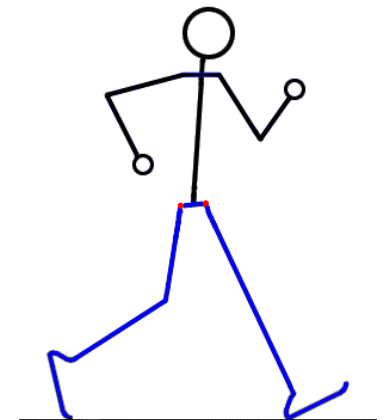




BIOMECÁNICA DE MIEMBRO INFERIOR

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Docente Escuela de Fisioterapia
Maestría en Fisioterapia





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Peak torque and rate of torque development in elderly with and without fall history[☆]

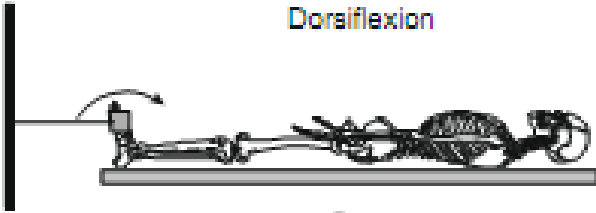
Paulo Cesar Barauce Bento^a, Gleber Pereira^b, Carlos Ugrinowitsch^c, André Luiz Felix Rodacki^{a,*}

Table 1

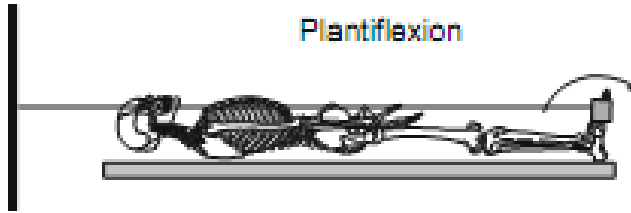
Mean (SD) physical characteristics of the participants of the non-fallers (GI), one fall (GII), and two or more falls (GIII) in the last 12 months.

	GI (n = 13)	GII (n = 08)	GIII (n = 10)	F	P
Age (years-old)	67.6 (7.5)	66.0 (4.9)	67.8 (8.8)	0.29	0.74
Body mass (kg)	73.5 (16.1)	73.3 (4.4)	75.8 (12.0)	0.24	0.78
Stature (cm)	157.9 (12.0)	157.5 (4.1)	157.1 (7.4)	0.04	0.96
BMI (m ² kg ⁻¹)	29.1 (3.9)	29.5 (3.0)	30.6 (2.1)	1.24	0.29

