



## A STUDY ON USE OF NEURODYNAMIC TESTS AMONG NEUROREHABILITATION PROFESSIONALS

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### ABSTRACT

**Purpose:** Neurodynamic tests are a combination of passive movements of the body and limbs performed by a therapist to stimulate mechanical movement of nerve tissue to assess their mobility and sensitivity to mechanical stress. The paper presents a study conducted among rehabilitation professionals in the area of neurorehabilitation. The aim of the study is to explore how known to the respondents the neurodynamics tests are.

**Methods:** The study includes 21 practicing physiotherapists and rehabilitators from University hospital and Rehabilitation hospital Medika – Ruse, University hospital Kanev - Ruse and University hospital St. Marina - Varna. Study participants were asked about feedback on neurodynamic tests and their use for functional diagnosis and treatment of peripheral nerves by a questionnaire.

**Results:** Neurodynamic tests are well known among working physiotherapists and rehabilitators in Bulgaria. The best known are the Lasague test, Passive neck flexion and Passive knee flexion tests, which leads to their wider use in practice, both for diagnosis and for treatment. The most unknown and least used are upper limb tests.

**Conclusions:** Although neurodynamic tests assess the subjective sensation of the patient, they depend on the reliability and experience of the therapist. A large number of specialists in Bulgaria do not know them and, as a result, they are not widespread and implemented in practice. Another reason for their lack of recognition is the lack of a unified specialized terminology in Bulgaria and globally.

**Keywords:** neurorehabilitation, neurodynamic tests, physical therapy,

### INTRODUCTION

In comparison with other treatment approaches of neuromusculoskeletal disorders, neurodynamic or neural tensions tests are relatively new, but their significance had increased with introducing manual therapy after the 70s. The reason for integrating neurophysiological mechanisms is that these neuronal tests should be called "neurodynamic tests," not "nervous tension tests" or "nervous provocation tests". Currently, research still uses the terms "nervous ten-

sion" and "neural sections", and a marked approach to the subject. When the human body moves, the mechanical forces are applied to the nerve tissues. Sliding, elongation, tension and pressure changes are some of these mechanical effects. These mechanical stresses cause changes in blood flow, axonal transport and impulse traffic in nerve tissue. [1].

The term "neurodynamics" combines in one mechanism mechanical and physiological characteristics. Neurodynamics tests are nervous tension tests that lead to mechanical and physiological responses [2]. Their role is to evaluate the sensitivity of peripheral nerves to the mechanical movement of tension and to detect underlying pathology, such as nerve compression or damage [3]. Nonetheless, neurodynamic tests are used also as a complement to treatment with the aim to improve nerve mobility and mechanical sensitivity [4]. They represent a battery of basic techniques in the applied physiotherapy. [5]

Neurodynamic tests (NDT) are a combination of passive movements of the body and limbs performed by a therapist to stimulate mechanical movement of nerve tissue to assess their mobility and sensitivity to mechanical stress.

With every NDT, the symptoms (pain, paresthesia, etc., in what range of motion it occurs) and tissue resistance (R) are assessed (in what range of motion occurs, what character is there and when it stops further movement). Symptoms and tissue resistance should be reported after each test step and before adding the next movement.

Neurodynamic tests put stress on the peripheral nerves and, as normal, a lack of pathology. The normal reaction, i. the test is not positive if it only provokes discomfort (feeling tensed, tingling, deep and dull pain as a result of stretching symmetrical to the left and to the right side). The test is positive when:

- Provides (replicates) the typical complaints of the patient - the test is "clearly positive"
- The patient's reactions during the test are different for the left and right sides - the test is "secretly positive"
- The patient's reactions during the test are different from known norms

- Movement of a remote segment (the sensitizing movement) leads to a change in symptoms.

Essential to the differential diagnosis, besides the appearance of typical nerve tissue stretching symptoms, is also the positive sensitizing (provocative) test. Sensitizing tests are based on the movement of a remote segment of the body (the extremities), which is unusual to alter the physical condition of the local soft tissues on the symptomatic side while preserving the position at which the symptoms are provoked. If they are the same - the test is negative. If the symptoms change, the test is positive and confirms the presence of a neurological injury.

