

BROKEN WING SIGN AND DIABETIC FOOT: ASSOCIATION WITH ULCERATION AND AMPUTATION IN A CASE-CONTROL STUDY

L.Cacciatore¹, O.Mingrino², L.Smeraldi³, G.Arnaldi³, G.Messina²

¹Pododynamic, Centre of Podology and Posture, Via Don Luigi Sturzo 17, 92027, Licata

²San Raffaele University of Rome, Department of Human Sciences and Promotion of the Quality of Life, Via di Val Cannuta n 247, 00166, Roma

³Section of Endocrinology, Diabetology and Metabolism, Department of Health Promotion, University of Palermo, Palermo

BACKGROUND

Diabetic foot complications are traditionally attributed to distal factors.

Growing evidence suggests that proximal biomechanical dysfunction may also contribute to ulceration.

The Broken Wing Sign (BWS) evaluates hip compensation during single-leg stance and may indicate dysfunction of the locomotor chain.

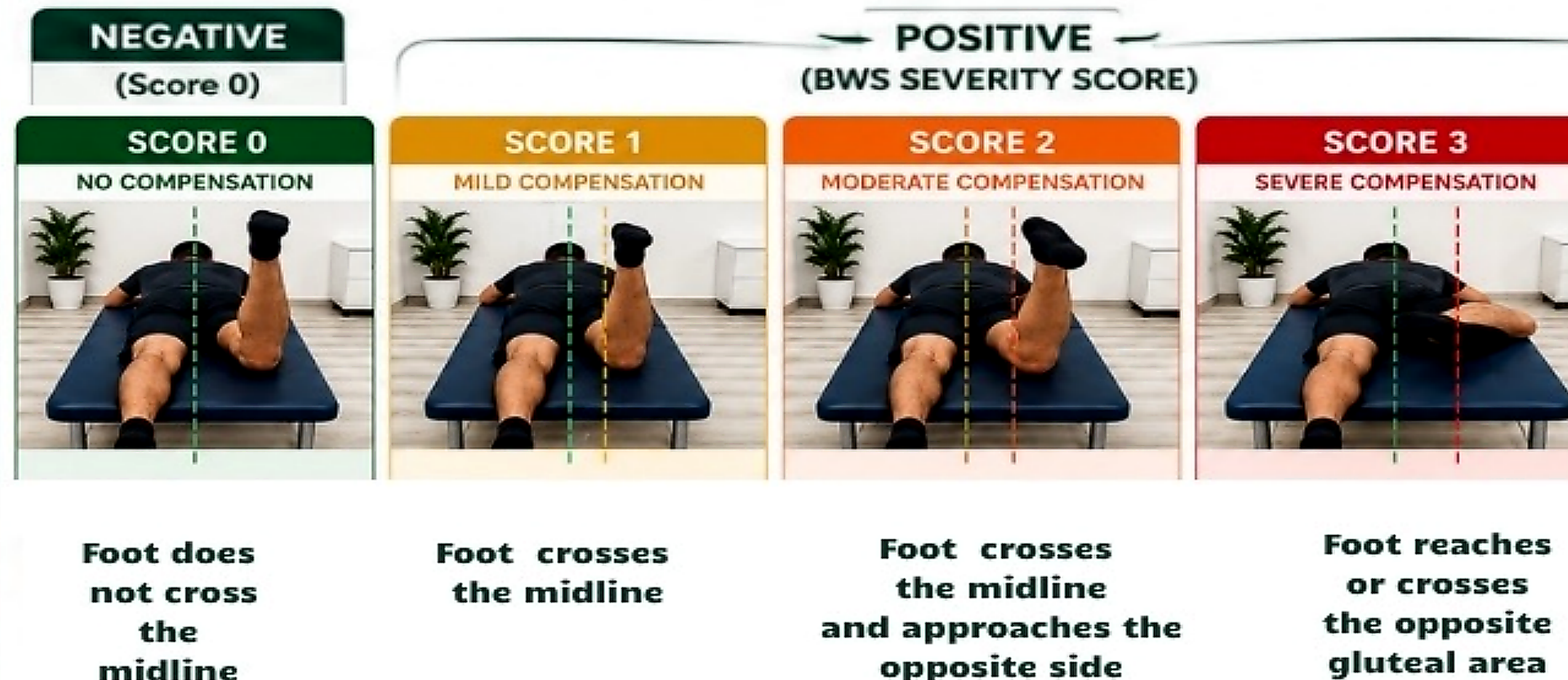
BWS has never been studied in diabetic patient

OBJECTIVE

To evaluate whether the **severity of the Broken Wing Sign** is higher in diabetic patients with active or previous foot ulcer and/or amputation compared to diabetic patients without a history of ulceration.

