

## HIGHLIGHTS

- OFM repeatability measured in relation to 3 assessors with different backgrounds
- OFM was largely repeatable (most errors fell below 5°)
- Forefoot/hindfoot adduction errors exceed the total range of movement
- Future research should define acceptable level of repeatability/accuracy

## CAPTIONS FOR FIGURES

- Figure 1      a. Inter- and intra-assessor SEM  
                  b. Inter- and intra-assessor SEM + 95% confidence limits
- Figure 2      Normative data (mean +/- 1SD from 540 trials)
- Figure 3      Percentage of inter-assessor SEM (+95% CI) to total range of motion

## FIGURES

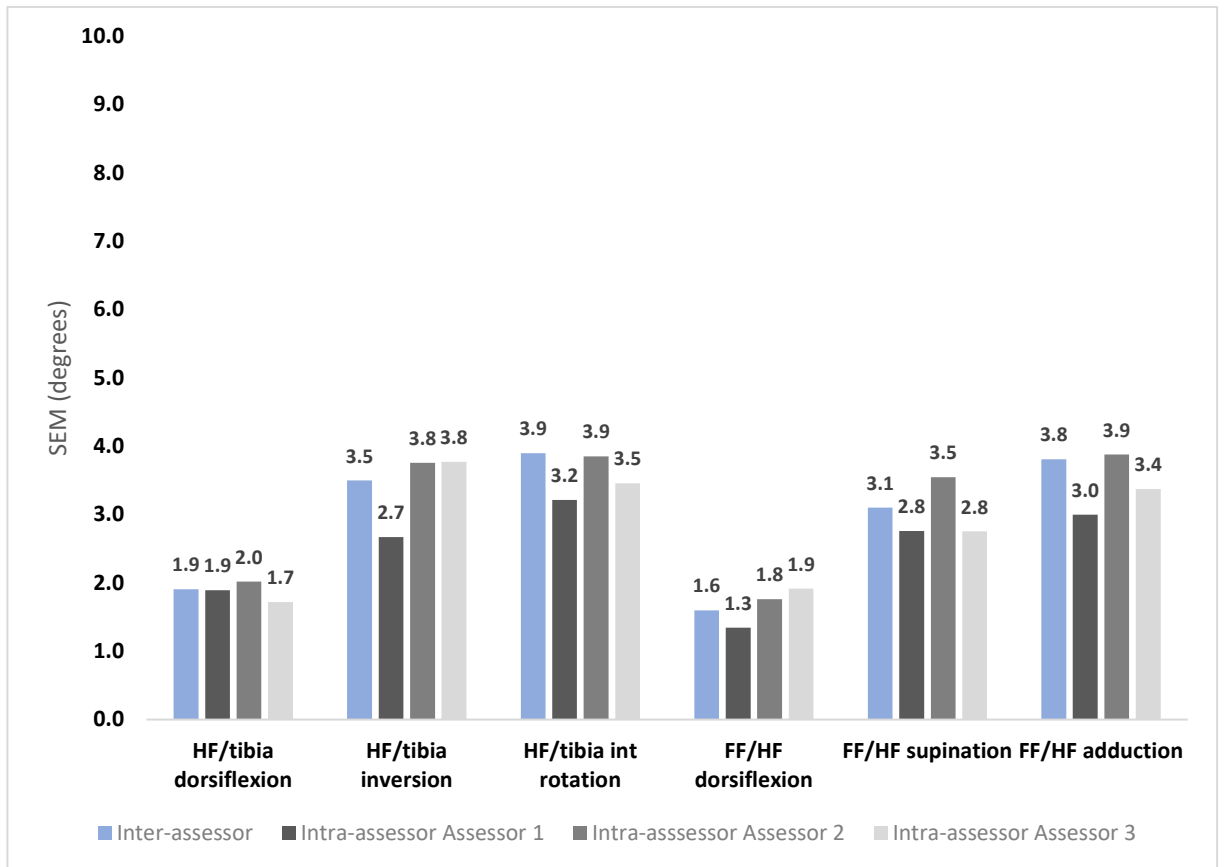


Figure 1a. (To be printed in colour)

