

Classification of Gait Types at Apoplexy to Standardise the Orthotic Treatment

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Introduction

The goal of an orthotic treatment after a stroke is the best possible approach towards a physiological gait.

A classification assigns patients to different gait types [1], thus potentially enabling a standardisation and quality assurance for the orthotic treatment. Through the assessment of the knee position and foot contact in mid stance, such a classification is easily processed by an interdisciplinary team. The Amsterdam Gait Classification is used for CP [2] in a similar way.

GOAL: Creating a classification for the orthotic treatment of apoplexy patients after a stroke based on an analytical gait examination that is as easy to process as the Amsterdam Gait Classification.

Methods

- n = 5 patients after a media infarction (in inpatient rehab), 3 of these patients with hyperextension and 2 with hyperflexion in *mid stance* [3]
- passed *Timed-Up-And-Go-Test*
- standardised footwear
- video-supported 2D gait analysis, frame rate 50Hz
- CONTEMPLAS TEMPLO, Clinical Gait Analysis module
- 1x Basler camera, sagittal (acA640-100gc) and frontal (acA2000-50gc)
- 3 gait cycles per body side
- angle movements of the hip (HA), knee (KA), ankle (AA), tibia inclination (TI) and heel contact (HC)
- mean values of angles in mid stance, Wilcoxon Signed-Rank Test

Results

Hyperextension



Fig. 1: example 1 - patient with hyperextended knee

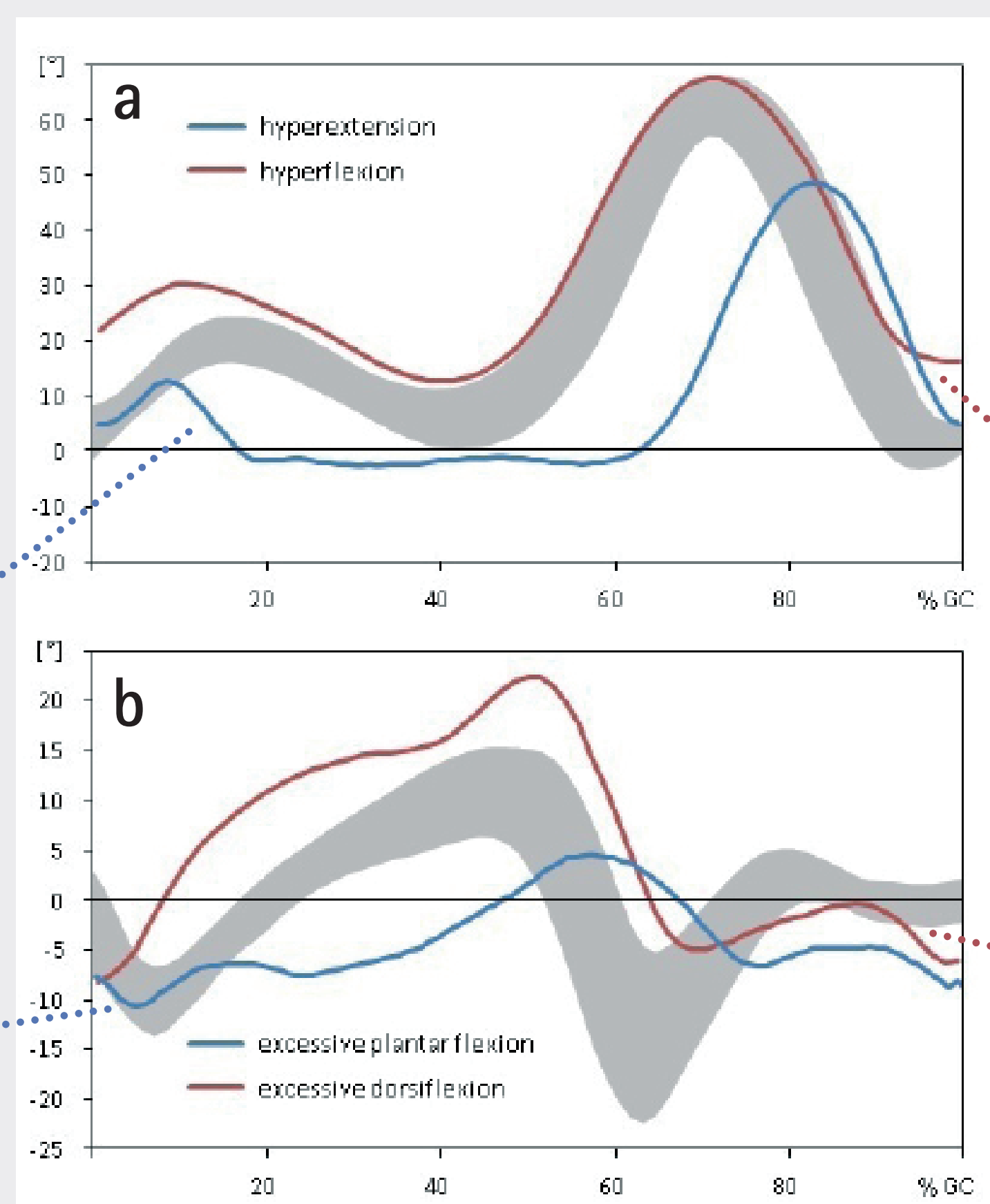


Fig. 2: movements of a) knee angle and b) ankle angle; hyperextension (blue), -flexion (red), physiological gait (grey)