BROKEN WING SIGN TEST

Single-leg stance – Posterior view



MATERIALS & METHODS



Study design

Case-control study – Cross-sectional
January – May 2026



Participants

20 diabetic patients
10 CASE: active or previous foot ulcer and/or amputation
10 CONTROL: no history of ulceration



Assessments

Broken Wing Sign (BWS) – Sierra 2025
Neuropathy (10g monofilament)
Foot deformities – Windlass mechanism –
Central metatarsal overload – ABI

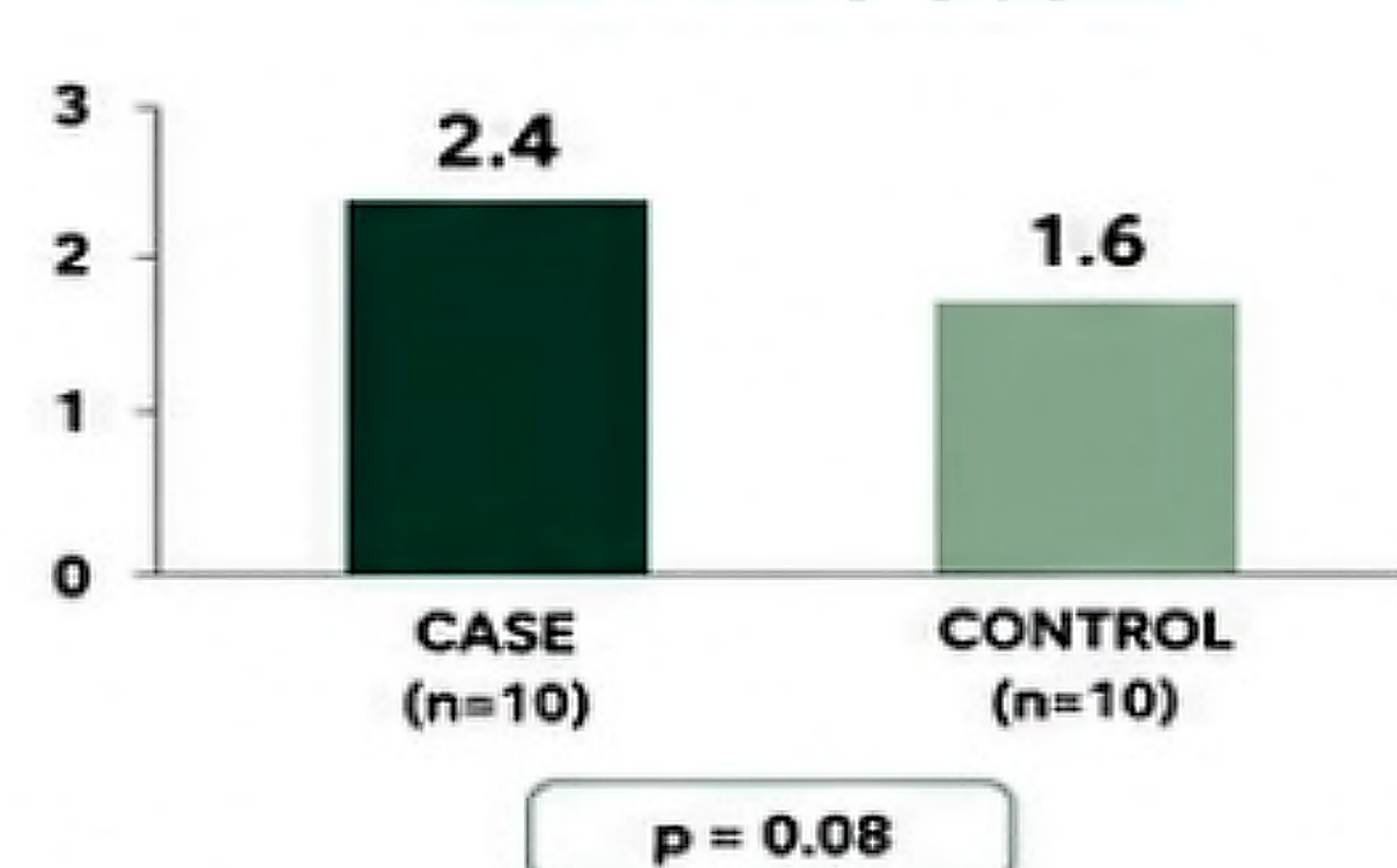


BWS Severity Score

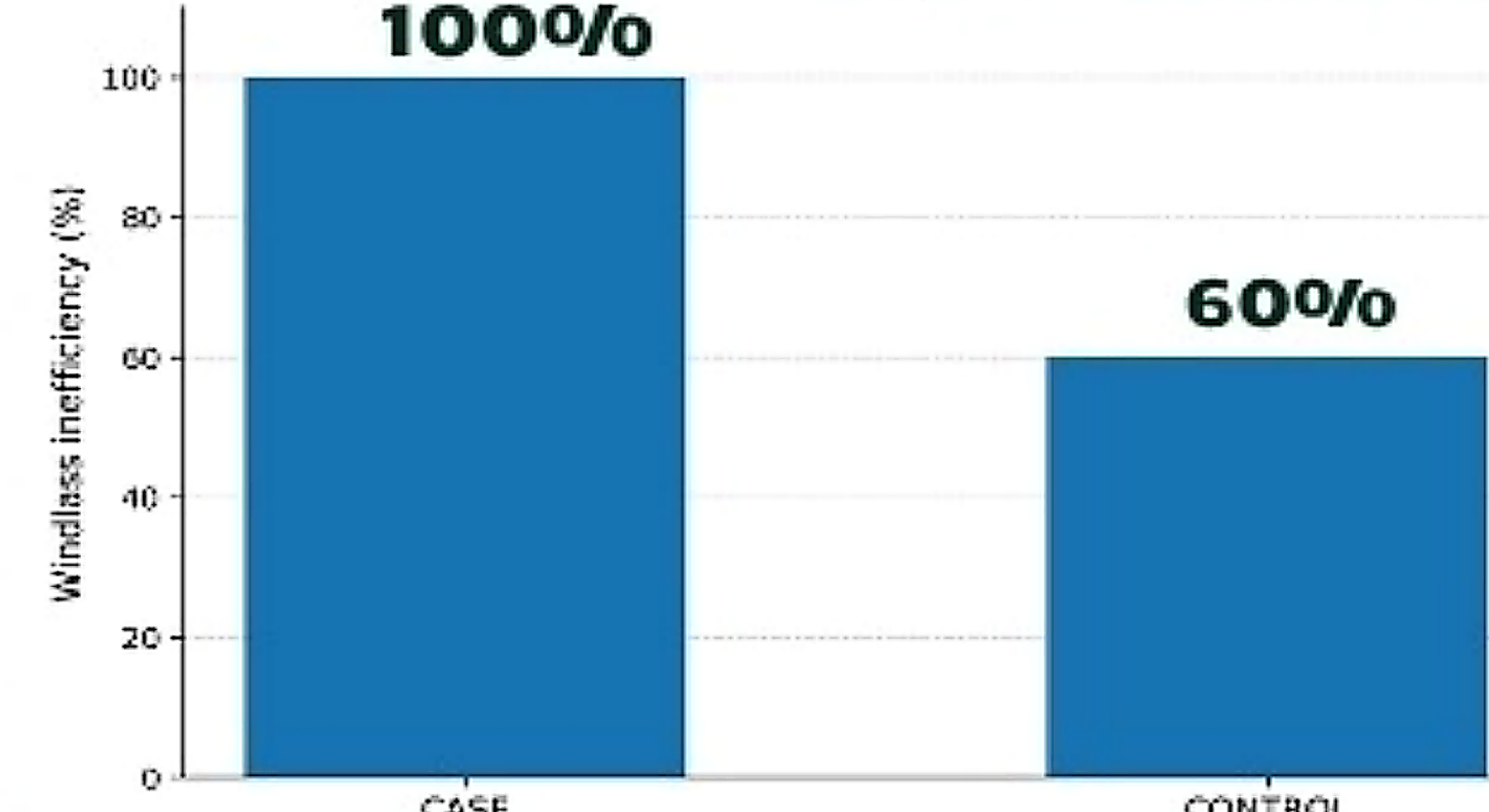
0 = no adduction 1 = mild 2 = moderate 3 = severe

