sensitivity, specificity, and 95% confidence intervals (CIs) of all the tests were calculated.

Results

Significant differences were present in baseline characteristics. Patients in the CLPB group were 4.7 and the SLBP 7.1 years older than in the control group.

Ratios between women and men were similar in the CLBP and control groups, but males predominated in the SLBP group. The CLBP group included more heavy laborers than did the SLBP or the control group. More subjects were on sick leave because of LBP in the CLBP group (Table 1).

The odds ratio, sensitivity, and specificity of all the tests are provided in Tables 5–7. Of the 31 clinical tests, several tests in every test category differentiated CLBP patients from controls, with high odds ratio, including all gross func-

tional tests, mobility tests (lumbar spine flexion and extension, and specific posterior-anterior (PA) mobility), neurological and neurodynamic tests (slump, straight leg raise (SLR), and sensation in the feet), and pain provocation tests (heel drop, Kibler's skin roll, interspinous ligament sensitivity, and transverse process pressure) (see Table 5).

Of the clinical tests, only gross functional tests (walking, undressing, walking on toes, and heel walking), one neurological test (sensation in the feet), and one pain provocation test (Kibler's skin roll) differentiated between CLBP and SLBP patients (see Table 6). In functional tests, one-third of the CLBP subjects had difficulty in squat and rise (31%), walking (33%), and undressing (24%), whereas the SLBP group showed only a few positive findings in this test category. The only positive finding in the control group was in the squat and rise test.

The only clinical differences between SLBP patients and controls were in mobility tests (lumbar spine flexion and extension, and specific PA mobility) and in one test of muscle tightness: tightness of hip flexors (see Table 7). Of the inspection tests, only back posture was entered in the forward stepwise logistic model, with a high odds ratio in comparison of CLBP and of SLBP with controls. In this test, proportions of positive findings were 72% in the CLBP, 72% in the SLBP, and 49% in the control group.

In the mobility test category, decreased or painful movement of the lumbar spine in extension and flexion differentiated between the CLBP and SLBP patients and the controls, especially in the flexion test. In this test, the likelihood of a positive finding was 28-fold greater for CLBP than controls. The proportions of positive findings in the flexion and extension tests were moderate, being 49% (in flexion) and 62% (in extension) in the CLBP subjects, 36% and 57% in the SLBP, and 4% and 22% in the controls, respectively. In a specific PA mobility test, the finding was positive in 84% of CLBP patients, in 93% of SLBP, and 54% for controls.

Among the tests that examine muscle tightness, the hip flexor test (ilio-

TABLE 5. Forward stepwise logistic models in six test classes: sensitivity and specificity of the selected clinical tests for chronic LBP compared to controls

Variable	Forward Stepwise Logistic Model † OR (95% CI ‡)	Sensitivity (95% CI)	Specificity (95% CI)
Functional tests:			
Walking	26.36 (3.36 to 10)	33 (19 to 45)	100 (93 to 100)
Undressing	20.25 (2.57 to 100)	27 (15 to 38)	100 (93 to 100)
Walking on toes	9.19 (1.10 to 76.21)	15 (5 to 24)	100 (93 to 100)
Heel walking	16.71 (2.10 to 100)	24 (5 to 28)	100 (93 to 100)
Squat and rise	6.18 (2.12 to 17.97)	38 (19 to 46)	87 (75 to 95)
Inspection tests:			
Posture of low back	2.77 (1.25 to 6.12)	72 (59 to 84)	58 (39 to 69)
Posture of feet		15 (8 to 29)	75 (54 to 81)
Posture of knees		15 (8 to 29)	93 (75 to 95)
Length difference of lower limbs		33 (15 to 39)	80 (60 to 86)
Distribution of hair on lower back		9 (3 to 20)	96 (89 to 100)
Mobility tests:			
Lumbar spine lateral flexion	3.86 (1.66 to 8.99)	49 (35 to 63)	80 (67 to 91)
Lumbar spine rotation	2.39 (1.03 to 5.51)	40 (27 to 54)	78 (67 to 91)
Lumbar spine extension	5.80 (2.50 to 13.44)	62 (48 to 75)	78 (70 to 93)
Lumbar spine flexion	27.48 (6.7 to 100)	51 (37 to 65)	96 (89 to 100)
Mobility of hip		4 (3 to 20)	93 (77 to 97)
Specific PA mobility	4.58 (1.88 to 11.55)	84 (71 to 92)	47 (37 to 67)
Muscle tightness tests:			
Tightness of hamstring		53 (36 to 66)	62 (49 to 78)
Tightness of piriformis		15 (6 to 27)	95 (39 to 69)
Tightness of hip flexors	2.77 (1.25 to 6.12)	73 (59 to 84)	51 (39 to 69)
Neurological and neurodynamic tests:			
Slump	5.87 (2.15 to 16.00)	42 (29 to 56)	89 (80 to 98)
SLR (straight leg raise)	5.23 (1.62 to 16.89)	29 (19 to 45)	93 (86 to 99)
Reflexes (patella tendon)	2.49 (0.72 to 8.65)	16 (21 to 50)	93 (72 to 97)
Reflexes (Achilles tendon)	3.37 (1.13 to 10.08)	24 (25 to 50)	95 (77 to 97)
Babinski	-	-	-
Sensation in feet	7.18 (2.26 to 18.97)	27 (16 to 41)	100 (93 to 100)
Ely's test		6 (2 to 18)	100 (93 to 100)
Pain provocation tests:			
Heel drop	5.91 (1.59 to 21.99)	26 (17 to 43)	95 (86 to 99)
Kibler's skin-roll test	4.03 (1.70 to 9.59)	47 (34 to 64)	82 (70 to 93)
Interspino-sus ligament sensitivity	4.99 (2.16 to 11.49)	78 (65 to 88)	58 (48 to 78)
Transverse process pressure	5.37 (1.43 to 20.08)	24 (15 to 39)	95 (86 to 99)
Sacro-iliac joint pressure		13 (5 to 24)	93 (83 to 99)