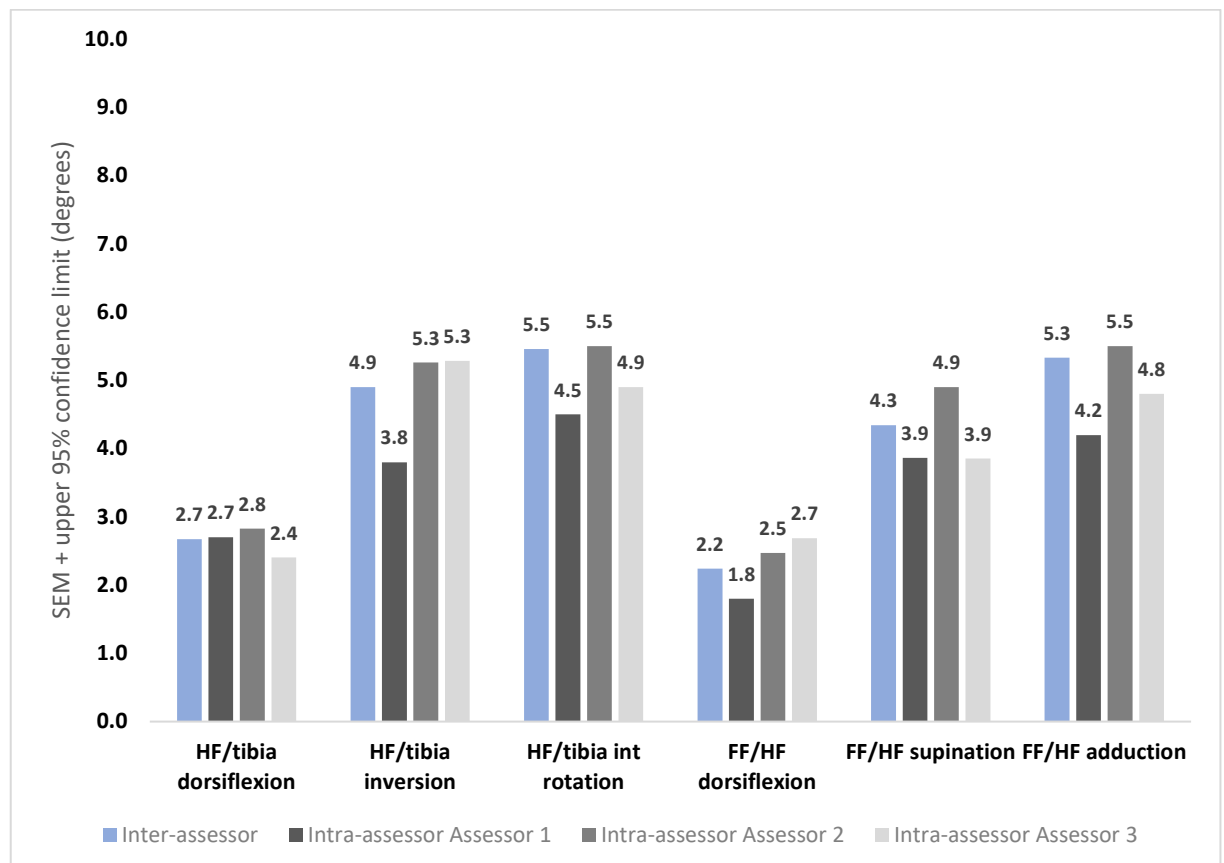


Figure 1b. (To be printed in colour)

