IMPACT OF LEG LENGTH DISCREPANCY ON LOW BACK PAIN AND FUNCTION

Author: Adrián Joel Lozano Valido
Tutor: Sergio Barroso Rosa (Orthopedic Surgery and Traumatology)
Co-tutor: Carmen Nieves Hernández Flores (Mathematics)

ULPGC Universidad de Las Palmas de Gran Canaria

SCAN ME

INTRODUCTION

80% of the population will experience low back pain and one of its contributing factors may be leg length discrepancy.

90% of the population has some degree of leg length discrepancy (anisomelia). The most frequent associations are scoliosis, low back pain, knee osteoarthritis, hip osteoarthritis and stress fractures.

There is no consensus on the magnitude of discrepancy which can favour low back pain and treatment with compensating shoe insoles.

ABSTRACT

Introduction: Low back pain is one of the most common chronic conditions worldwide. One of the contributing factors may be leg length discrepancy (anisomelia), which is highly prevalent. Correct measurement and treatment may help to reduce biomechanical alterations.

Objectives: Quantify leg length discrepancy with telemetry and correlate it with the presence and intensity of lumbar pain, the necessity for pharmacological treatment, and functional limitation. In addition, other factors contributing to lumbar pain will be analysed. To analyse other factors contributing to lumbar pain. The results will be compared and related between verbal numerical rating score (VNRS), WHO Analgesic Ladder and Oswestry Disability Index.

Methodology: An ambispective observational study was conducted to evaluate the relationship between leg length discrepancy and lumbar pain in patients who had undergone a telemetry in the CHUIMI Radiology Department. The data were collected prospectively through a telephone survey and retrospectively through electronic clinical records. A multivariable analysis was conducted, and correlation examined. A novel variable was created to compare the leg length discrepancy according to the patient's height.

Results: 92 patients were included. No statistically significant association was found between leg length discrepancy and lumbar pain. However, a statistically significant correlation was obtained between the VNRS, Oswestry Scale and WHO Analgesic Ladder, which indicates the usefulness of these scales in evaluating anisomelia and a satisfactory intra-observer correlation. There were gender differences in cervical and dorsal pain, use of analgesia and the Oswestry scale. For those who reported lumbar pain, there were differences in the magnitude of leg length discrepancy, the presence of herniated discs and scoliosis, the time of evolution of pain, VNRS, WHO Ladder and Oswestry index. Hypermetry was associated with an increase in pain and functional limitation of the ipsilateral hip and knee.

Conclusions: No association was found with leg length discrepancy and low back pain, but the scales demonstrate a good correlation with each other. Further analysis with larger sample sizes would be beneficial to re-evaluate the association with dysmetria greater than 10 mm.

MAIN OBJECTIVES

- To assess the correlation of leg length discrepancy with low back pain, its intensity and requirement for pharmacological treatment and functional limitation.
- To create a new variable that may achieve uniformity of the sample.

METHODOLOGY

DESIGN AND STUDY POPULATION

Ambispective observational study of patients with lower limb measurement in the Radiology service at CHUIMI. Retrospectively, leg length discrepancy was quantified with telemetry. Intra-rater test-retest measurements were conducted on all telemetry and re-read data blind to initial results. Prospectively, patients were contacted, and telephonic survey was conducted. Data collection took place between February and April 2024.

INCLUSION CRITERIA
- Telemetry carried out at CHUIMI from 3 January 2018 to 31 March 2023

EXCLUSION CRITERIA
- Individuals under the age of 18.
- Individuals over the age of 80.
- Patients who cannot be contacted by telephone.
- Radiographic study of poor technical quality, incomplete or unavailable
- Telemetries carried out with a compensating lift.

SUMMARY OF THE VARIABLES COLLECTED
- **Demographic variables and general characteristics.**
- **Pain assessment, pain questionnaires and quality of life.**
  - Verbal Numerical Rating Scale
  - Analgesic intake: drug type, dose and frequency.
    - WHO Analgesic Ladder
    - Oswestry disability index
- **Assessment of leg length discrepancy.**
  - Leg length discrepancy and categories
  - Years with leg length discrepancy

