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Effect of Specific Verbal Instructions on the Identification of Pain Location during a Passive Straight Leg Raise Test

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Abstract

Musculoskeletal pain is common. Because pain is subjective, objectively describing it is crucial. However, pain assessment may cause distress in patients; therefore, physical therapists (PTs) should conduct these tests quickly and accurately. Simple and clear instructions are recommended for pain assessment. However, few studies have provided evidence to support this hypothesis. Correspondingly, this study aimed to confirm the effectiveness of specific verbal instructions for pain location during five consecutive Passive Straight Leg Raise (PSLR) tests. The 28 asymptomatic participants (age 27.4 ± 9.6 years) who provided informed consent received five consecutive PSLR tests: three without and two with specific verbal instructions to ascertain pain intensity, quality, and location. The participants drew pain locations on a body chart and described the pain intensity and quality after each test. All participants were interviewed regarding the differences they noted in the presence and absence of specific verbal instructions. Each pain location was classified into one of ten areas for statistical analysis. The proportion of participants who changed the pain location was compared between the tests using McNemar's test, and the kappa coefficient was confirmed for consistency of pain location. There was a significant difference in the proportion of participants who changed their pain location between the second and third tests and from the third to the fourth test (McNemar's test: $p = 0.003$). Kappa coefficients had low consistency ($\kappa = 0.28$) just after receiving the specific verbal instructions in the fourth test compared to the third test. Consistency improved in the fifth test ($\kappa = 0.57$); 93% of the participants answered that the pain location had become clearer. This study revealed the effects of specific verbal instructions in identifying pain locations. This detailed information may help PTs provide appropriate treatment and contribute to reducing pain in clinical settings.

Keywords

Specific Verbal Instructions, Pain Location, Pain Assessment, Passive Straight Leg Raise Test

1. Introduction

Musculoskeletal pain is experienced by most people [1], and both physicians and patients face difficulty regarding its assessment. As pain is subjective and personal [2], it is necessary to express patients' symptoms objectively [3]. Pain assessment is useful for diagnosis, determining the effectiveness of treatment, and sharing information with other professionals [1] [4]. Communication with patients is vital for eliciting useful information. Moreover, pain assessment requires simple instructions [5]. However, only a few studies have been conducted on the effects of verbal instruction.

Our previous studies showed the effects of specific verbal instructions during three consecutive Passive Straight Leg Raise (PSLR) tests in individuals with chronic low back pain (LBP) and healthy participants [6] [7]. Before the second test, the participants were given three specific verbal instructions to remember the location, intensity, and quality of pain during the PSLR test. Although the hip flexion range of motion (HFROM), numeric rating scale (NRS), and pain extent (PE) were stable across the PSLR tests, the pain location changed in more than half of the participants in the second test compared to that in the first because almost all participants felt that the pain location became clearer after specific verbal instructions.

LBP is the most common symptom experienced in every person's life, and more than 85% of cases are nonspecific without exact causes, such as disc herniation or spondylosis [8] [9] [10].

Patients who have nonspecific LBP with mainly biological factors may have pain drivers in their physical conditions. Clarifying the exact anatomical location of pain will help physical therapists (PTs) make treatment decisions. Appropriate treatment comprehensively improves the patient's condition.

Therefore, it is essential that patients accurately identify the location of pain in pain-inducing examinations such as the PSLR test. This study aimed to confirm the effectiveness of specific verbal instructions for pain location during five consecutive PSLR tests: three without and two with specific verbal instructions. These findings should provide further evidence for using specific verbal instructions for pain assessment in clinical settings.

2. Methods

Twenty-eight participants (13 men, 15 women, mean age 27.4 ± 9.6 years, height

165.9 ± 8.3 cm, weight 60.2 ± 11.2 kg) were recruited in this cross-sectional study. The calculated sample size was 15, with effect size d = 0.80, α error = 0.05, and β error = 0.80. Considering possible dropouts, 28 participants were recruited for the study. We included healthy adults aged 20 - 60 years who could work normally and understand our verbal instructions. The exclusion criteria were a history of back or lower limb surgery, neurological disorders, psychological disorders, and acute or chronic musculoskeletal pain.

This study was approved by the Ethics Committee of Kanazawa Orthopedic Sports Medical Clinic (registration number: Kanazawa-OSMC-2020-002). All participants provided signed consent after receiving an explanation of the experimental study, which would involve pain inducement.