† Only those variables are shown that were entered in the model

‡ Robust estimate of variance

LBP = low back pain, CI = confidence interval

TABLE 6. Forward stepwise logistic models in six test classes: sensitivity and specificity of the selected clinical tests for chronic LBP compared to subacute LBP

Variables	Forward Stepwise Logistic Model † OR (95% CI ‡)	Sensitivity (95% CI)	Specificity (95% CI)
Functional tests:			
Walking	22.38 (2.85 to 100)	33 (20 to 46)	98 (89 to 100)
Undressing	8.44 (1.82 to 39.19)	27 (14 to 38)	96 (86 to 99)
Walking on toes	7.80 (0.94 to 65.12)	15 (4 to 26)	98 (89 to 100)
Heel walking	14.24 (1.79 to 100)	24 (4 to 26)	98 (89 to 100)
Squat and rise	3.53 (1.34 to 9.31)	38 (19 to 45)	94 (71 to 94)
Inspection tests:			
Posture of low back		73 (59 to 84)	28 (39 to 69)
Posture of feet		16 (8 to 29)	60 (54 to 81)
Posture of knees		16 (8 to 29)	83 (75 to 95)
Length difference in lower limbs		33 (15 to 39)	55 (60 to 86)
Distribution of hair on lower back		9 (3 to 20)	96 (89 to 100)
Mobility tests:			
Lumbar spine lateral flexion		49 (35 to 63)	51 (67 to 91)
Lumbar spine rotation	2.05 (0.81 to 5.15)	40 (27 to 54)	81 (67 to 91)
Lumbar spine extension		62 (48 to 75)	43 (40 to 93)
Lumbar spine flexion		51 (37 to 65)	64 (89 to 100)
Mobility of hip		4 (3 to 20)	89 (77 to 97)
Specific PA mobility		84 (71 to 92)	6 (37 to 67)
Muscle tightness tests:			
Tightness of hamstring		53 (36 to 66)	36 (49 to 78)
Tightness of piriformis		15 (6 to 27)	89 (39 to 69)
Tightness of hip flexors		73 (59 to 84)	13 (39 to 69)
Neurological and neurodynamic tests:			
Slump	2.08 (0.91 to 2.91)	42 (29 to 56)	72 (70 to 98)
SLR (straight leg raise)		29 (19 to 45)	83 (86 to 99)
Reflexes (Patella tendon)		16 (14 to 50)	79 (77 to 97)
Reflexes (Achilles tendon)		24 (24 to 50)	85 (77 to 97)
Babinski	-	-	-
Sensation in feet	8.42 (1.54 to 26.60)	27 (16 to 41)	96 (93 to 100)
Ely's test	-	7 (2 to 18)	100 (93 to 100)
Pain provocation tests:			
Heel drop	3.69 (1.06 to 8.47)	26 (16 to 45)	92 (71 to 94)
Kibler's skin-roll test	4.41 (2.39 to 6.54)	47 (34 to 64)	83 (70 to 93)
Interspino-sus ligament sensitivity		78 (65 to 88)	31 (38 to 78)
Transverse process pressure	3.34 (0.97 to 7.97)	24 (15 to 39)	98 (86 to 99)
Sacro-iliac joint pressure	5.91 (1.81 to 46.87)	13 (5 to 24)	94 (83 to 99)

† Only those variables showed that were entered in the model

‡ Robust estimate of variance

LBP = low back pain, CI = confidence interval

TABLE 7. Forward stepwise logistic models in six test classes: sensitivity and specificity of the selected clinical tests for subacute LBP compared to controls