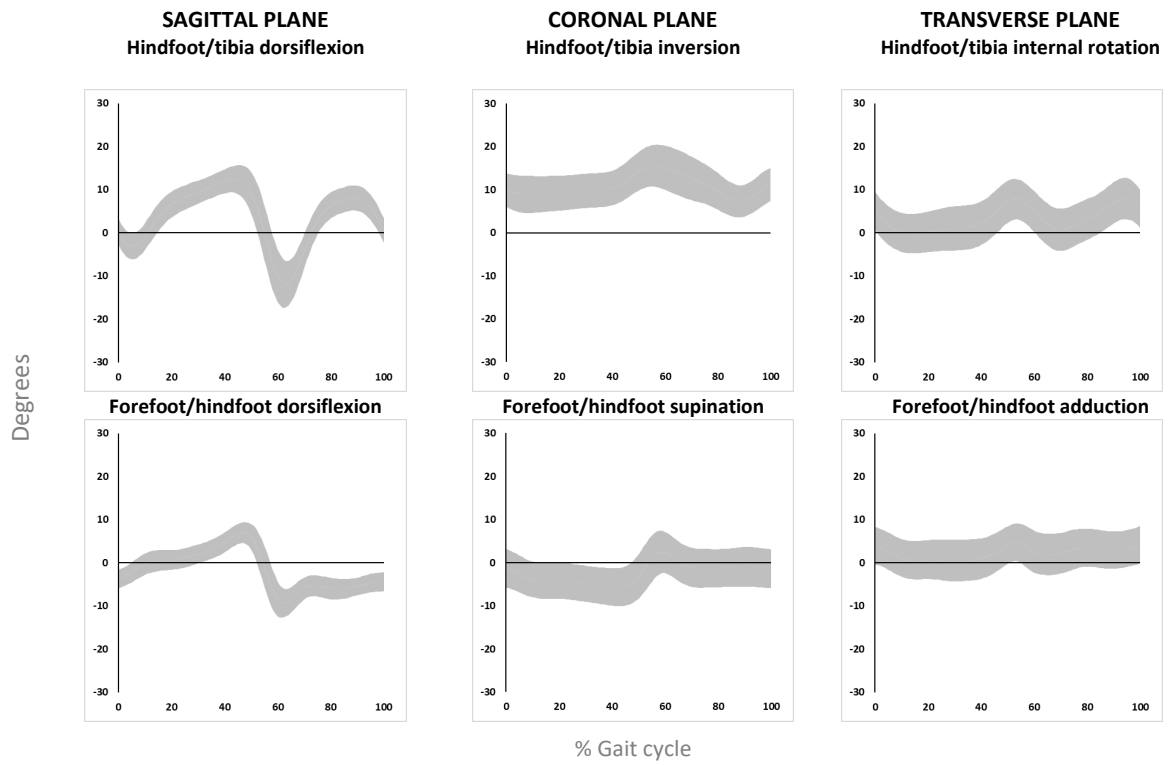


Figure 2

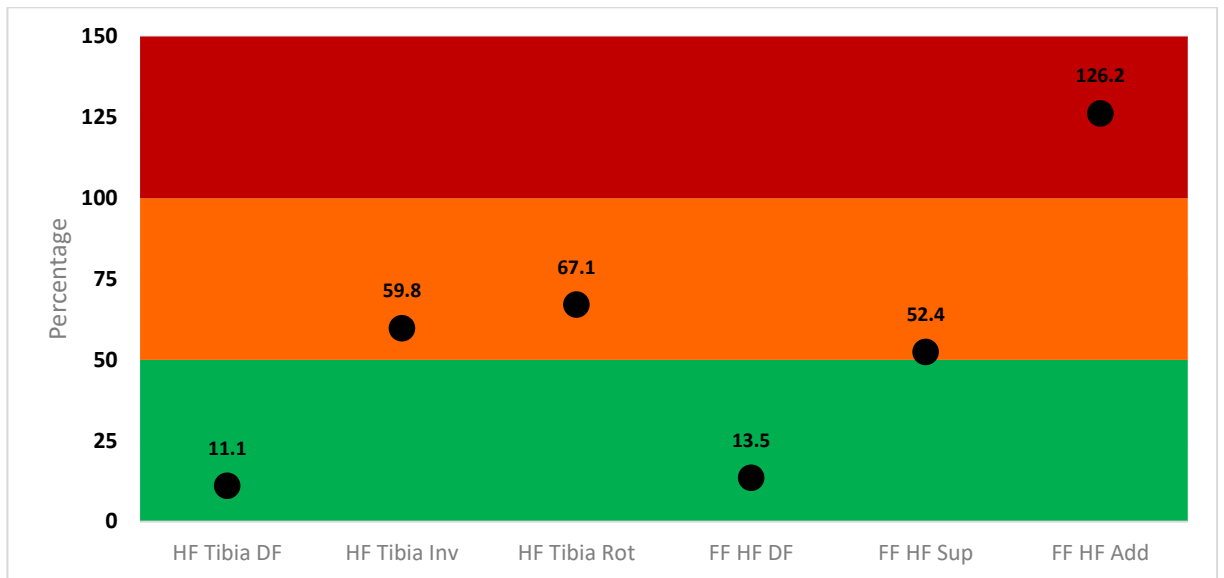


Figure 3 (To be printed in colour)