$$\text{RELATIVE DISCREPANCY} = \frac{\text{LEG LENGTH DISCREPANCY (cm)}}{\text{HEIGHT OF THE PATIENT (cm)}} = X$$
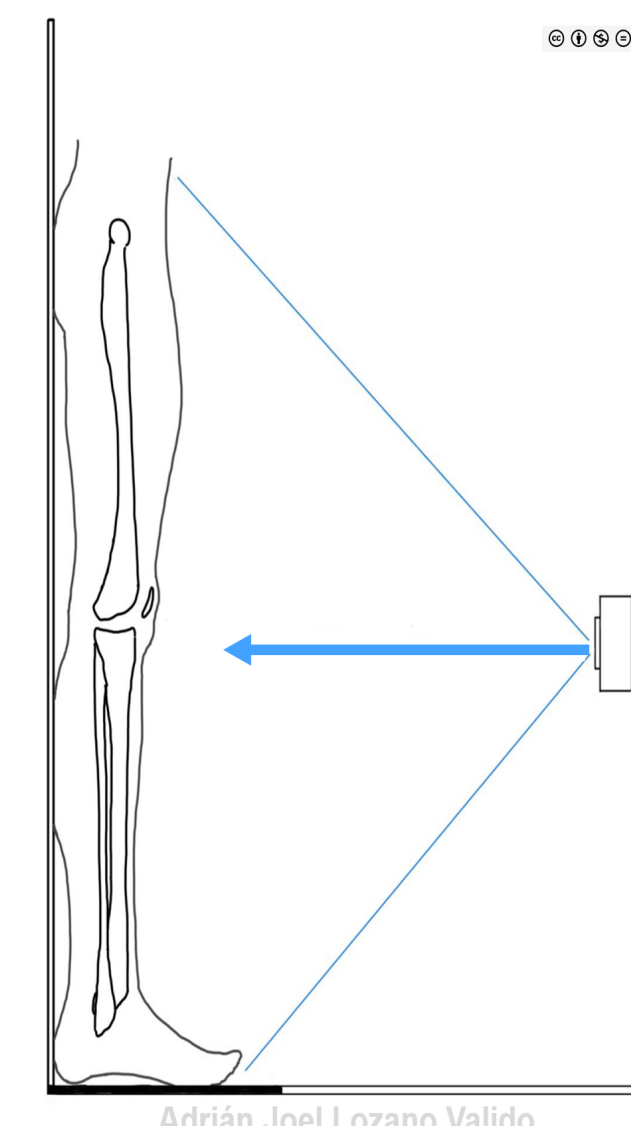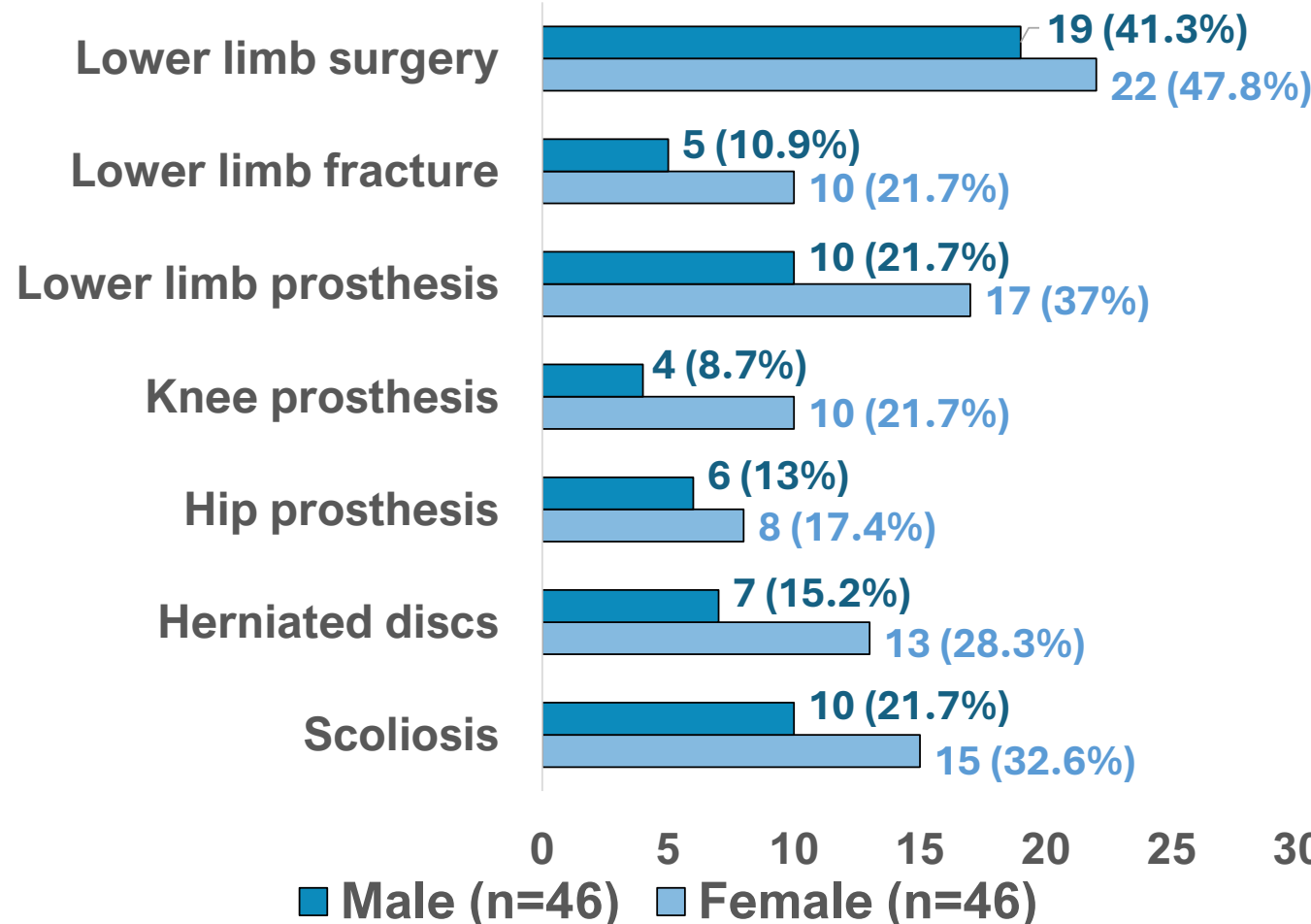

Figure 1. Telemetry diagram and method of measuring leg length discrepancy in patients.

