

# Determining and implementing the individual normal posture in making a negative cast to produce orthoses for patients with neurological gait disorders

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## Aim

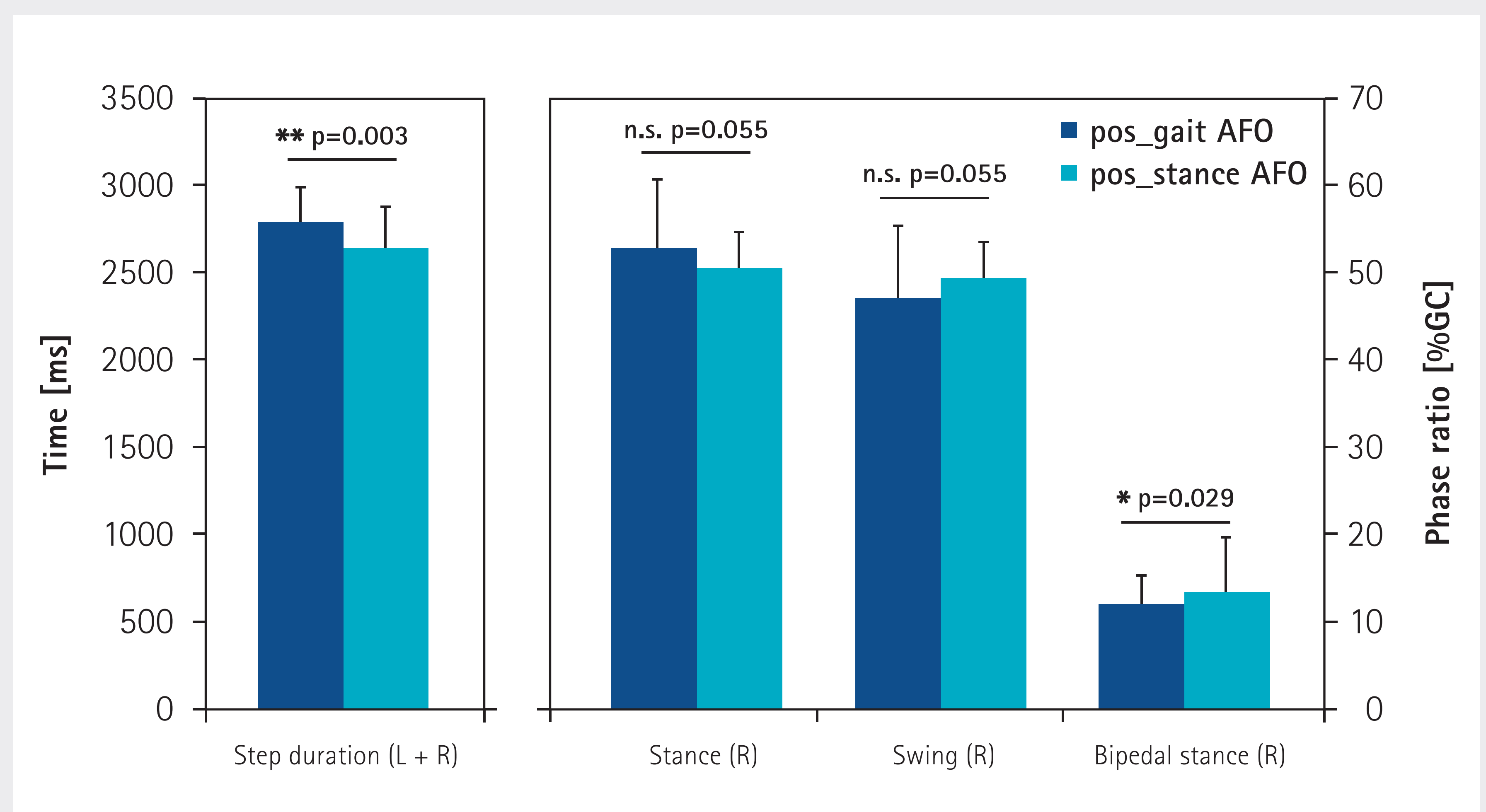
The aim of this case study is to demonstrate how load distribution in the individual normal posture [1] of a standing patient while making a negative cast affects the efficacy of the final orthosis.