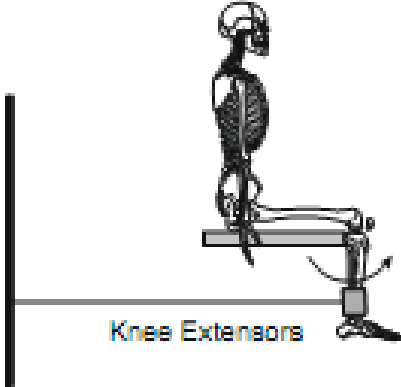
Dorsiflexion



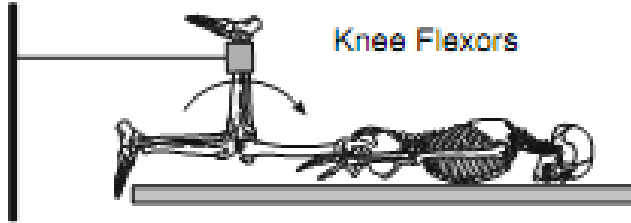
Plantiflexion



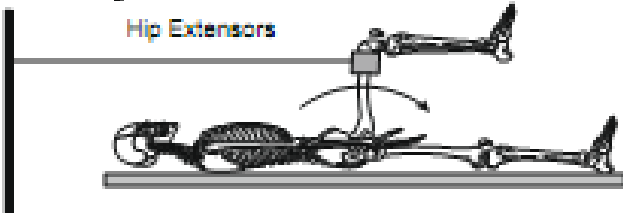
Knee Extensors



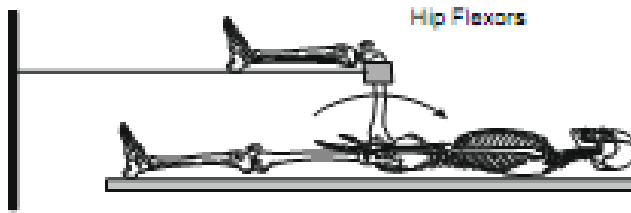
Knee Flexors



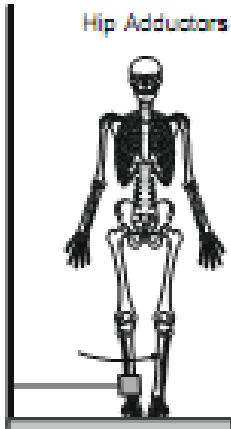
Hip Extensors



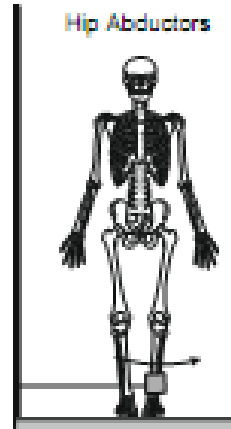
Hip Flexors



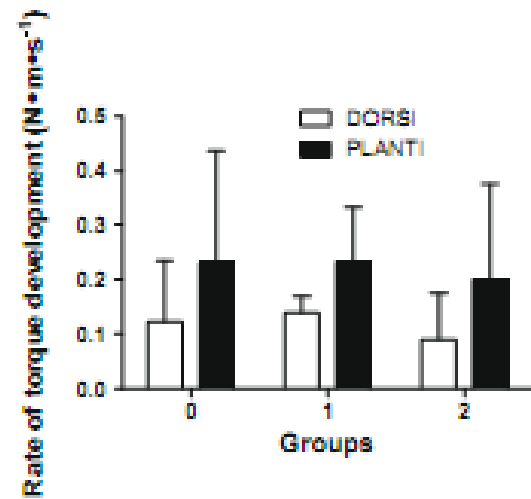
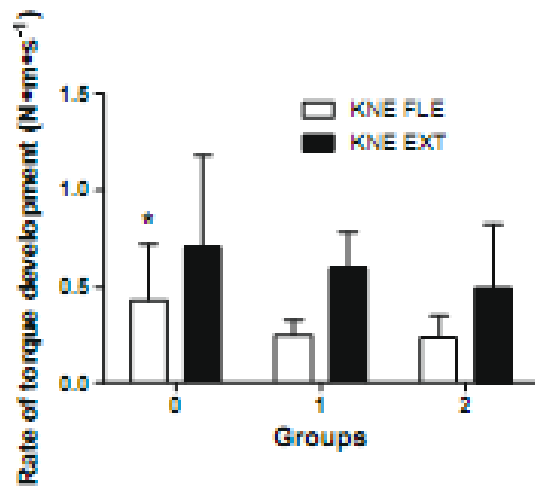
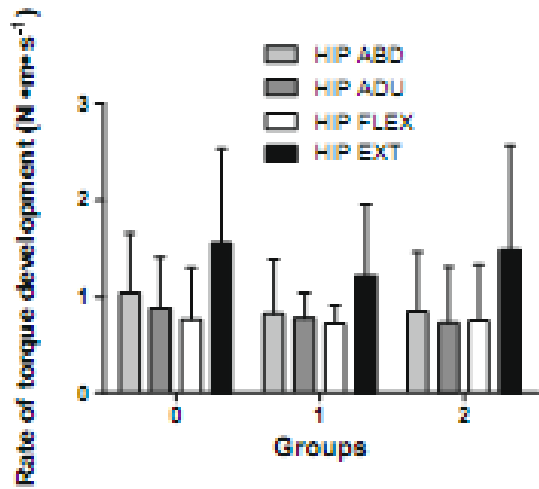
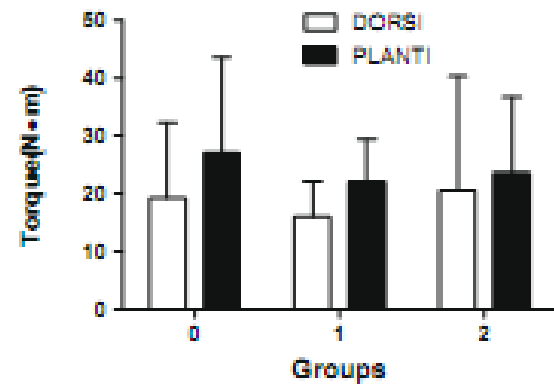
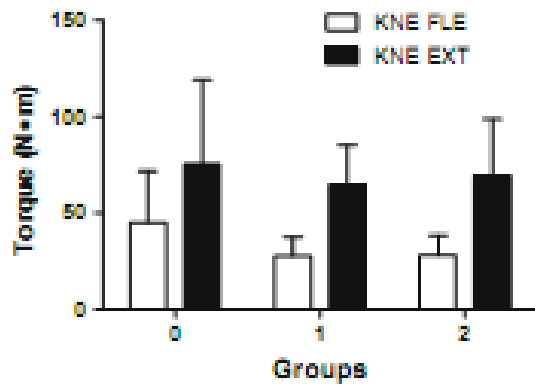
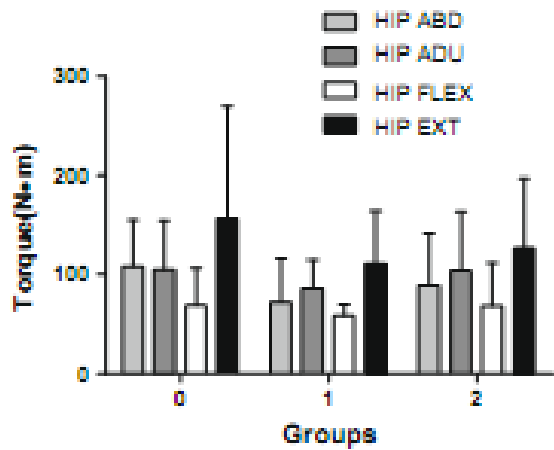
Hip Adductors



Hip Abductors



Célula de carga



Aplicaciones...

- El torque de los flexores de rodilla (GI) fue mayor que el observado en quienes tenían historial de caídas y tienen relación significativa con el número de caídas ($p < 0.05$).
- La generación de un torque mayor puede contribuir en recuperar el equilibrio después de deslizarse.

Reduced Hip Extension in the Elderly: Dynamic or Postural?

Laura W. Lee, MD, MBA, Keyvan Zavarei, MD, Jonathan Evans, MD, MPH, Jennifer J. Lelas, BA, Patrick O. Riley, PhD, D. Casey Kerrigan, MD, MS

ABSTRACT. Lee LW, Zavarei K, Evans J, Lelas JJ, Riley PO, Kerrigan DC. Reduced hip extension in the elderly: dynamic or postural? Arch Phys Med Rehabil 2005;86:1851-4.

Participantes: 25 adultos mayores (71 ± 5 años) y 25 adultos jóvenes (26 ± 5). Fueron evaluados mediante análisis de imagen, cuando asumían la posición de pie y caminaban a una velocidad confortable, lenta y mas rápida.

Table 1: Gait Characteristics: Hip Extension and Anterior Pelvic Tilt Kinematics

Group	Elderly	Young Adults
Hip extension (deg)		
Comfortable speed	7±6	11±6
Slow speed	6±6	9±5
Fast speed	9±6	14±6
Anterior pelvic tilt (deg)		
Comfortable speed	15±5	11±5
Slow speed	15±4	12±5
Fast speed	17±5	13±5

NOTE. Values are mean ± SD.

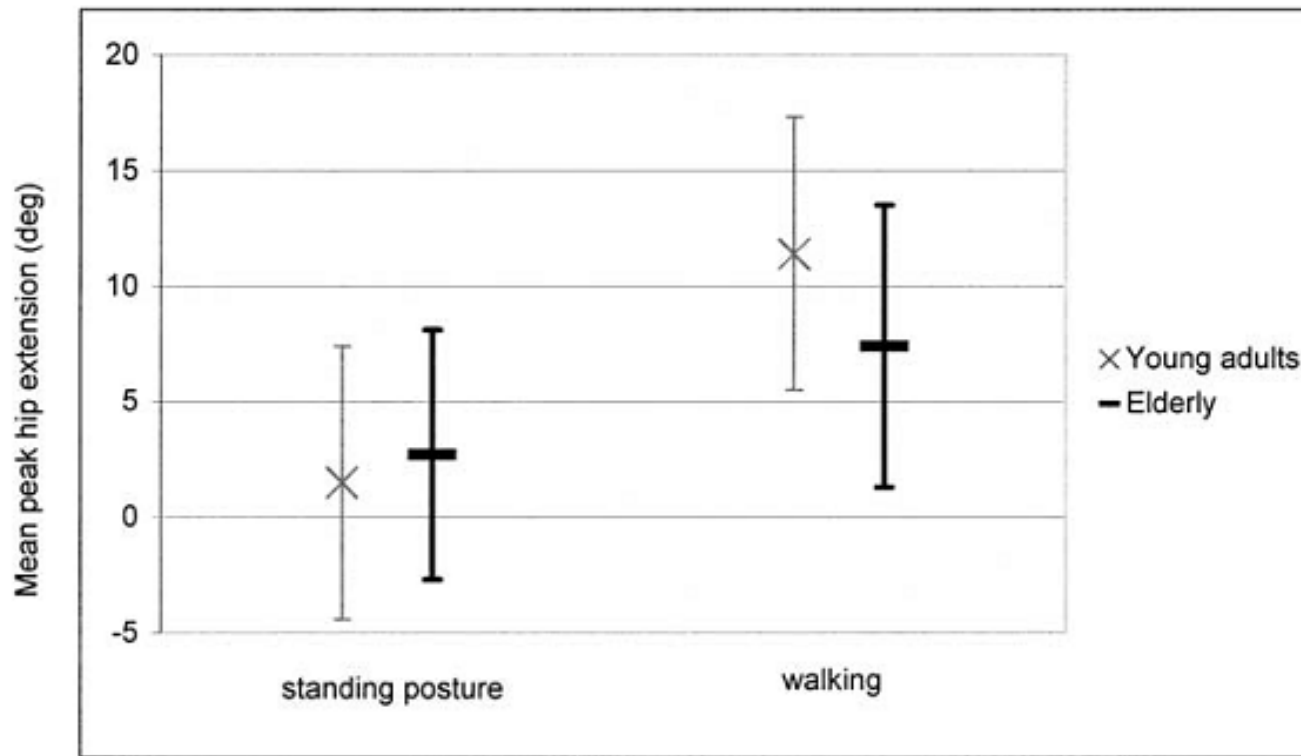
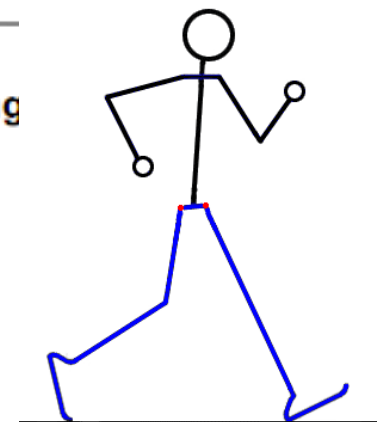