RESULTS

3465 patients underwent telemetry at CHUIMI. Final sample of 92 patients were included. No correlation found between variables and BMI.

Figure 2. Main comorbidities of the sample.

	Male (n=46)	Female (n=46)
Lower limb surgery	19 (41.3%)	22 (47.8%)
Lower limb fracture	5 (10.9%)	10 (21.7%)
Lower limb prosthesis	10 (21.7%)	17 (37%)
Knee prosthesis	4 (8.7%)	10 (21.7%)
Hip prosthesis	6 (13%)	8 (17.4%)
Herniated discs	7 (15.2%)	13 (28.3%)
Scoliosis	10 (21.7%)	15 (32.6%)

VARIABLE	Female (n=46)	Male (n=46)	p-value
Leg length discrepancy (cm)	0.37 (0.14; 0.78)	0.59 (0.28; 0.93)	0.0682
Categories LLD (cm)			0.3555
< 0.5	26 (56.5)	20 (43.5)	
0.5 - 1	11 (23.9)	17 (37.0)	
≥ 1	9 (19.6)	9 (19.6)	

Table 1. Leg length discrepancy (LLD) of the study population.

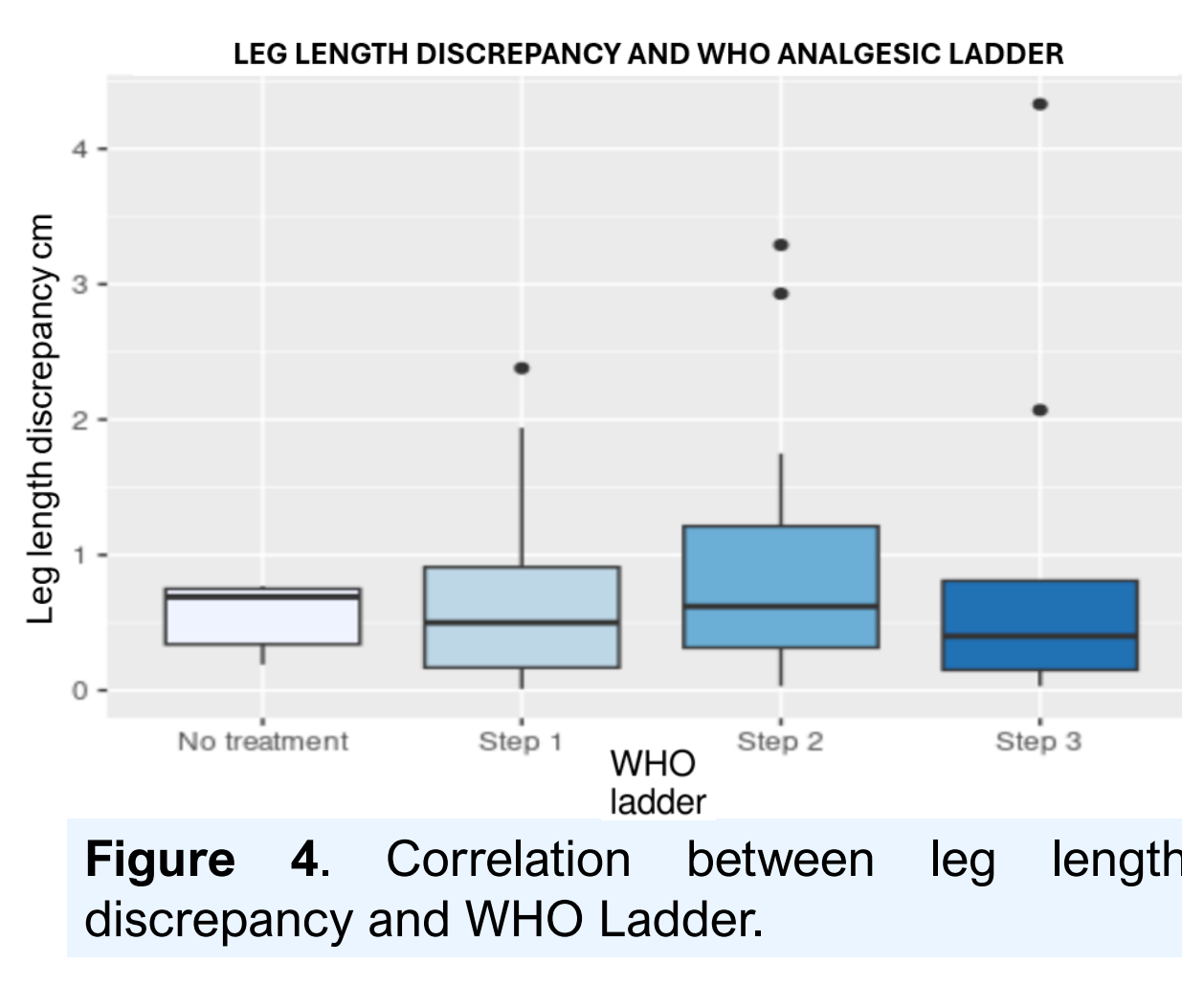| VARIABLE	Female (n=46)	Male (n=46)	p-value
General data:			
Age (years)	59.7 ± 12	55.5 ± 10.4	0.077
Age range	(25; 78)	(32; 79)	
Height (cm)	162.2 ± 6.2	174.4 ± 7.7	<0.001
Weight (kg)	72 (65; 83)	85 (75; 96)	<0.001
Years with scoliosis	39.9 ± 16.9	42.1 ± 8.6	0.678
Pain evolution time (months)	44 (16; 120)	14 (8.25; 48)	0.097
CatVNRS			0.097
Mild	5 (10.9)	7 (15.2)	
Moderate	19 (41.3)	27 (58.7)	
Severe	22 (47.8)	12 (26.1)	
Pain location			
Cervical	31 (67.4)	13 (28.3)	0.0002
Dorsal	22 (47.8)	10 (21.7)	0.009
Low back	38 (82.6)	30 (65.2)	0.058
Right hip	23 (50)	17 (37)	0.207
Left hip	25 (54.3)	21 (45.7)	0.404
Right knee	28 (60.9)	31 (67.4)	0.514
Left knee	29 (63)	26 (56.5)	0.524
Use analgesia	44 (95.7)	34 (73.9)	0.004
WHO ladder			0.097
No treatment	2 (4.3)	9 (19.6)	
1st step	28 (60.9)	19 (41.3)	
2nd step	12 (26.1)	13 (28.3)	
3rd step	4 (8.7)	5 (10.9)	
Oswestry index	44.9 ± 19.2	38 ± 20.1	0.011