2.1. Procedure

Five consecutive PSLR tests were conducted on the right leg as follows: the first, second, and third tests (without specific verbal instructions), the fourth test (with specific verbal instructions), and the fifth test (with the same specific verbal instructions). Participants were given a common verbal instruction to stop the test at the point of submaximal pain, defined as "the moment the pain or symptom increases and you want to cease the test" [11] [12]. Before the first, second, and third tests, the participants were only given the previously mentioned verbal instruction. For the fourth and fifth tests, the participants were given additional specific verbal instructions to remember the pain intensity, quality, and location. Immediately after each test, the participants completed a pain drawing (PD) to identify the pain location and described the pain intensity on the NRS. They described the pain quality using the following terms: stretch sensation, stretched pain, pins and needles, burning, sharpness, and tingling. After the fifth test, the participants responded to an interview about what they felt differently during each test, with and without specific verbal instructions.

2.2. Data Collection

The participants lay on the plinth in a supine position, with their arms resting on their abdomens. A towel was placed under the head if necessary to keep the cervical spine in a neutral position. The rater positioned the ankle joint in maximal dorsiflexion, the knee joint in extension, and the hip joint in a neutral position and slowly raised the leg [13]. HFROM was measured at submaximal pain using a magnetic three-dimensional position-measuring device (LIBERTY, Polhemus, USA) placed 15 cm above the patella. Pain was assessed immediately after each PSLR test. The participants circled the pain location as accurately as possible on the back view of the body chart. They completed the NRS and selected pain quality.

The body chart was divided into ten areas: buttock, thigh (proximal, central, and distal), popliteus, lower thigh (proximal, central, and distal), ankle, and sole. Pain locations marked by the participants were assigned to any area. The ten areas were assigned a number to analyze the changes in pain location between tests.

Pain location was also quantified as PE. The pixels of the entire body chart were measured by summing the front and back views of the body chart using the ImageJ freehand function (version 1.47, National Institutes of Health, USA). The pixels of the pain location were measured using the same method, and the percentage of the entire surface was calculated and defined as the PE. Interview responses regarding differences with and without specific verbal instructions were classified into pain location and intensity. We asked about the need for specific verbal instructions for pain assessment.

2.3. Statistical Analyses

Statistical analyses were performed using SPSS (version 29.0; IBM; Armonk, NY, USA). The differences and consistency between the first and second tests, second and third tests, third and fourth tests, and fourth and fifth tests regarding HFROM, PE, and NRS were compared using a paired t-test, and the consistency of pain location was examined using the kappa coefficient. McNemar's test was performed to compare the proportions of participants who changed the pain location between the first to the second test and from the second to the third test. The same analysis was repeated for the third, fourth, and fifth tests. The significance level was set at $P < 0.05$ in all statistical analyses.

Cross-tabulation tables were used to visualize the changes in pain location associated with the kappa coefficient. The intraclass correlation coefficient (ICC) was used to measure the intra-rater reliability for HFROM and PE between each test. We followed the criteria established by Koo *et al.* to interpret the ICC results [14].

3. Results

The ICC ranged from moderate to excellent for both HFROM and PE. No significant differences were found in HFROM, PE, and NRS scores between the tests. **Table 1** lists the mean values of the different parameters.

The pain location showed various changes: 11 participants (39.2%) changed their pain location in the second test compared to the first; five (17.9%) in the third test compared to the second; 17 (60.7%) in the fourth test compared to the third; and nine (32.1%) in the fifth test compared to the fourth.

A significant difference was noted between the second to the third tests and the third to fourth tests in McNemar's test ($p = 0.003$) (**Table 2**).

The values of the kappa coefficients are listed in **Table 3**. There was high consistency ($\kappa = 0.74$) between the second and third tests and low consistency ($\kappa = 0.28$) between the third and fourth tests. Furthermore, the consistency improved in the fifth test ($\kappa = 0.57$).

Ninety-three percent of the participants found it difficult to draw their pain location after the first test as follows: "The pain location was ambiguous" and "I

Table 1. Mean and p-values of hip flexion ROM, PE, and NRS.

(n = 28)

	mean ± SD					p-value			
test	1st	2nd	3rd	4th	5th	1st to 2nd	2nd to 3rd	3rd to 4th	4th to 5th
ROM (˚)	48.1 ± 18.3	51.7 ± 22.0	51.4 ± 20.3	52.9 ± 23.3	51.2 ± 22.4	0.80	1.00	0.80	1.00
PE (%)	1.0 ± 0.58	1.0 ± 0.63	0.96 ± 0.56	1.13 ± 0.66	1.01 ± 0.74	0.96	0.42	0.05	0.16
NRS	5.7 ± 1.8	5.8 ± 1.9	5.6 ± 2.0	6.1 ± 2.2	5.8 ± 2.0	0.90	0.70	0.40	0.60

SD: Standard Deviation

Table 2. Comparison of the proportion of participants who changed the pain location between the tests.

(n = 28)

	p value
1st to 2nd vs 2nd to 3rd	0.18
2nd to 3rd vs 3rd to 4th	0.003
3rd to 4th vs 4th to 5th	0.07

Table 3. Consistency in pain location between the tests.