RESULTS

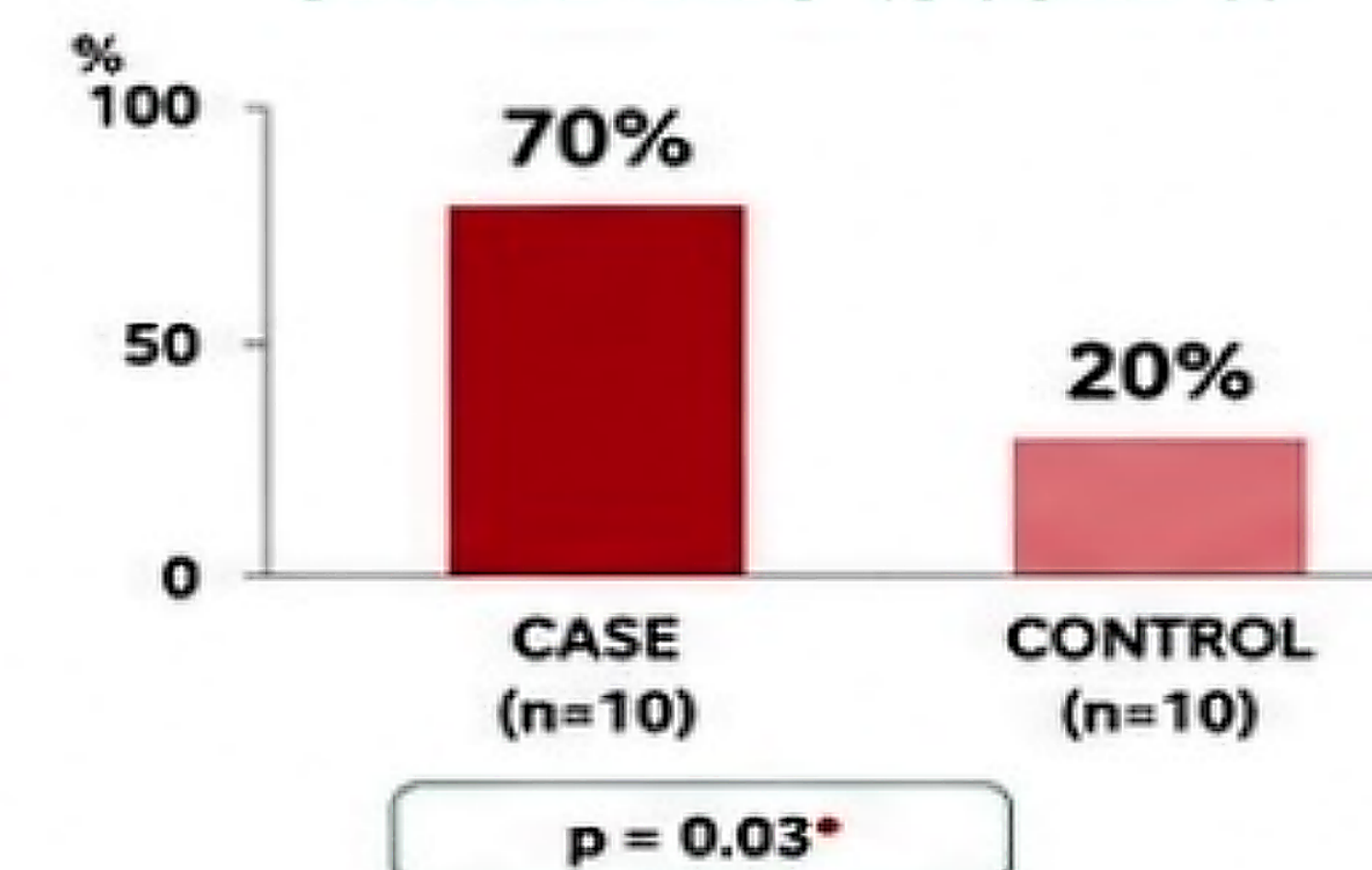
MEAN BWS SCORE



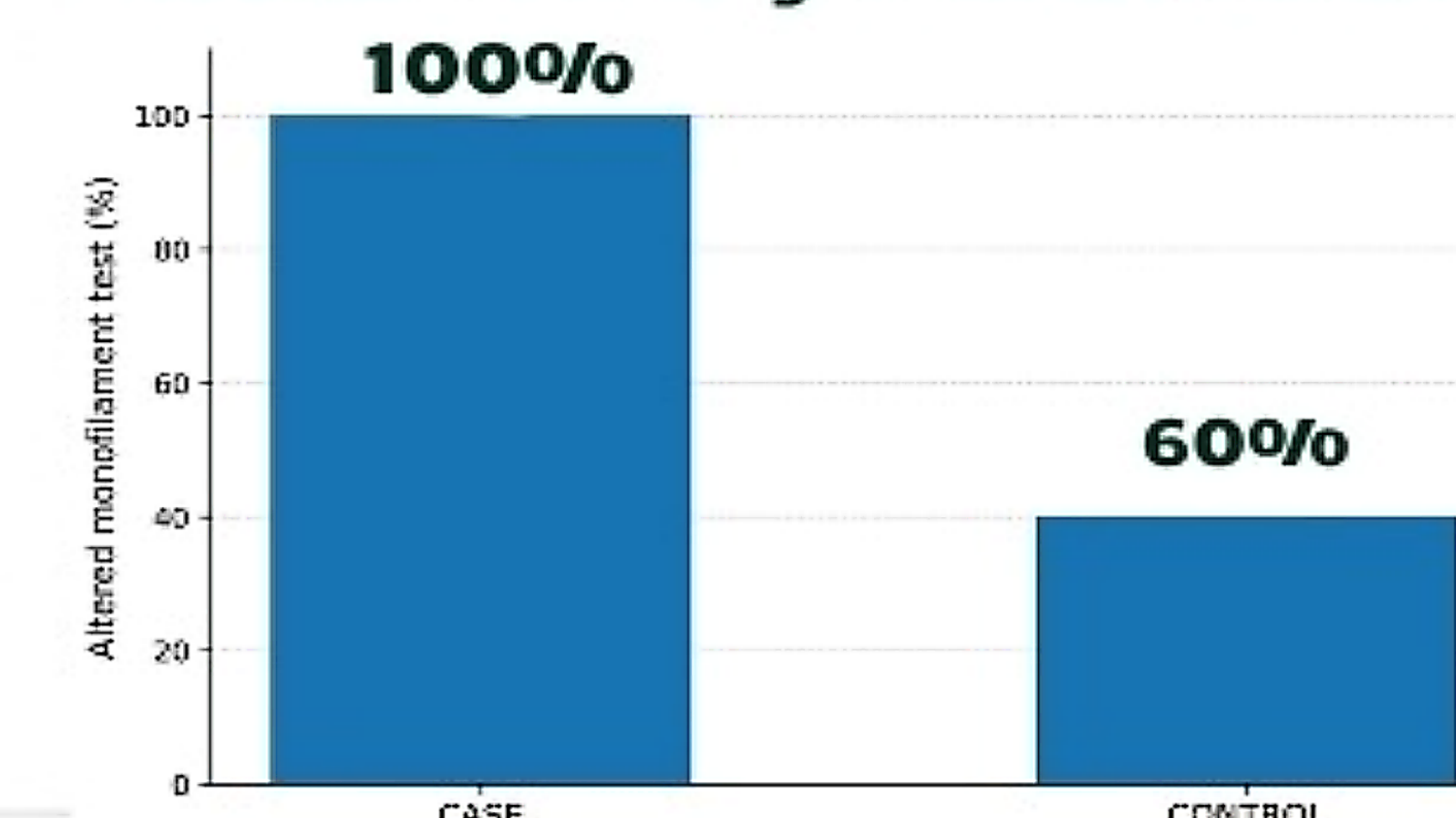
WINDLASS INEFFICIENCY



SEVERE BWS (SCORE 3)



NEUROPATHY 10 g (MONOFILAMENT)



KEY FINDINGS

- Higher mean BWS score in CASE.
- Severe BWS (score 3) more frequent in CASE (70% vs 20%).
- BWS positivity high in both groups with bilateral involvement common.
- Neuropathy present in all CASE patients.

Biomechanical and Clinical Interpretation



CONCLUSION

Preliminary findings suggest that Broken Wing Sign severity is greater in diabetic patients with ulceration or amputation.

BWS may represent a potential clinical marker of proximal biomechanical dysfunction to be integrated in clinical assessment.

Prospective studies with larger samples and instrumental gait and plantar pressure analysis are needed to confirm these hypotheses.



REFERENCES

- Sebastião R, Fonseca P, Sousa M, et al. Lower Limb Joint Moments During Gait in Subjects with Diabetes with and without Peripheral Neuropathy: A Systematic Review with Meta-Analysis. Clin Biomech. 2026;136:106806.
- Sierra RJ, et al. Broken Wing Sign: A Clinical Sign Associated with Gluteus Medius Degeneration. 2025.