Variable	Forward Stepwise Logistic Model † OR (95% CI ‡)	Sensitivity (95% CI)	Specificity (95% CI)
Functional tests:			
Walking		2 (< 1 to 10)	100 (93 to 100)
Undressing		4 (2 to 15)	100 (93 to 100)
Walking on toes		2 (< 1 to 10)	100 (93 to 100)
Heel walking		2 (< 1 to 10)	100 (93 to 100)
Squat and rise		15 (6 to 27)	69 (54 to 81)
Inspection tests:			
Posture of low back	2.71 (1.18 to 6.22)	72 (59 to 84)	58 (39 to 69)
Posture of feet		40 (8 to 29)	75 (54 to 81)
Posture of knees		16 (8 to 29)	93 (75 to 95)
Length difference of lower limbs		45 (15 to 39)	80 (60 to 86)
Distribution of hair on lower back		4 (3 to 20)	96 (89 to 100)
Mobility tests:			
Lumbar spine lateral flexion	3.83 (1.60 to 9.19)	49 (35 to 63)	81 (67 to 91)
Lumbar spine rotation		19 (27 to 54)	78 (67 to 91)
Lumbar spine extension	4.84 (2.04 to 11.46)	57 (48 to 75)	78 (70 to 93)
Lumbar spine flexion	15.02 (3.25 to 69.49)	36 (37 to 65)	96 (89 to 100)
Mobility of hip		9 (3 to 20)	93 (77 to 97)
Specific PA mobility	13.15 (6.42 to 47.47)	94 (71 to 92)	47 (37 to 67)
Muscle tightness tests:			
Tightness of hamstring		64 (36 to 66)	62 (49 to 78)
Tightness of piriformis		10 (6 to 27)	95 (39 to 69)
Tightness of hip flexors	7.09 (2.59 to 19.39)	87 (59 to 84)	51 (39 to 69)
Neurological and neurodynamic tests:			
Slump	2.80 (0.96 to 8.18)	28 (29 to 56)	89 (80 to 98)
SLR (straight leg raise)	2.62 (0.73 to 9.32)	17 (16 to 45)	93 (86 to 99)
Reflexes (Patella tendon)	2.49 (0.44 to 8.47)	21 (20 to 50)	93 (71 to 97)
Reflexes (Achilles tendon)	3.03 (0.74 to 12.47)	15 (24 to 50)	95 (77 to 97)
Babinski	-	-	-
Sensation in feet		4 (6 to 41)	100 (93 to 100)
Ely's test	-	-	-
Pain provocation tests:			
Heel drop		9 (3 to 20)	95 (86 to 99)
Kibler's skin-roll test		17 (34 to 64)	82 (70 to 93)
Interspino-sus ligament sensitivity	2.97 (1.32 to 6.70)	68 (65 to 88)	58 (48 to 78)
Transverse process pressure		9 (10 to 39)	76 (76 to 99)
Sacro-iliac joint pressure		2 (5 to 24)	93 (83 to 99)

† Only those variables are shown that were entered in the model

‡ Robust estimate of variance

LBP = low back pain, CI = confidence interval

psoas) was the only one entered into the model and was 3-fold to 7-fold greater for the CLBPs and SLBPs than for the controls, with the proportion of positive test findings 67% in the CLBP group, 87% in the SLBP group, and 49% in the control group.

Among neurological and neurodynamic tests, slump, SLR, and sensation in the feet were those that differentiated between CLBPs and controls. Positive findings for CLBP were 42% in the slump test, 28% in SLR tests, 27% in sensation in the feet; respectively; for SLBP, 24%, 18%, and 5%, respectively; and for controls 11%, 7%, and 0%, respectively.

For pain provocation tests, many tests differentiated between CLBP patients and controls with high odds ratios (heel drop, Kibler's skin roll, interspinous ligament sensitivity and transverse process pressure). Heel drop, Kibler's skin roll, and transverse process pressure differentiated between CLBP patients and SLBP as well. Positive findings occurred in CLBP for heel drop 25%, for Kibler's test 50%, for interspinous ligament sensitivity 78%, and for transverse process pressure (a unilateral PA) 24%, while for SLBP the corresponding figures were 10%, 17%, 68%, and 10%, respectively, and for controls 6%, 18%, 40%, and 5%, respectively.

Discussion

Non-specific LBP patients comprise a very heterogeneous group expressing many different diagnoses and functional problems. Assessment of severity or chronicity of LBP can only in part be based on findings in a clinical examination. In addition, when using diagnostic tests, other epidemiological and statistical variables should also be considered³. A lack of consensus among participating clinicians regarding duration-based subgroups and a lack of evidence for the validity of sub-grouping form a compelling argument for further research into this clinical practice.