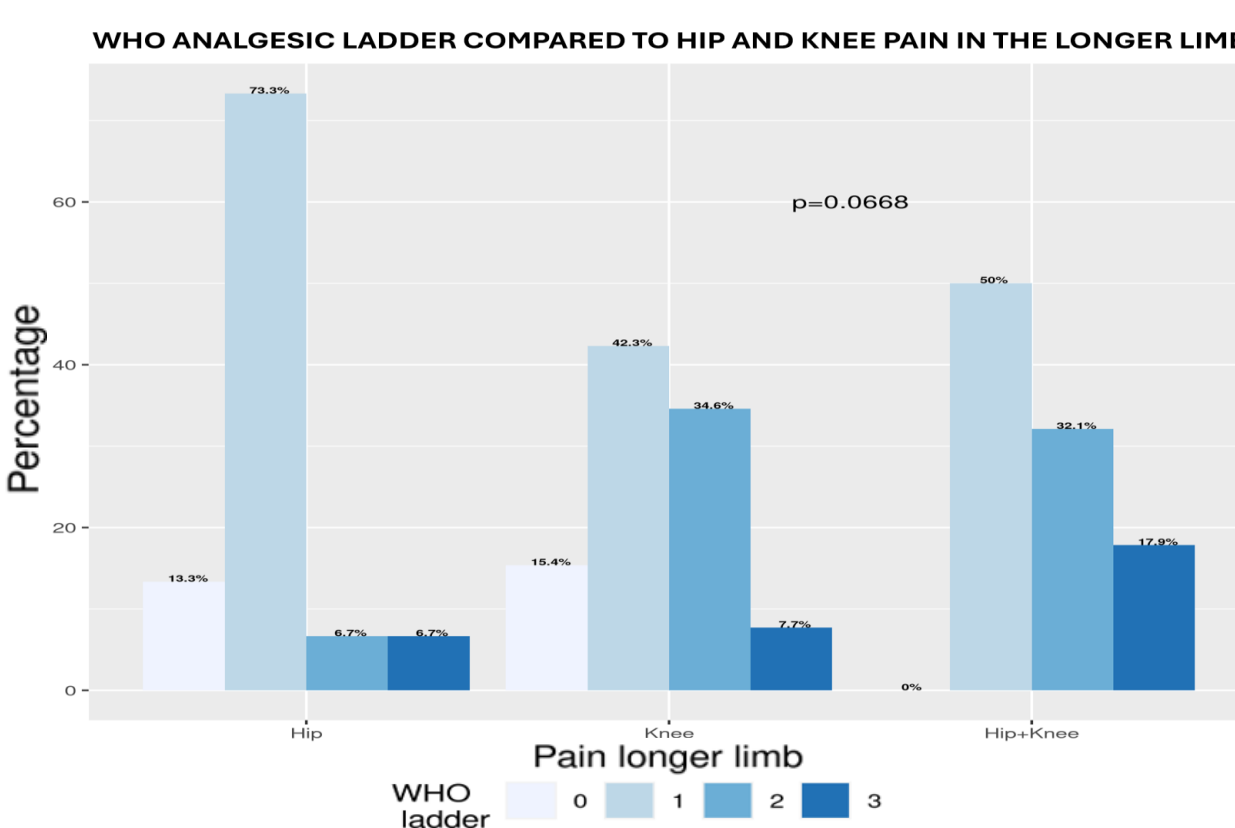**Table 2. General data and pain assessment of the study population.**
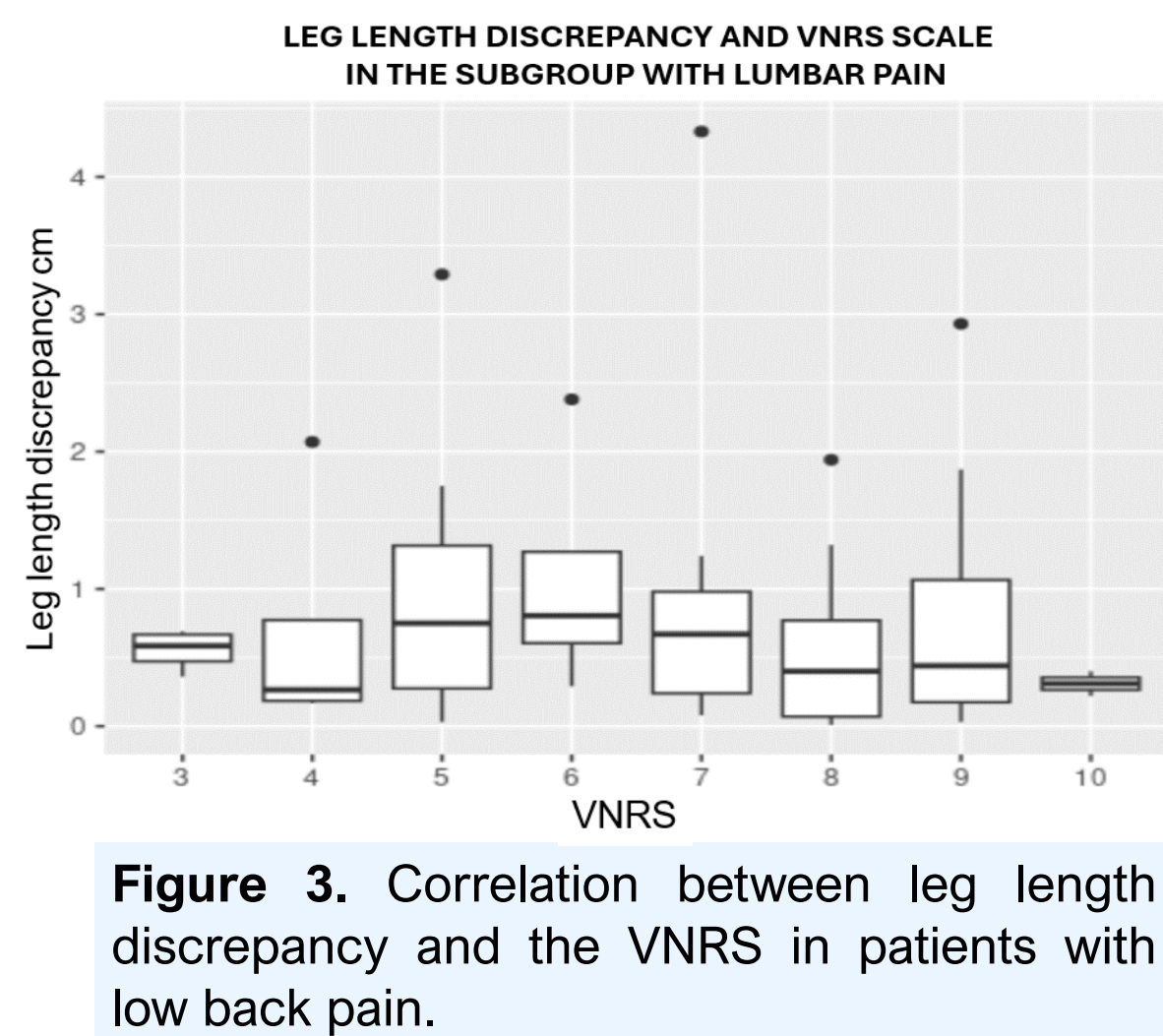