Fig 1. Comparison of peak hip extension in the elderly and young adult groups during standing and comfortable walking speed.



Aplicaciones...

- En adultos mayores la disminución del pico de extensión de cadera y el aumento de la inclinación pélvica anterior es un fenómeno más dinámico que postural, asociado con los cambios de velocidad.
- Las causas de estos cambios requieren de futuros estudios para aclarar su asociación con disminución en la fuerza, retracciones o limitaciones articulares.

Hip Abductor Function and Lower Extremity Landing Kinematics: Sex Differences

Cale A. Jacobs, PhD, ATC*†; Timothy L. Uhl, PhD, PT, ATC*;
Carl G. Mattacola, PhD, ATC*; Robert Shapiro, PhD*; William S. Rayens, PhD*



Figure 2. A demonstration of the functional landing task, which consists of the following: A, Double-leg hop. B, Hitting an overhead target. C, Landing on a single leg.

Participantes: 30 adultos jóvenes (15 hombres y 15 mujeres).



Table 1. Sex Differences in Hip and Knee Peak Joint Displacement During Jump Landing (Mean \pm SD)

Joint Rotation	Men, °	Women, °	<i>P</i>	Cohen <i>d</i>
Hip flexion	26.11 \pm 9.49	23.51 \pm 8.73	.41	0.28
Hip adduction	10.33 \pm 5.61	12.49 \pm 6.93	.33	0.34
Hip internal rotation	13.36 \pm 5.54	10.96 \pm 6.89	.25	0.38
Knee flexion	42.04 \pm 8.79	39.51 \pm 8.88	.41	0.29
Knee valgus	3.29 \pm 3.54	7.26 \pm 6.61	.04	0.75
Knee external rotation	3.72 \pm 2.67	3.85 \pm 5.35	.93	0.03

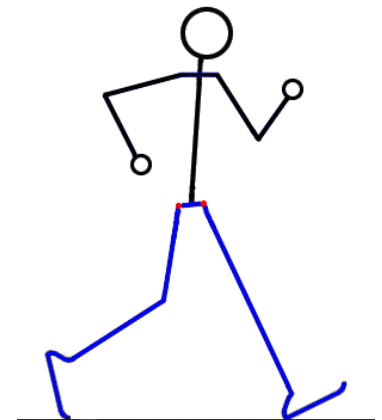
Table 2. Pearson Product Moment Correlation Coefficients (*r*) Between Hip Abductor Normalized Peak Torque and Peak Lower Extremity Joint Displacements of Men and Women

Peak Torque	Hip			Knee		
	Flexion	Adduction	Internal Rotation	Flexion	Valgus	External Rotation
Women	-.58*	-.40	-.04	.12	-.35	-.11
Men	.34	.20	.10	.32	.09	.40
Overall	.06	-.16	.16	.28	-.30	.06

*Significant correlation (*P* < .05)

Aplicaciones...

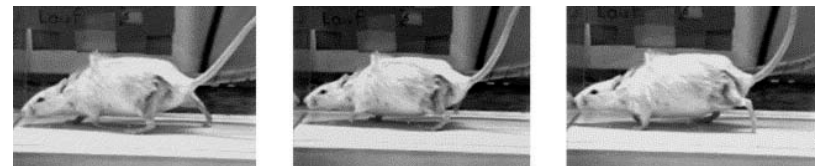
- En mujeres fue menor el pico de torque de los abductores y mayor el valgo de rodilla durante el aterrizaje.
- Las correlaciones entre la fuerza de los abd y la cinemática del salto fue mayor en mujeres que hombres.

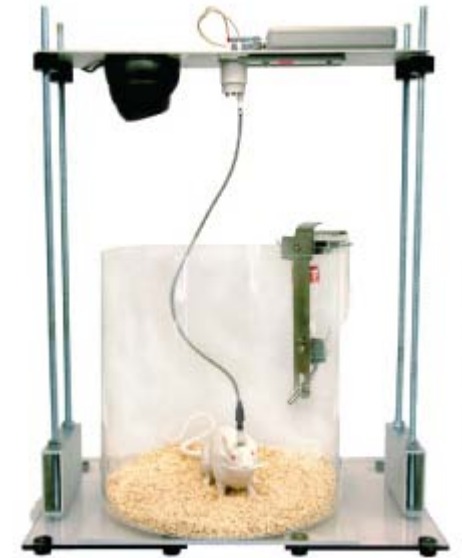
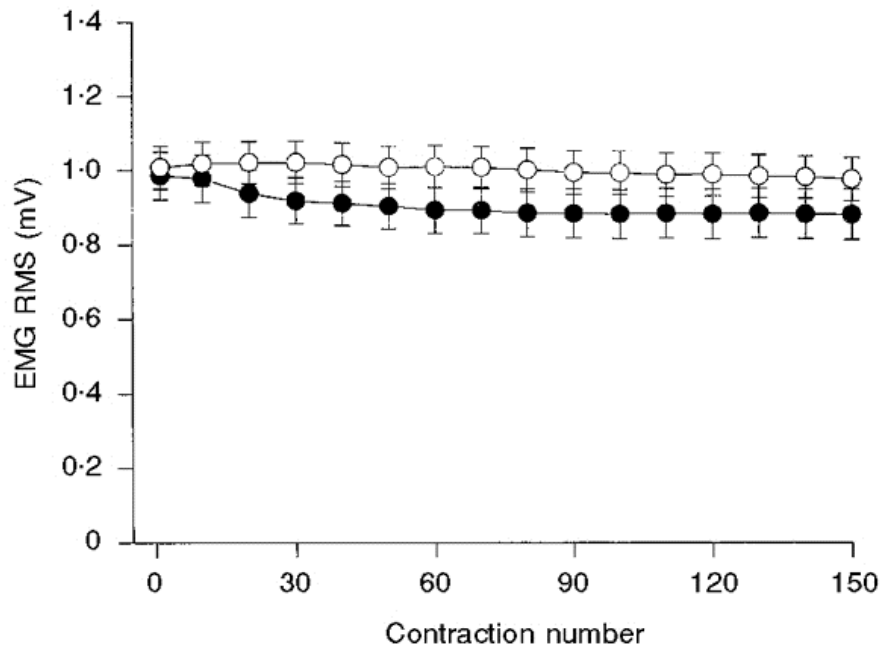
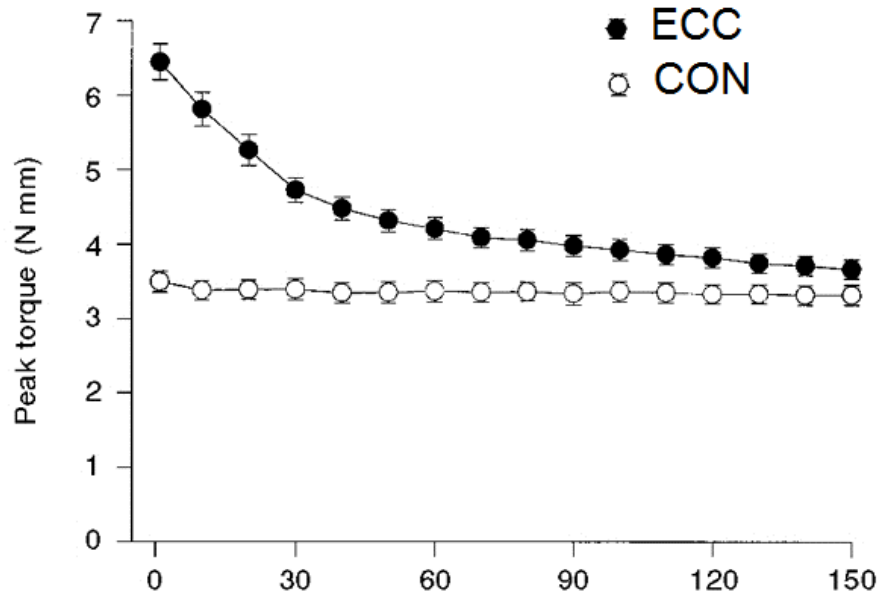