## TABLES

	Inter-rater repeatability	Intra-rater repeatability
<b>Step 1</b>	Data from up to six walking trials in each session were ensemble averaged (intended to minimise inter-trial variability as a component of the SEM)	As per inter-rater repeatability  Calculated following steps 1 and 2 to the left and then the procedure to the left except that calculations are performed separately for each assessor including only the three measurements made by that person on each participant. The number of degrees of freedom for each assessor is 20 and the upper 95% confidence limit is thus 1.4 times the SEM.
<b>Step 2</b>	An <i>individual SEM</i> ( $SEM_{i,t}$ ) was calculated for each participant (i) and time point (t) as the standard deviation of the ensemble averaged data across each session (this comprised measurements from each assessor)	An <i>individual SEM</i> ( $SEM_{i,t}$ ) was calculated for each participant (i) and time point (t) as the standard deviation of the ensemble averaged data across each assessor (this comprised measurements from sessions 1, 2 and 3)
<b>Step 3</b>	The <i>overall SEM</i> ( $SEM_t$ ) was calculated via the following steps: A) The root mean square average of the <i>individual SEM</i> for every time point of every participant for session 1 (all assessors) B) The root mean square average of the <i>individual SEM</i> for every time point of every participant for session 2 (all assessors) C) The root mean square average of the <i>individual SEM</i> for every time point of every participant for session 3 (all assessors) D) The average of the root mean square average for A, B and C, displayed for every time point	The <i>overall SEM</i> ( $SEM_t$ ) was calculated via the following steps: A) The root mean square average of the <i>individual SEM</i> for every time point of every individual for each assessor
<b>Step 4</b>	The <i>summary SEM</i> (SEM) was calculated by averaging Step 3 D across the gait cycle to provide one value for each joint angle	The summary SEM was calculated by averaging by step 3 A across the gait cycle to provide one value for each joint angle
<b>Step 5</b>	<p>The <i>upper 95% confidence limit (CL)</i> was calculated assuming that the variances follow a chi-squared distribution in which the CL can be expressed as a multiplier of the SEM (following Stratford et al [23])</p> $CL_{SEM}^{95\%} = \sqrt{\frac{dfe}{\chi^2_{(1-\alpha, dfe)}}} \cdot SEM$ <p>where <i>dfe</i> is the number of degrees of freedom</p> $dfe = n_p(n_m - 1)$ <p>and <math>n_p</math> is the number of participants and <math>n_m</math> is the number of measurements per participant, and <math>\chi^2_{(1-\alpha, dfe)}</math> is the chi-squared distribution for a probability level of <math>\alpha</math> and the same number of degrees of freedom. As there is no obvious clinical significance to the lower confidence limit a value of <math>\alpha=0.05</math> was used (rather than 0.025 as used by Stratford et al. [23])</p> <p>The number of degrees of freedom when calculating the inter- and intra-assessor values is 20 and the upper 95% confidence limit is thus 1.4 times the SEM</p>	

Table 1. Method of statistical analysis

	Author(s)	Sample (all healthy individuals)	Assessors	Type of analysis	Hindfoot tibia			Forefoot hindfoot		
					DF	Inv	Rot	DF	Sup	Add
INTER-ASSESSOR ERROR	Carson et al. [11]	2 adults	2	SEM (estimated from graph)	1.8°	3.4°	3.7°	3.6°	4.0°	4.8°
	Van Hove et al. [19]	9 adults	2	SEM 90% confidence (upper limit SEM averaged across loading and push off)	2.1°	3.4°	2.7°	1.4°	1.6°	1.1°
	This study	10 adults	3	SEM + 95% confidence limit	2.1°	4.5°	4.1°	2.3°	3.3°	4.0°
INTRA-ASSESSOR ERROR	Carson et al. [11]	2 adults	2	SEM (estimated from graph)	1.4°	3.0°	3.2°	2.9°	3.4°	4.3°
	Curtis et al. [16]	8 children	Not documented	TEM (mean value averaged across three rockers)	3.4°	3.8°	7.2°	1.7°	2.3°	3.0°
	Mahaffey et al. [17]	14 children	1	SEM (averaged across gait cycle events provided)	3.3°	2.9°	7.9°	4.2°	3.6°	3.2°
	McCahill et al. [18]	15 children (typical developing children only)	1	Mean absolute difference - range (estimated across graph)	2.1°	-	-	2.5°	-	-
				Mean absolute difference - average (estimated across graph)	-	3.2°	6.8°	-	3.8°	7.5°
				Mean absolute difference - maximum stance (estimated across graph)	3.9°	-	-	4.3°	-	-
				Mean absolute difference - maximum swing (estimated across graph)	4.1°	-	-	3.5°	-	-
	Stebbins et al. [12]	15 children	1	Within subject SD (based on maximum / minimum joint range version 5 of model)	2.8°	4.6°	6.6°	3.3°	5.4°	7.1°
				Within subject SD (based on range)	2.8°	2.0°	2.1°	2.7°	1.6°	2.4°
	Van Hove et al. [19]	9 adults	2	SEM 90% confidence (upper limit SEM averaged across loading and push off)	4.2°	3.4°	3.6°	3.7°	2.9°	3.3°
	Wright et al. [20]	17 adults	1	SEM 90% confidence (referenced to neutral stance and averaged across gait cycle events)	1.9°	1.1°	1.0°	1.9°	2.1°	0.9°
SEM 90% confidence (not referenced to neutral stance and averaged across gait cycle events)				1.5°	5.4°	2.2°	2.7°	5.0°	2.9°	
This study	10 adults	3	SEM + 95% confidence limit	2.4 to 2.8°	3.7 to 5.3°	4.5 to 5.4°	1.9 to 2.7°	3.9 to 5.0°	4.2 to 5.4°	

DF = Dorsiflexion; Inv = inversion; Rot = rotation; Sup = supination; Add = adduction; SEM Standard error of measurement; TEM = Typical error of measurement

Table 2. Summary of published OFM repeatability studies