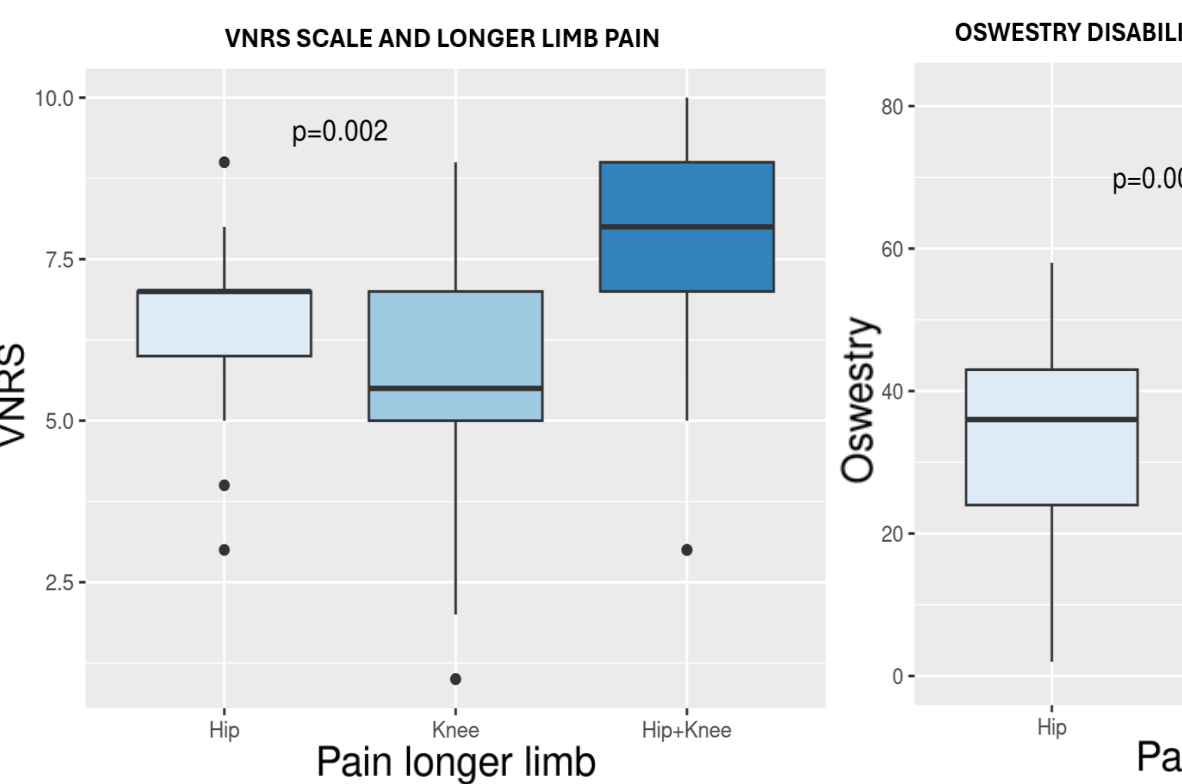**Figure 3.** Correlation between leg length discrepancy and the VNRS in patients with low back pain.