Uncoupling of *in vivo* torque production from EMG in mouse muscles injured by eccentric contractions

[Gordon L Warren](#), [Christopher P Ingalls](#), [Shree J Shah](#), and [R B Armstrong](#)

- En 12 ratones se implantaron los electrodos en el tibial anterior izquierdo, para señal EMG.
- El crural anterior fue anestesiado y se realizaron 150 contracciones excéntricas (ECC) o 150 concéntricas (CON).

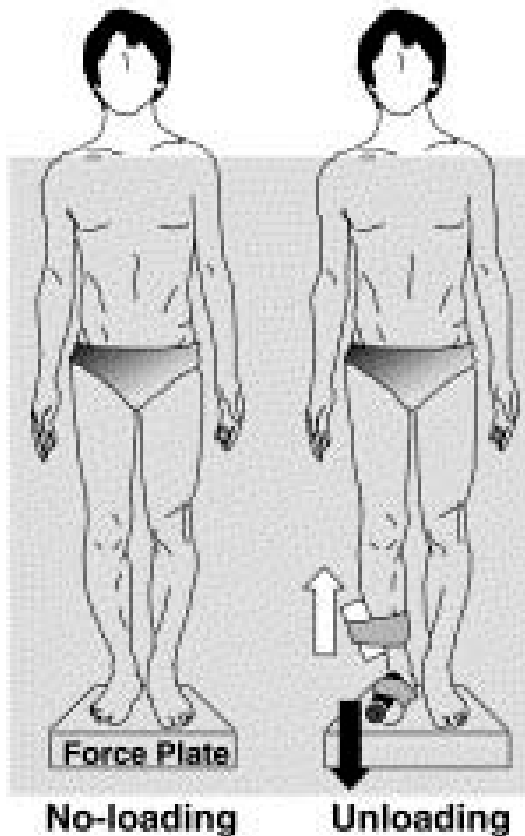




Mean (s.e.m.) peak torque (A) and EMG RMS (B) produced during the two 150 contraction protocols

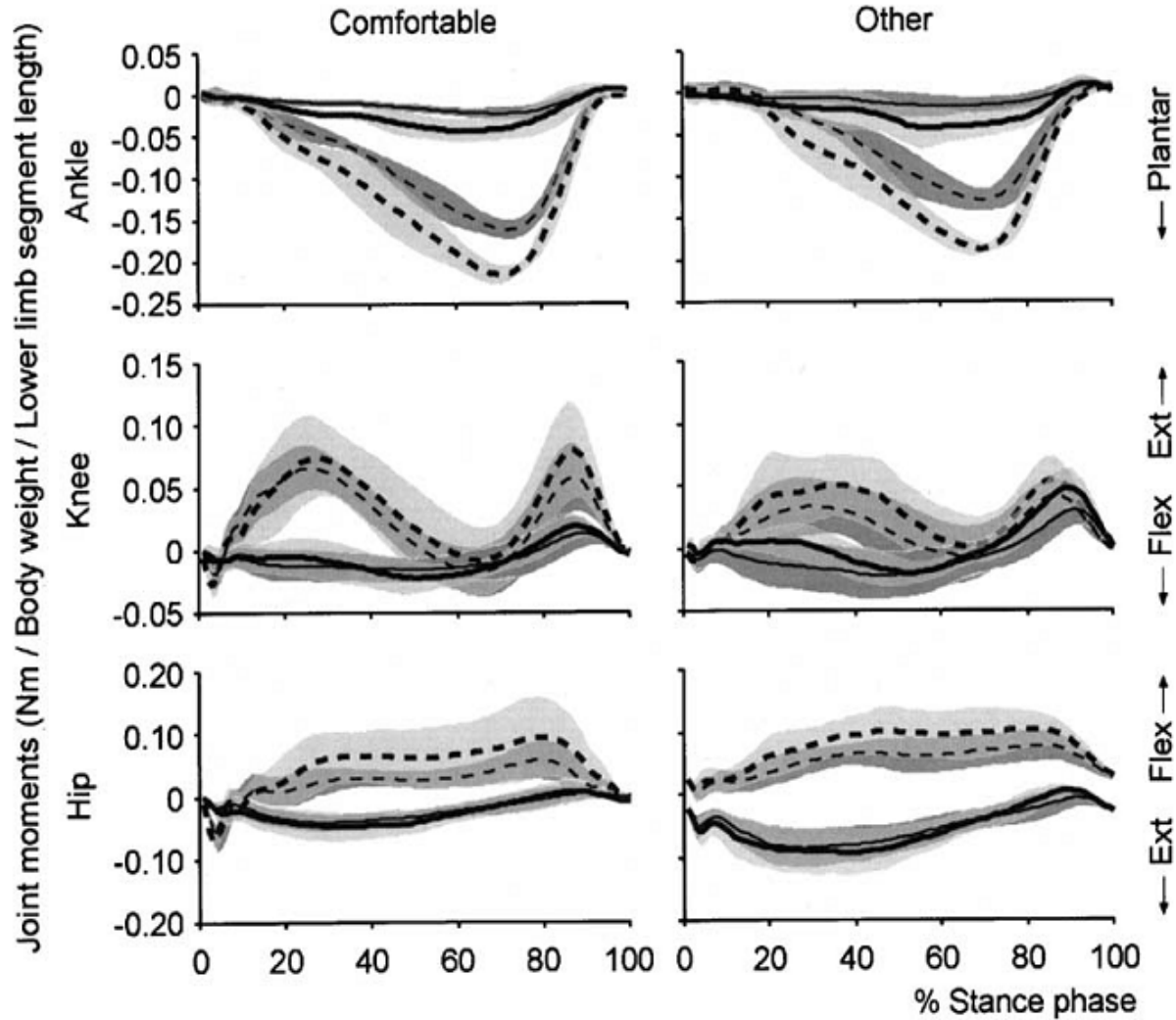
Functional roles of lower-limb joint moments while walking in water