Two main points are the basis for creating nervous tension tests. In order to obtain a neuro-mechanical response in their application, a good knowledge of the anatomical location of the nerves and the direction of movement of the adjacent joints is necessary. The angulation of the joints increases the length of the nerve on the side of the increasing angle of movement. This causes elongation and nerve sliding [6].

The most important part of neurodynamic testing is to maintain the position achieved in the previous movement before the next movement in the test is added. Each joint position is reached all the way and then moves to the next joint. Testing is terminated when symptoms occur, taking into account the achieved position. Symptoms and their change are analyzed after each step of the test. If the symptom is not provoked until the end position is achieved, the nerve structures are additionally strained by tilting the head towards the untested side.

Using neurodynamic tests, the therapist can determine whether the neural tissue is involved in the pathological process and which specific nerve has reduced the range of mobility. Once the location has been established

and the cause of the disorder is understood, the degree of pathology of the neural tissue has to be determined.

Shacklock (2005) offers classification of disorders at three levels:

- Level 1 - acute stage when the disturbance of the mechanical properties is completely predetermined by the pathophysiological processes in the nervous tissue;
- Level 2 is the normal state in which most people find themselves when physiological and mechanical factors are in equilibrium.
- Level 3 refers to a group of people where the mechanical component predominates over the physiological component. This means that the standard neurodynamic test does not cause a reaction. [2]

The analysis of the situation in Bulgaria shows the absence of unity in the formation of the professional competences of medical specialists conducting treatment by movement. This calls for the introduction of Unified State Requirements (USR) for Physical therapy and Rehabilitation in Bachelor's Degree.

With the implementation of USR in 2014, the discipline "Muscle Techniques and Mobilizations of Peripheral Nerves" is included in the group of obligatory disciplines. This provoked us to conduct a survey among working physiotherapists and rehabilitators, about how well known and used neurodynamic tests are, as they are essential to build practical competencies in physical therapy students.

#### MATERIALS AND METHODS:

The aim of the study is to examine the opinion of physiotherapists and rehabilitators about the role of neurodynamic tests in functional diagnosis and treatment of peripheral nerve damage. A special questionnaire was prepared to carry out this study (table 1).

**Table 1.** Questionnaire sample

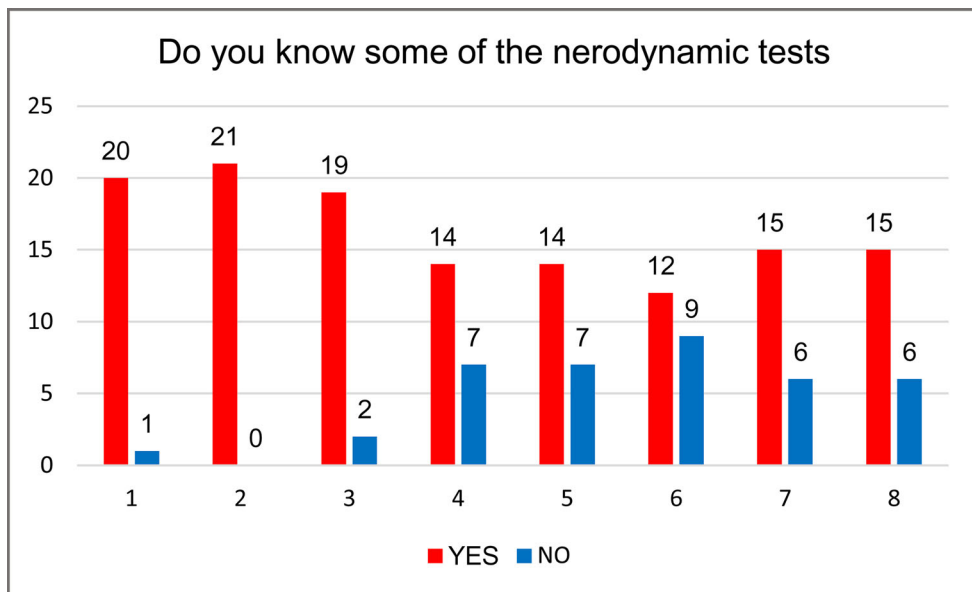
No.	TEST NAME	Do you know some neurodynamic tests?		Do you use neurodynamic tests in your practice?			
				For diagnostics		For treatment	
		YES	NO	YES	NO	YES	NO
1	Passive Neck Flexion Test						
2	Straight Leg Raise Test (Lasegue test)						
3	Passive knee flexion test						
4	Slump test						
5	Test for n. medianus (UNLT1)						
6	Test for n. medianus, n. musculocutaneus et n. axillaris (UNLT2a)						
7	Test for n. radialis (UNLT2b)						
8	Test for n. ulnaris ( UNLT3)						