Hyperflexion



Fig. 3: example 2 - patient with hyperflexed knee

Results of the Statistical Evaluation:

Table 1: statistical differences of both gait types compared to a physiological gait pattern; valid is * p=0.05 and ** p=0.01

Gait type	HA	KA	AA	TI	HC
Hyperextension	0.0014 **	0.0002 **	0.0075 *	0.0016 **	0.3258
Hyperflexion	0.0820	0.0952	0.0125 *	0.0055 **	0.0156 *

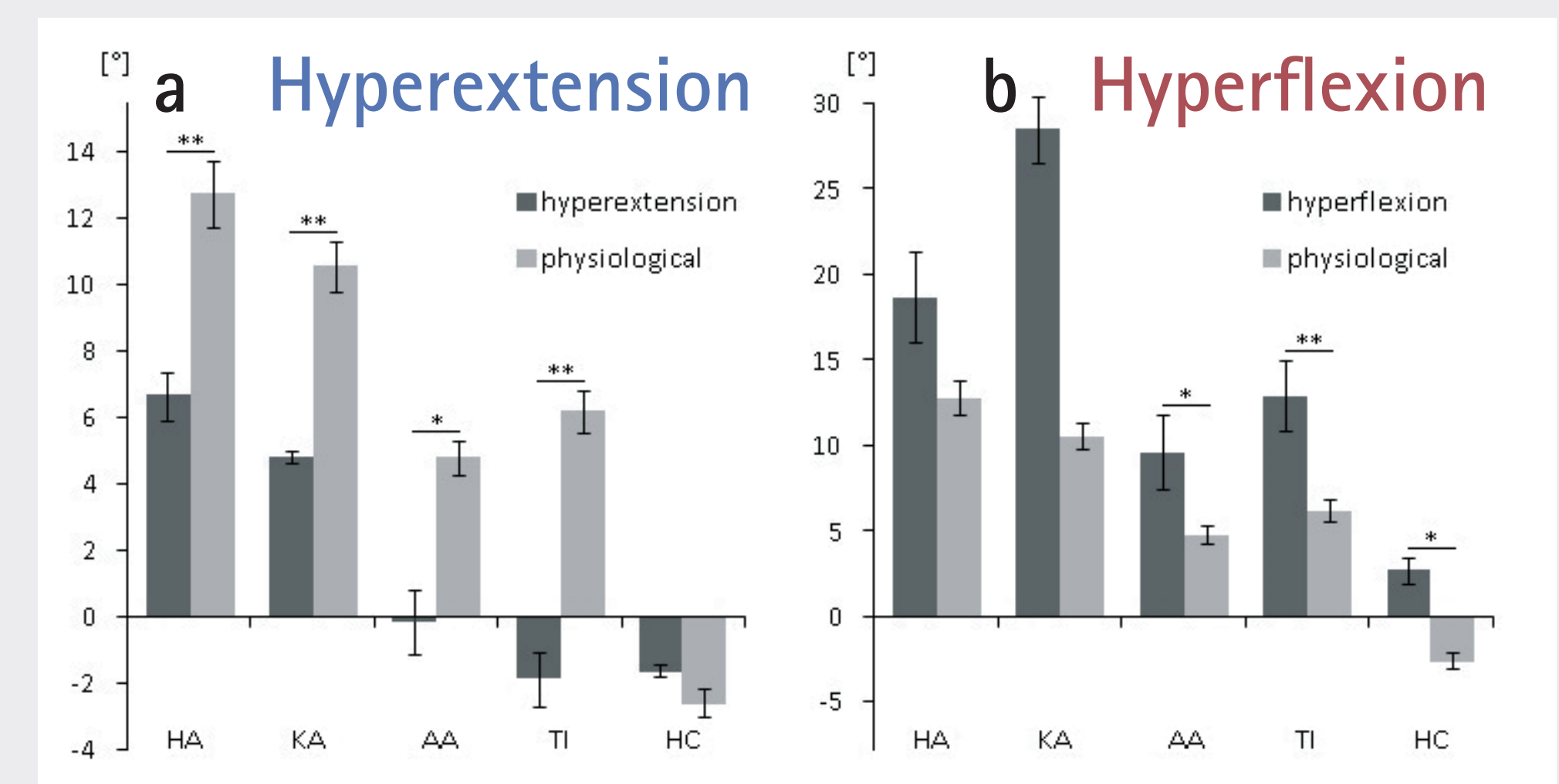


Fig. 4: joint angle [°] in mid stance compared to the physiological gait pattern at a) hyperextension and b) hyperflexion; valid is * p=0.05 and ** p=0.01