Tasuku Miyoshi ^{a,*}, Takashi Shirota ^b, Shin-Ichiro Yamamoto ^b,
Kimitaka Nakazawa ^a, Masami Akai ^a

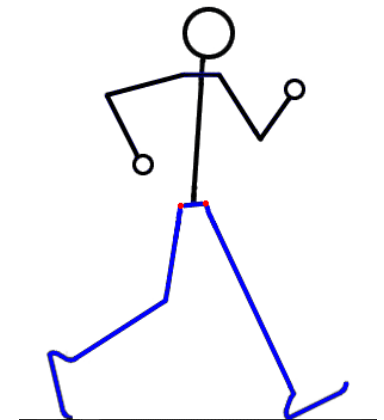


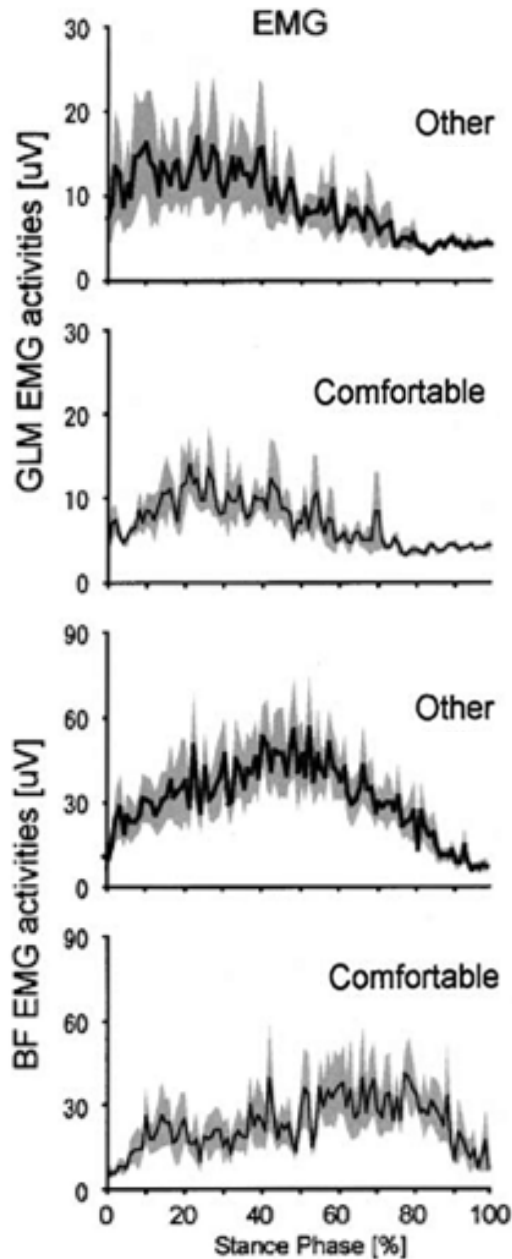
Participantes: 16 adultos jóvenes (12 hombres y 4 mujeres).

Caminaron en la tierra y el agua, en la velocidad preferida y en otras velocidades; con carga y sin carga adicional.

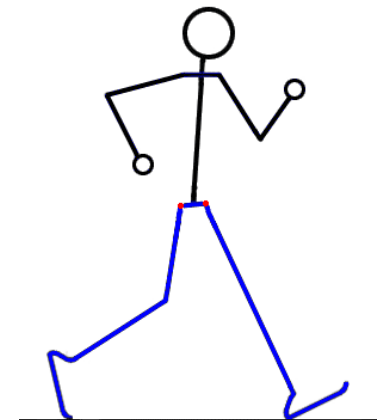


- - - - tierra sin peso
- . - . tierra con peso
- agua sin peso
- (thick) agua con peso





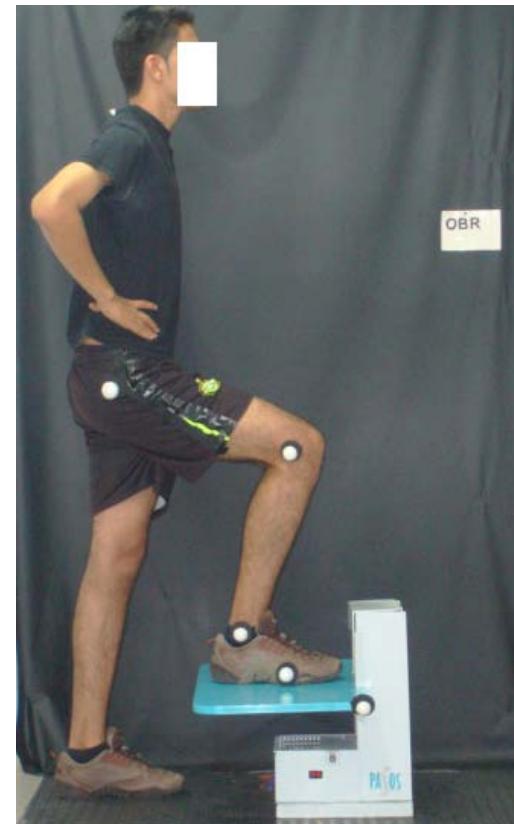
EMG del glúteo mayor y el biceps femoral en el agua.



Aplicaciones...

- Los extensores de cadera contribuyen en la propulsión.
- El aumento en la velocidad de la marcha, incrementa el momento extensor de cadera.
- El peso adicional incrementa el momento plantiflexor y extensor de rodilla.
- En el agua se reducen los torques articulares y cambia la coordinación intersegmental.

Patiño MS, Florez JL, Zarate L. Reproducibilidad inter-evaluador e intra-evaluador de la medición con fotogrametría, de los ángulos de flexión de cadera en el cajón estandar y con altura ajustable, aplicada en estudiantes universitarios. UIS, 2011.



Participantes: 20 estudiantes de la UIS, talla promedio total de 1,66 m \pm 0,08, peso de 62,05 kg \pm 11,45 y un IMC de 22,29 kg/m² \pm 3,50.