**RESULTS AND DISCUSSION:**

The study includes 21 practicing physiotherapists and rehabilitators from University hospital and Rehabilitation hospital Medika – Ruse, University hospital Kanev

– Ruse and University hospital St. Marina – Varna. Study participants were asked about feedback on neurodynamic tests and their use for functional diagnosis and treatment of peripheral nerves.

**Fig. 1.** Do you know the Neurodynamics Tests?



The data presented in Figure 1 shows how known to the respondents the neurodynamics tests are. The answers to this question indicate that the tests are known to physiotherapists and rehabilitators on average (78.55% of the respondents answered with “Yes”). Most recognizable are: Lasegue test (100%); Passive Neck Flexion (95.2%) and Passive Flexion of the knee joint (90.5%). Most likely, this high percentage of the Lasegue test is due to its widespread use in clinical neurology, and the other two

tests are known from the pathogenesis diagnosis for musculoskeletal dysfunctions. All three tests do not include a sensitizing movement that could precise the diagnosis of the shortened structures, side and level of damage, which is a key sign of neurodynamics. The least known are: UNLT2a (n. Medianus test, n. Muskulocutaneus et axillaris) - 57.2% of respondents respond with “Yes”; Slump test and UNLT1 - with 66.7% positive responses.

**Fig. 2.** Do you use neurodynamic tests in your practice for diagnostics?

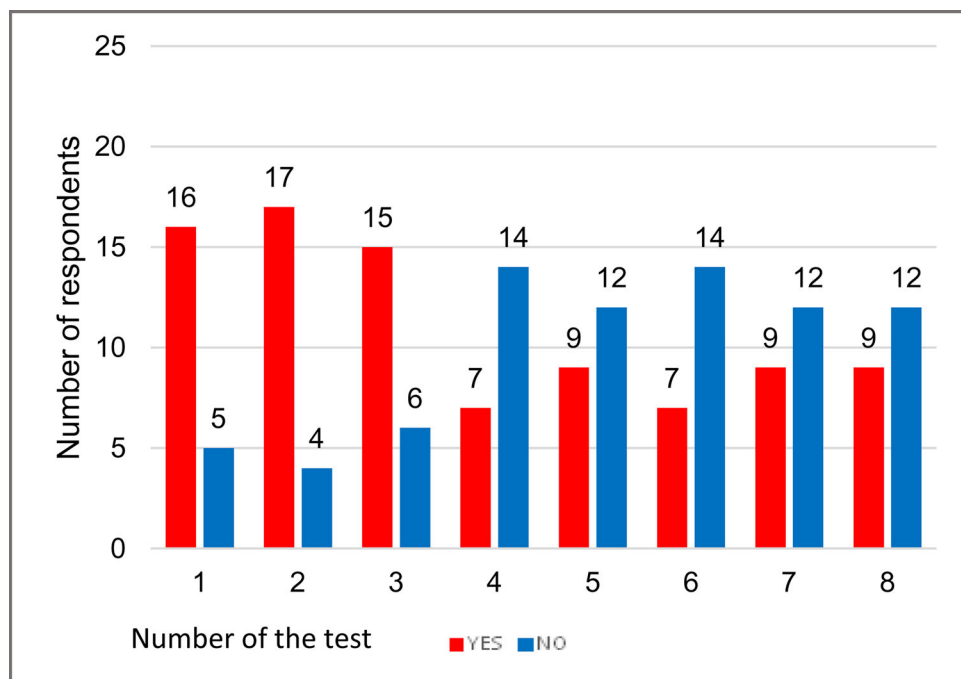
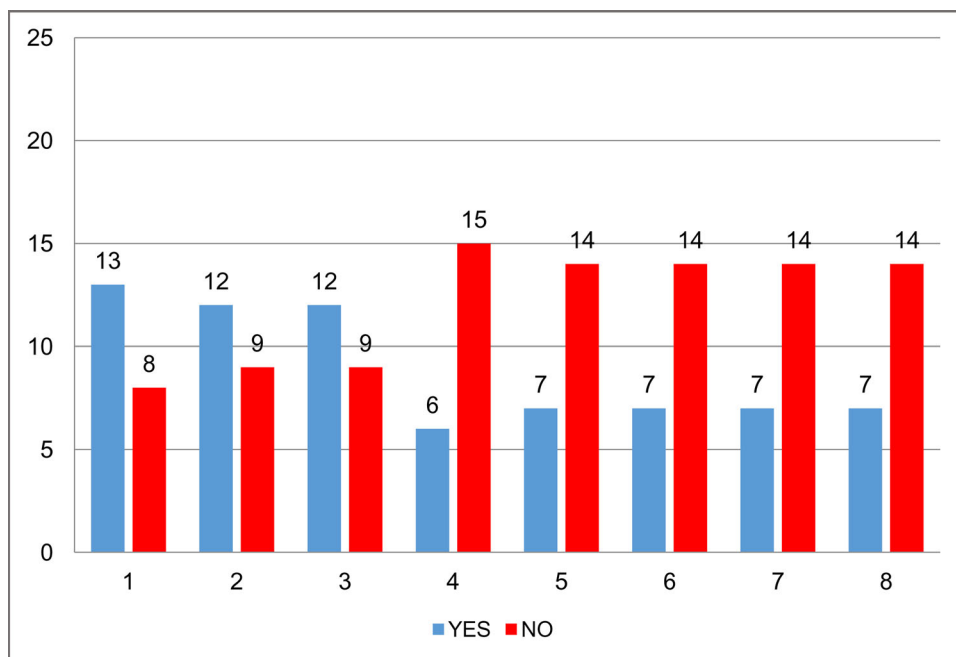


Figure 2. shows the results obtained in the survey on the use of tests for the diagnosis of peripheral nerve damage. Data shows that the most common tests (Lasegue test, Passive neck flexion and Passive Neck Flexion Test)