Conclusion

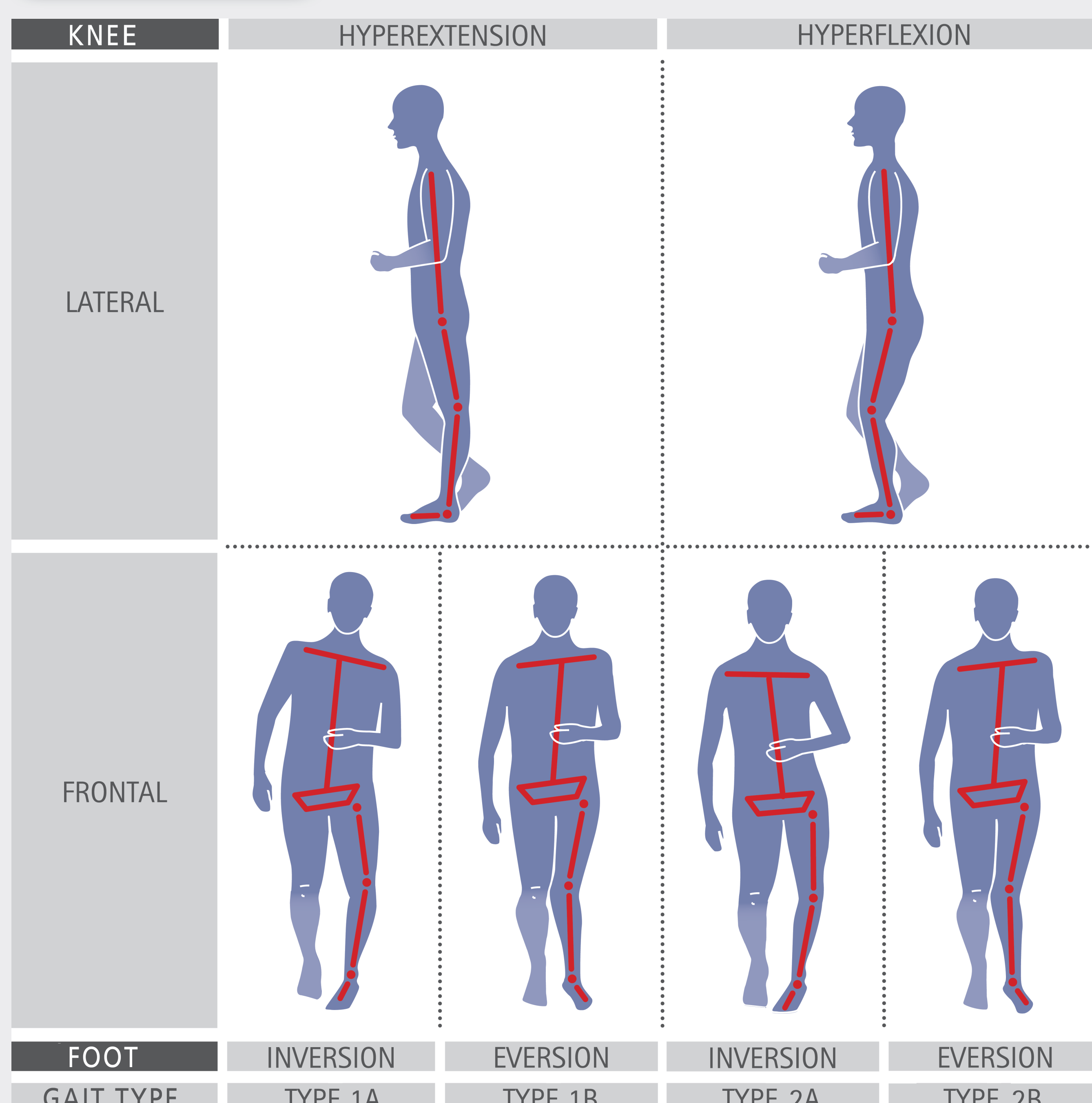


Fig. 5: Classification of apoplexy patients through the assessment of the knee and foot position

Qualitatively, a gait type with hyperextended knee (ankle in plantar flexion) and a gait type with hyperflexed knee (ankle in dorsiflexion) [3] were each determined at full heel contact [4] (fig. 1-3).

In table 1, the hyperextended gait type is statistically demonstrated by the KA and AA (fig. 4a) as the hyperflexed gait type is demonstrated by the AA (fig. 4b).

Unlike for the Amsterdam Gait Classification for CP [2], heel contact is not an important factor. However, the qualitatively determined inversive and eversive position of the foot in frontal plane is essential for the assessment of the gait pattern of apoplexy patients.

Based on this insight, a classification to standardise the orthotic treatment after a stroke has been introduced (fig. 5).

This classification is to be validated with more subjects.

Literature

- [1] Rodda, J, Graham HK (2001): Eur J Neurol 8(Suppl. 5): 98-108.
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- [3] Perry J, Burnfield JM (2010) Thorofare: Slack.
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