Promedio (X) y desviación estándar (DE) para los dos evaluadores y totales, de las dos mediciones de los ángulos de flexión de cadera, en el cajón estándar (FlexE) y de altura ajustable (FlexA). (n=20)

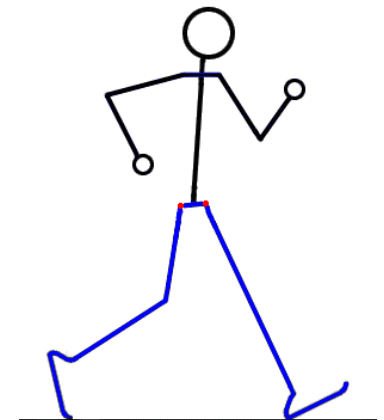
Variable	Evaluador 1		Evaluador 2		TOTAL
	X	DE	X	DE	
FlexE1	88.02	4.84	89.8	4.35	88.82 \pm 0.94*
FlexE2	88.01	5.14	89.48	4.78	
FlexA1	69.8	3.95	70.19	3.89	70.09 \pm 0.45**
FlexA2	69.7	4.19	70.7	3.83	

* cajón estándar ** cajón ajustable

Reproducibilidad intra-evaluador (CCI) de la medición de los ángulos de flexión de la cadera en los cajones estándar y ajustable, utilizando el software de análisis postural (SAPO). (n=20)

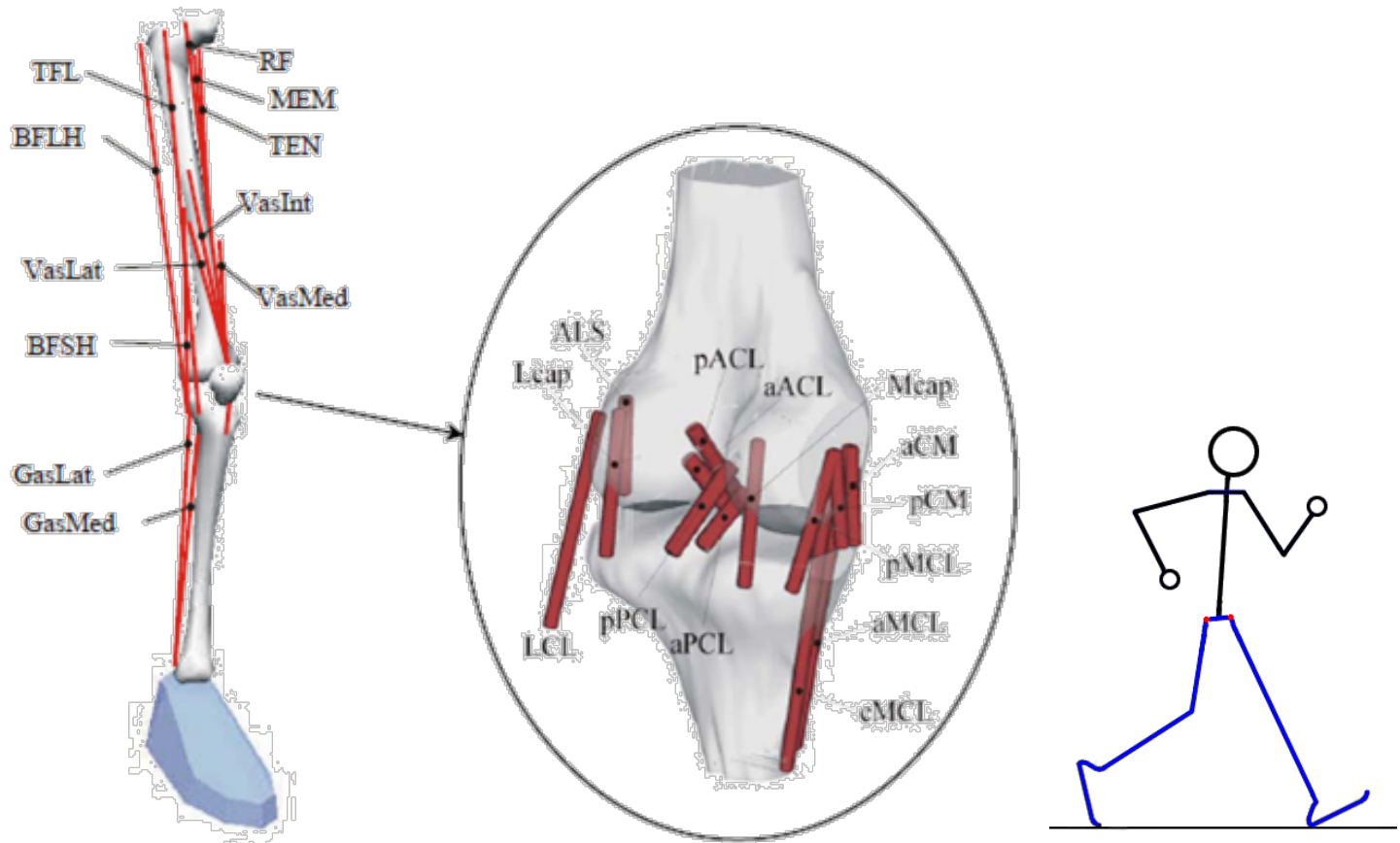
Variable	Evaluador 1		Evaluador 2	
	CCI	(IC 95%)	CCI	(IC 95%)
I	0.997	(0.991-0.999)	0.980	(0.949-0.992)
II	0.998	(0.994-0.999)	0.987	(0.968-0.995)

- I. *Ángulo de flexión de cadera en el cajón estándar.*
- II. *Ángulo de flexión de cadera en el cajón ajustable.*