(n = 28)

	κ
1st to 2nd	0.49
2nd to 3rd	0.74
3rd to 4th	0.28
4th to 5th	0.57

did not remember." Concerning the pain location during the first to the third test, the frequent words were "unclear," "vague," and "no confidence." However, after receiving the specific verbal instructions, 93% of the participants reported, "It became clear," "I could concentrate and identify the exact location," and "I could understand the extent."

Regarding pain intensity, 14% of participants reported intensified pain when paying attention to specific verbal instructions. Eighty-nine percent of participants agreed that the specific verbal instructions were helpful. However, 4% were neutral, and 7% felt the verbal instructions were unnecessary. For instance, a participant felt nervous about the test, stating there was pressure to answer. Another noted that the pain location could be identified without specific verbal instructions.

4. Discussion

This study examined the effect of specific verbal instructions on pain location during PSLR tests. The HFROM, NRS, and PE values did not differ significantly between the tests. A significant difference was found in the proportion of participants who changed their pain location between the second and third tests and from the third to the fourth test. This result was supported by the high consistency in the kappa coefficient between the second and third tests and the low consistency between the third and fourth tests. In the fourth test, after receiving specific verbal instructions, the pain locations changed in more than half of the participants and tended to stabilize in the fifth test. Our previous studies support this result.

Furthermore, most participants felt different after receiving specific verbal instructions because the pain location became clear. They were able to identify the exact location of the pain confidently. Therefore, specific verbal instructions enable improved concentration, resulting in changes in the pain location.

Focusing on stabilizing the pain location, the third test without specific verbal instructions showed the highest consistency. Previous studies have reported the high test-retest reliability of PD [12] [15]. In these studies, participants were asked to perform the second PD without information in advance; therefore, they seemed to reproduce "pain memory." In the current study, the participants may have thought they did not remember the pain location during the first test. This experience made them draw the same pain locations in the second and third tests.

Although the participants in this study did not have chronic LBP, many were aware of lower-limb muscle tightness. Therefore, HFROM was >10˚ smaller than that in our previous healthy participants. In the current study, many PDs were located on the popliteus, muscle belly, and proximal to the gastrocnemius after the participants received specific verbal instructions. Considering the responses in the interview, participants could identify the pain location not just as "the gastrocnemius" or "the hamstrings;" they could precisely identify the exact point within the muscles. Therefore, this localized information gained by specific verbal instructions may be more precise in finding problematic tissues than without them.

Doctors use the PSLR as a neurodynamic test to diagnose and assess neurological dysfunction in patients with LBP. However, most cases of LBP are nonspecific [8] [9] [10]. In such cases, identifying the pain trigger leads to appropriate treatment. Some studies have reported reduced extensibility or tightness of the hamstrings and gastrocnemius muscles in individuals with LBP [16] [17] [18]. As mentioned previously, participants could localize the pain because of specific verbal instructions. Thus, a single PSLR test with specific verbal instructions helps the PTs elicit detailed information from patients, leading to an optimal approach that can reduce patient distress during pain-induced tests.

Eighty-nine percent of the participants supported the use of specific verbal instructions; however, some complained that verbal instructions might make patients nervous or distort the pure impression of the pain location. Additionally, two participants experienced stronger pain intensity with specific verbal instructions than without. Kitahara described that when doctors asked patients about pain, the patients focused on it [19]. These opinions suggest that verbal instructions can help guide patients. Therefore, PTs should understand how verbal instructions affect patients' attention and use them carefully to assess pain before conducting physical examinations. PTs should also adjust verbal instructions in line with the patient's condition.

This study clarified the effect of specific verbal instructions for localizing pain and suggested that they are vital in pain assessment. Improving accuracy in physical examination requires practice and experience. In contrast, verbal instruction is easy to use in clinical settings regardless of the PT's experience, but the instructions should be simple and clear [5] [20]. An appropriate number of instructions and content will be examined to gain further evidence in future studies.

Limitations & Future Study

First, this study included a limited number of participants. We aim to confirm the accuracy of the pain localization through a trial treatment of the identified locations. This test may validate the effectiveness of specific verbal instructions in pain assessment. Moreover, participants may have been affected by the experience with PDs in the fourth and fifth tests. Considering the need for a clearer differentiation from the learning effect, two or three consecutive PSLR tests with specific verbal instructions will be conducted in the future.

5. Conclusion

This study determined the effects of specific verbal instructions on pain location during five consecutive PSLR tests. Although the HFROM, NRS, and PE did not show significant changes, pain locations were changed significantly and localized after specific verbal instructions. Therefore, specific verbal instructions may contribute to a rapid and accurate pain assessment and appropriate treatment in clinical settings.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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