are often used in diagnosis practice - on average, 76.2% of the respondents give a positive response. The remaining five tests are poorly used for diagnosis - less than 50% of respondents respond with “YES” (average 39.1%).

**Fig. 3.** Do you practice neurodynamics testing for your treatment



The results obtained from the third question, “Do you use neurodynamics tests in your treatment?” are similar to the previous question. On average, 58.7% of respondents apply the first three tests (Lasegue test, Passive neck flexion and Passive knee flexion) to treat peripheral nerves, while 32.9% of respondents do not use them.

After the survey conducted and analysis of the results obtained, the following conclusions can be made:

1. Neurodynamic tests are well known among working physiotherapists and rehabilitators in Bulgaria (72.5% on average - the respondents respond positively).

2. The best known are the Lasegue test, Passive neck flexion and Passive knee flexion tests, which leads

to their wider use in practice, both for diagnosis and for treatment.

3. The most unknown and least used are upper limb tests (UNLT1, UNLT2a, UNLT2b and UNLT3).

### CONCLUSION:

Although neurodynamic tests assess the subjective sensation of the patient, they depend on the reliability and experience of the therapist. In Bulgaria, they are mentioned for the first time after 2000. A large number of specialists in Bulgaria do not know them and, as a result, they are not widespread and implemented in practice. Another reason for their lack of recognition is the lack of a unified specialized terminology in Bulgaria and globally.

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