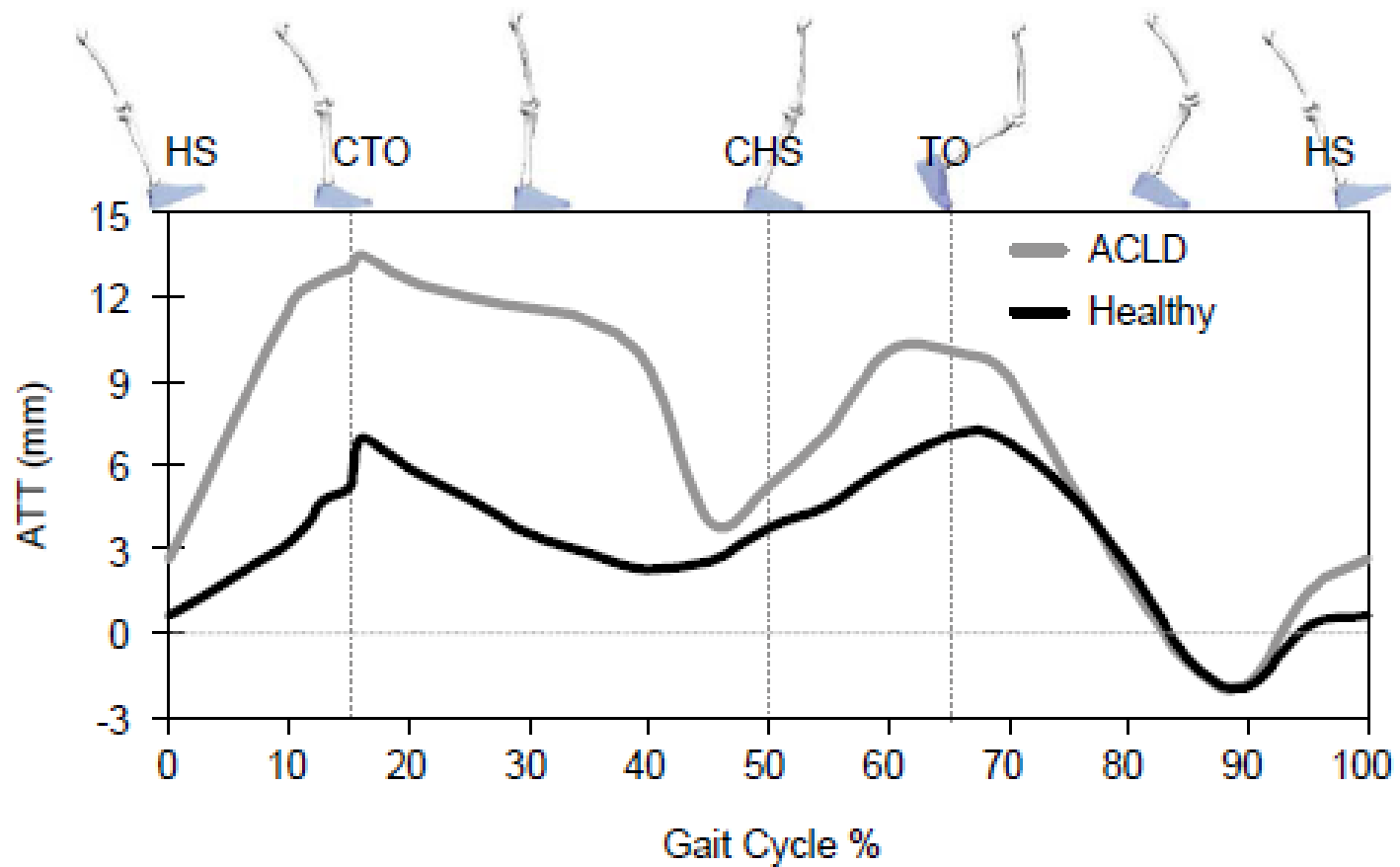


Comparison of shear forces and ligament loading in the healthy and ACL-deficient knee during gait

Kevin B. Shelburne^{a,*}, Marcus G. Pandy^b, Michael R. Torry^a



Traslación tibial anterior



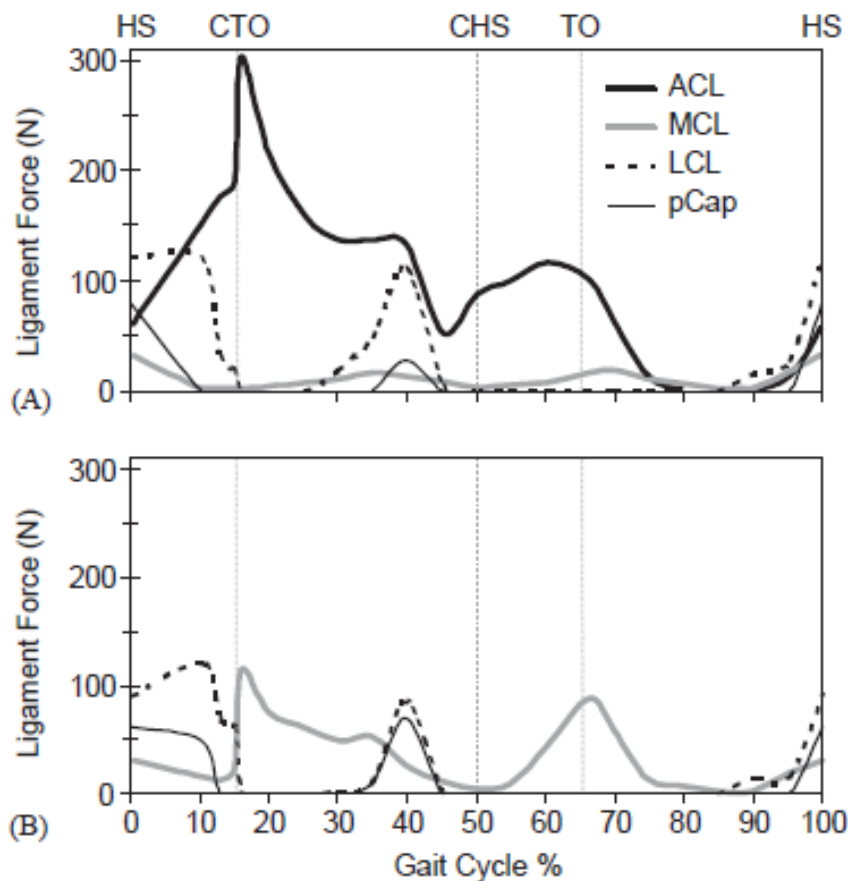


Fig. 3. Ligament forces calculated for the ACL-intact knee (A) and for the ACL-deficient knee (B) for one complete cycle of gait.

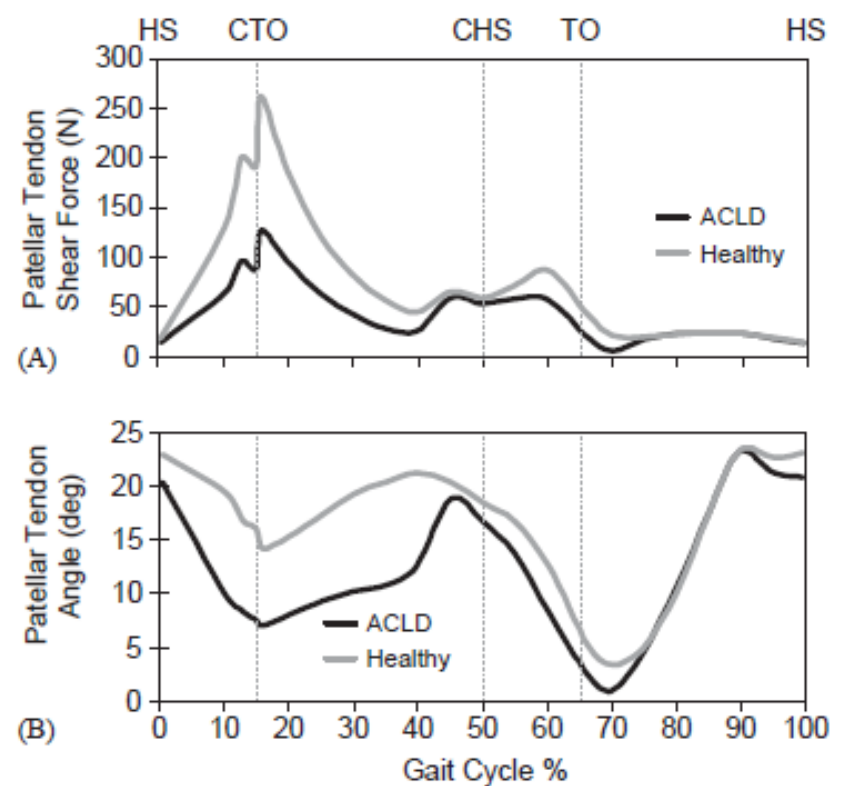


Fig. 5. (A) Shear force applied by the patellar tendon in the ACL-deficient model and in the ACL-intact model for one full cycle of walking. (B) Angle subtended by the patellar tendon and the long axis of the tibia in the ACL-deficient model and in the ACL-intact model for one cycle of gait.