Figure 4. Correlation between leg length discrepancy and WHO Ladder.

Figure 5. Correlation between leg length discrepancy and Oswestry scale in patients with low back pain.

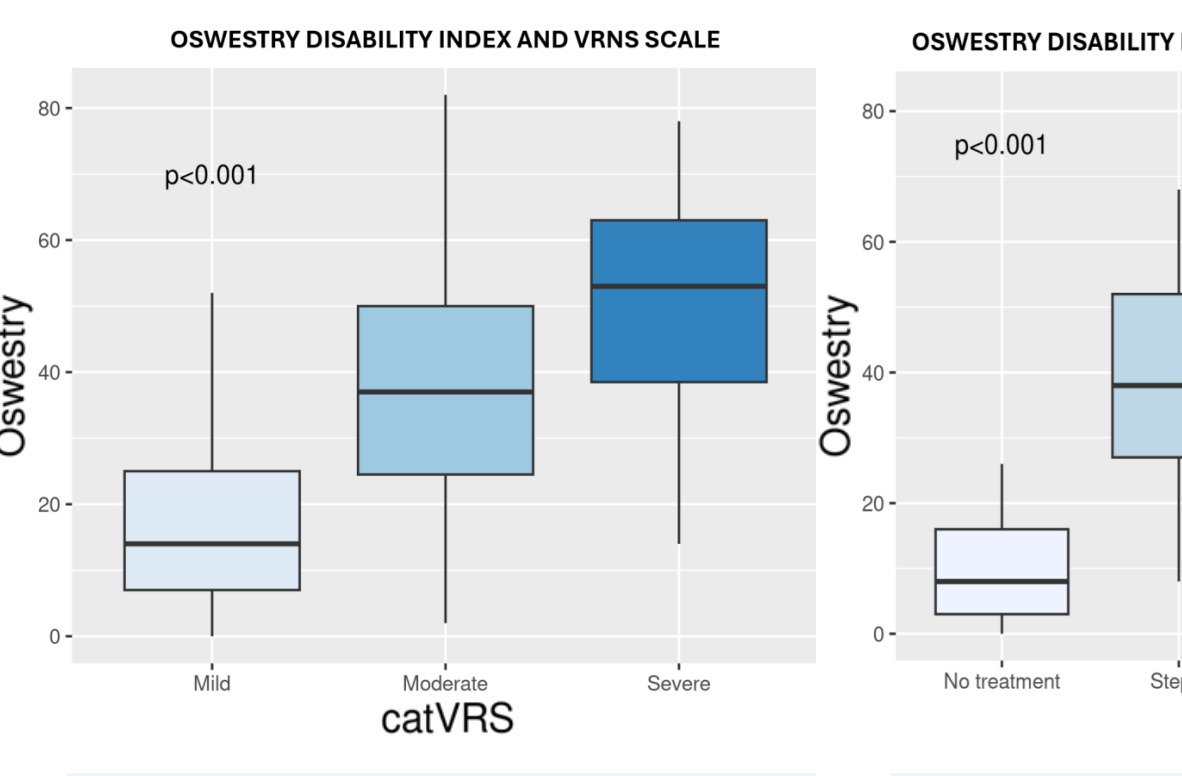