In this study, each group had clearly differing lengths of LBP history. This allowed us to investigate the sensitivity of the clinical tests within the pain-duration-based groupings, a necessity to understanding the true effectiveness of a

test^{14,15}. Our results provide new and important information about the usefulness of the clinical tests for improving back pain physiotherapy. In our study, the positive test results were modest for general movement, like walking, undressing, and squatting, percentages ranging from 24% to 33% in the CLBP group. For lumbar spine flexion, specific AP mobility, tightness of hip flexors, slump, sensation in the feet, Kibler's, and interspinous ligament sensitivity, percentages from 42% to 84% occurred in the CLBP group. The low likelihood of assort of these tests supports the notion that not all tests in common clinical use are equally valuable. This seems to be the case when the target group has the diagnosis “non-specific low back pain.” These tests could, however, be valuable for differential diagnosis, which emphasizes the urgent need to develop clinical tests in order to choose proper treatment for a particular back problem.

As far as we know, no studies have revealed major differences in the clinical examination between chronic and subacute LBP patients and subjects without LBP patient status. One study has, however, evaluated the relationship between mechanical factors and LBP. Nourbakhsh and Arab⁹ came to the conclusion that muscle endurance and weakness are associated with LBP. They also concluded that structural factors such as amount of lumbar lordosis, pelvic tilt, leg length discrepancy, nor length of abdominal, hamstring, and iliopsoas muscles are related to the occurrence of LBP. Conversely, we found that the iliopsoas was significantly tighter in the CLBP and SLBP groups than in the controls, and the size or shape of lumbar lordosis was abnormal in the CLBP and SLBP groups as well. However, the value of inspection and muscle tightness tests should be questioned because of their low reliability.

One commonly tested assessment for patients with chronic LBP is muscle strength, or endurance tests. We elected not to test these variables based on the abundance of earlier research on this subject¹⁶⁻²⁰. Instead, we opted to investigate functional tests, which are routinely underexplored for patients with LBP. Ljungquist et al reported functional tests

(gait and stair-climbing tests and two lifting tests) as sensitive to change in spinal pain¹⁷. In our study, difficulties in walking occurred only in subjects in the CLBP group.

Specific patterns of intervertebral motion and intravertebral deformation result in pain in chronic LBP patients, which substantiates their mechanical back pain etiology. The slump test, for instance, assesses the contribution of neural tissue to the referred symptoms associated with spinal pain, especially with discogenic pain¹⁸. In the present study, the slump was the only one of the neural and neurological tests with a high odds ratio and moderate percentage of positive tests. In addition, our positive findings in the lumbar flexion and extension tests, in specific PA mobility, and the tightness of the iliopsoas test were much greater in LBP patients than in controls. Further, interspinous ligament sensitivity was a very common finding in our CLBP group. All these findings support a conclusion of mechanical pain etiology¹⁹.

Pain-related factors contribute to muscle inhibition in patients with CLBP, which is especially related to lumbar flexion²¹. Dankaerts et al suggested that maladaptive movement or control impairment and associated faulty strategies result in chronic abnormal tissue loading (associated with either excessive or reduced spinal stability), pain, disability, and distress²². Whether impaired flexion is a result of pain or a reason for pain remains an open question.

Limitations

This study has shortcomings. The chronic LBP group may not be comparable to other chronic LBP groups, because we suspected that one subject might need a spinal operation (the general practitioner had wanted to consult an orthopedic surgeon). Second, the clinical findings were not compared with any objective findings. In addition, the non-specific LBP grouping was not determined by physical methods; instead, it was based on pain duration and the orthopedic consultation. Consequently, any comparison between certain objective methods and clinical tests

would have been unlikely to provide any additional information. In addition, the examiners did not know each patient or control's medical history and back pain history, x-ray findings, or treatments, a situation very common in clinical practice on the first visit, when treatment is based only on a clinical examination. In addition, although in the actual study 14 physiotherapists participated and intertester reliability and test-retest reproducibility of all clinical tests were analyzed in all test categories by only 2 physiotherapists specializing in OMT. All physiotherapists were taught by the OMT specialist, with 22 years of experience in this field, to perform the specific clinical tests in the same way.

Conclusions

Overall, a large number of the selected 31 clinical tests were sufficient to sort the CLBP from controls. Tests such as walking, lumbar spine flexion, tightness of hip flexor muscles, slump, Kibler's skin-roll, and the interspinous ligament sensitivity test seem best in differentiating between these two groups. The best predictor for CLBP was the lumbar spine flexion test. SLBP seemed to differ from the control group in lumbar flexion, in a specific PA mobility test, and in tightness of hip flexor muscles. CLBP differed from SLBP in functional tests, sensation in the feet, and in the different pain provocation tests. Whether these tests are sufficiently sensitive to classify a more specific diagnostic or clinical subgroup remains untested, and further studies with clinical tests to differentiate among pathological conditions are necessary. In future we should also explore the interplay between biological, social, and psychosocial factors.

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