## Material/Methods

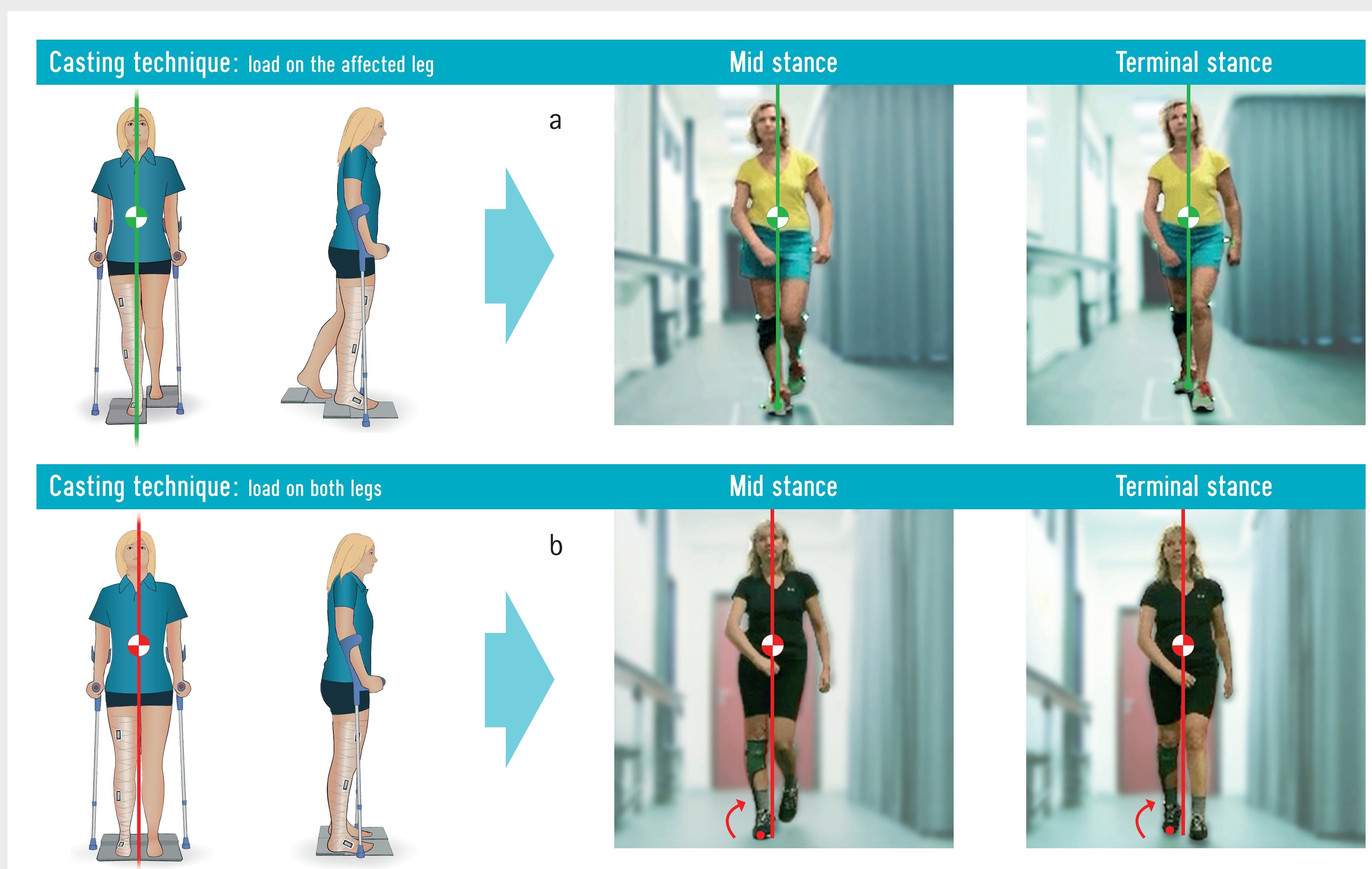
- patient with right-sided hemiplegia (w, 48 years, ischaemic stroke)
- two dynamic Ankle Foot Orthoses (AFOs) with spring-hinge joints
- AFOs produced based on negative casts, taken in two different positions:
  1. in a gait related position: bodyweight more on affected leg, imitating mid stance (pos\_gait AFO)
  2. in a stance related position: bodyweight distributed equally on both legs (pos\_stance AFO)
- pressure distribution measurement over 45 gait cycles with each AFO
- video-based gait analysis
- comparison of both conditions, right side (Wilcoxon rank-sum test)

## Results

	pos_gait AFO		pos_stance AFO	
	Left, unaffected	Right, affected	Left, unaffected	Right, affected
Step duration [ms]	1375.92 (±128.73)	1389.80 (±169.40)	1312.27 (±141.53)	1311.36 (±162.42)
Left + Right [ms]	2765.71 (±227.06)		2623.64 (±253.83)	
Stance [%GC]	60.11 (± 4.80)	52.64 (± 8.01)	61.49 (± 6.48)	50.53 (± 4.11)
Swing [%GC]	39.89 (± 4.80)	47.36 (± 8.01)	38.51 (± 6.48)	49.47 (± 4.11)
Bipedal stance [%GC]	10.59 (± 13.11)	12.39 (± 2.97)	8.60 (± 5.89)	13.91 (± 4.39)



## Discussion



### pos\_gait AFO:

- body's centre of gravity aligning over the affected leg in mid stance (a)
- first and second bipedal stance phase equalise
- step width is reduced
- well suited for actively walking patients
- orthosis might provide an almost physiological gait

### pos\_stance AFO:

- body's centre of gravity tilting medially in mid stance and terminal stance (b)
- unphysiological pronation of the foot-lower leg-unit
  1. shortened swing phase
  2. prolonged stance phase
  3. increased step width
- for patients with an increased need for safety
- e.g. orthosis mostly for transfer purpose

## Conclusion

Modifying the individual normal posture of a patient while making a negative cast might affect the gait. For an appropriate posture, consider the purpose of the orthosis and the mobility of your patient.

Keywords: Orthotics, neurological gait disorders, negative cast, individual normal posture

## References

[1] Dünwald A et al. Orthop Tech 2015; 66(3): 42-46