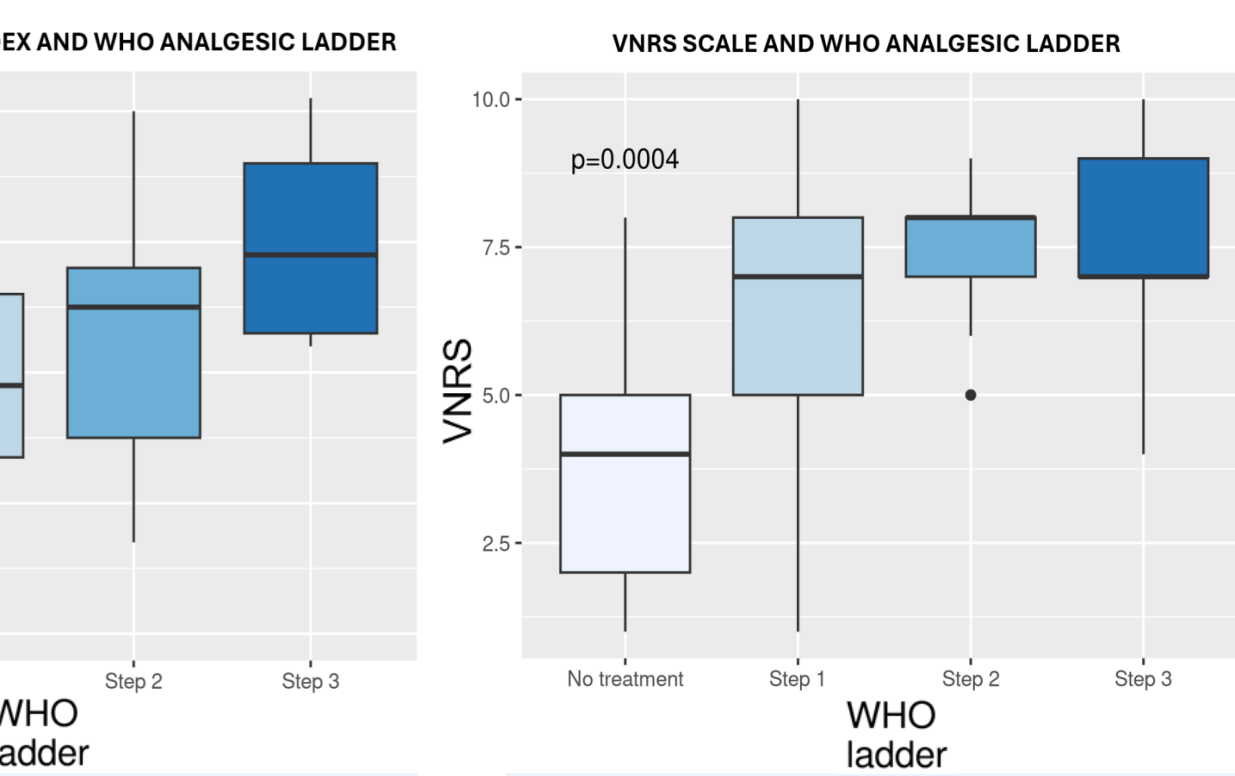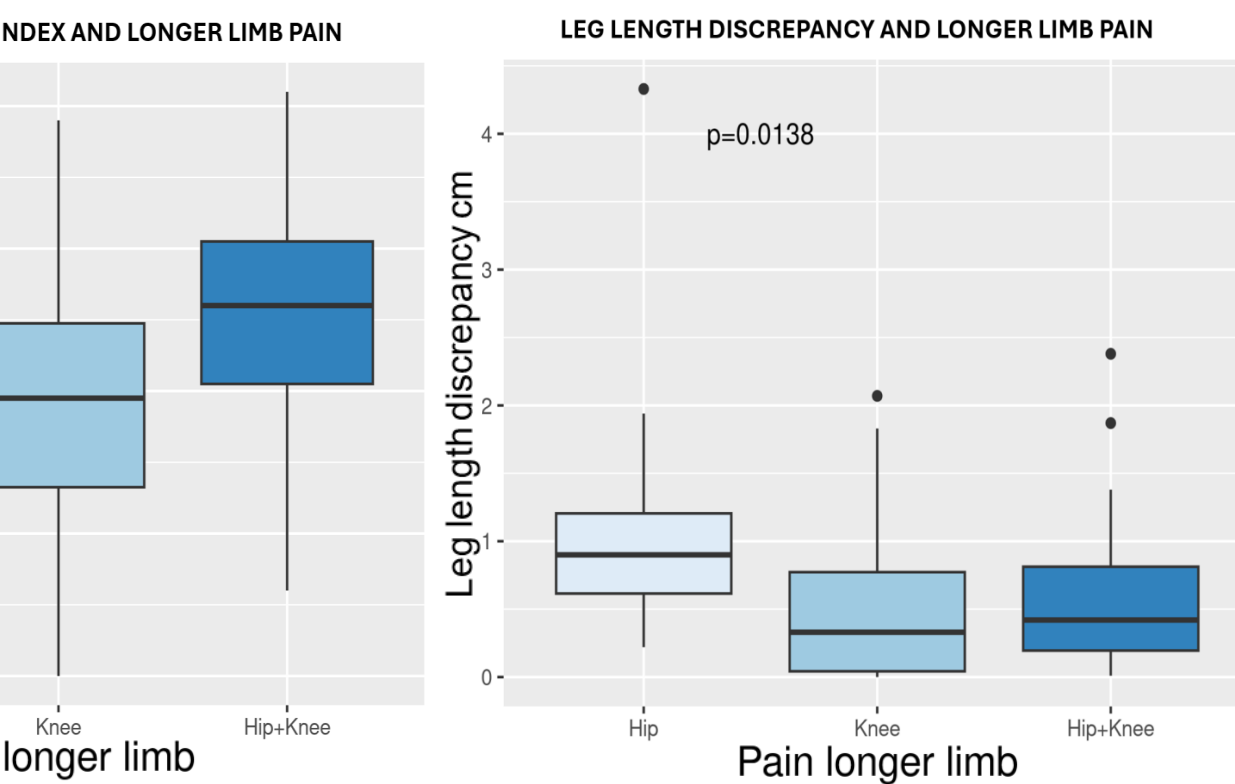**Figure 6.** Correlation between WHO pain management scale and pain in the longer lower limb, grouped by pain location.
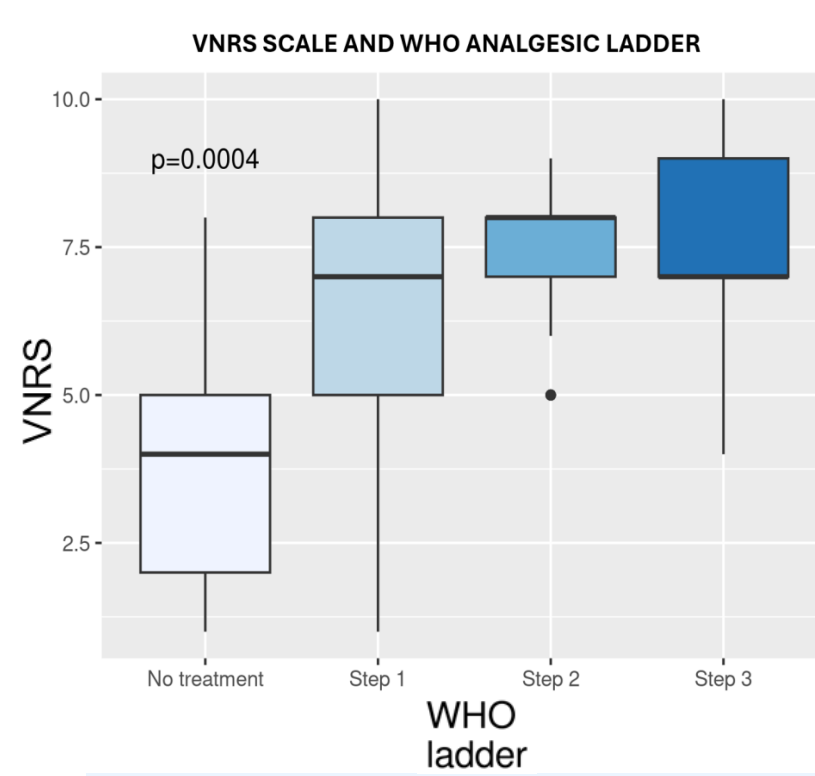

Figures 7, 8 y 9. Correlation on the longer lower limb, grouped by pain location and assessed by: **(7)** the VNRS, **(8)** Oswestry and **(9)** leg length discrepancy.

Figure 10. Correlation between Oswestry scale and VNRS scale.

Figures 11. Correlation between Oswestry scale and WHO Ladder.

Figures 12. Correlation between VNRS scale and WHO Ladder.

VARIABLE	Low back pain		p-value
	Yes (n=68)	No (n=24)	
BMI	28.16 (24.58; 32.39)	26.37 (25.32; 31.33)	0.8310
LL fracture	1 (4.2)	14 (20.6)	0.1044
LL prosthesis	18 (26.5)	9 (37.5)	0.3077
Hip prosthesis	10 (14.7)	4 (16.7)	0.7537
Knee prosthesis	9 (13.2)	5 (20.8)	0.5085
L4-L5 hernia	15 (16.3)	0	0.0093
L5-S1 hernia	8 (11.8)	1 (4.2)	0.4370
Scoliosis	23 (33.8)	2 (8.3)	0.0158
Years with scoliosis	40.17 ± 14.34	48 ± 8.49	0.3914
VNRS§	7 (5; 8)	5.5 (2.75; 7)	0.0006
Pain evolution time	44 (12.8; 111)	9.5 (5.5; 18.8)	<0.001
Cervical pain	38 (55.9)	6 (25.0)	0.0092
Dorsal pain	27 (39.7)	5 (20.8)	0.0951
WHO ladder			0.0449
No treatment	6 (25.0)	5 (7.4)	
1st step	11 (45.8)	36 (52.9)	
2nd step	7 (29.2)	18 (26.5)	
3rd step	0	9 (13.2)	
Oswestry index	26.08 ± 15.52	44.03 ± 19.86	<0.0001
Stair limitation			0.3894
No	11 (16.2)	7 (29.2)	
Limited a little	33 (48.5)	9 (37.5)	
Limited a lot	24 (35.3)	8 (33.3)	

Table 3. Characteristics of the patients with low back pain. LL: lower limb. BMI: Body Mass Index.

CONCLUSIONS

✓ No statistically significant correlation was found between anisomelia and low back pain, functional limitation, or the need for pharmacological treatment.

✓ The novel variable created "relative discrepancy" aim for more uniformity of the sample and had not been employed in previous studies.

✓ Statistically significant correlation was found between the VNRS, Oswestry Disability Scale and the WHO Analgesic Ladder. This indicates the usefulness of these scales in evaluating leg length discrepancies and the use of these collectively enables a satisfactory intra-observer correlation.

✓ Leg length discrepancy causes greater overall knee and hip pain intensity and functional limitation.

✓ It is necessary to expand the sample size, increasing the number of patients with discrepancies greater than 10mm.

REFERENCES

61 CONGRESO SECOT

SOCIEDAD ESPAÑOLA DE CIRUGÍA ORTOPÉDICA Y TRAUMATOLOGÍA