Aplicaciones en lesión LCA...

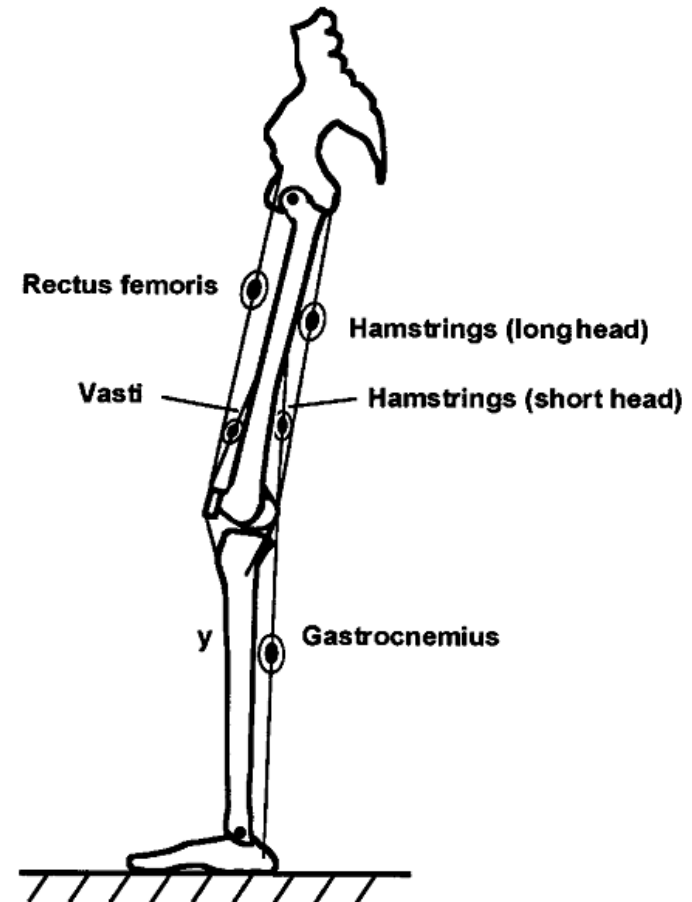
- La traslación tibial anterior se aumenta en la fase de apoyo.
- El LCM fue el primer restrictor de la traslación anterior.
- El ángulo de tracción del tendón patelar disminuye y se genera menor fuerza.

Influence of Anthropometric and Mechanical Variations on Functional Instability in the ACL-Deficient Knee

WEN LIU¹ and MURRAY E. MAITLAND²

¹Department of Physical Therapy Education, The University of Kansas Medical Center, Kansas City, Kansas
and ²School of Physical Therapy, University of South Florida, Tampa, Florida

Modelo matemático de rodilla, simulando el torque flexor en la fase de apoyo.



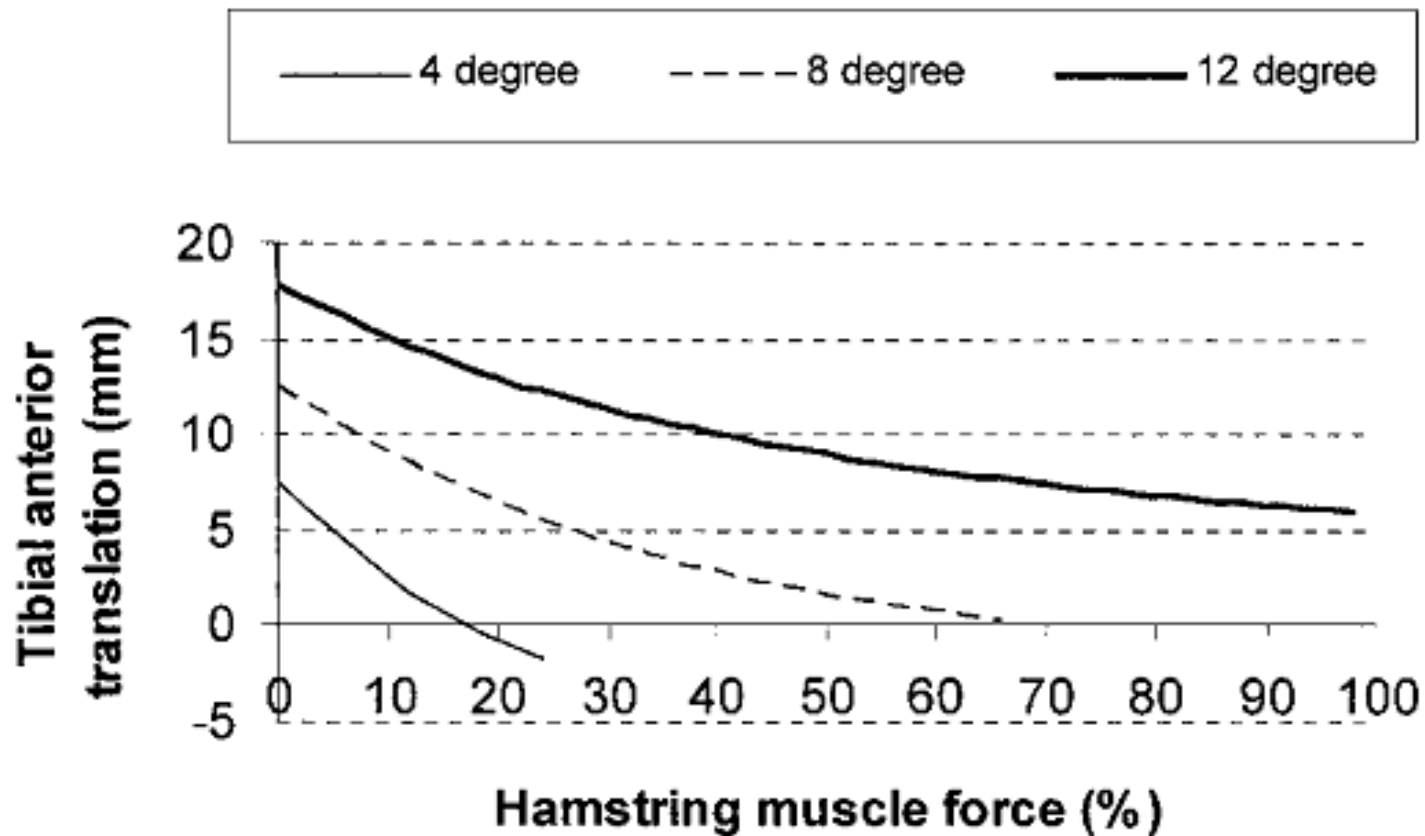


FIGURE 2. Simulated results of tibial anterior translation (mm) as the function of incremental hamstring muscle forces with three different values of the slope of tibial plateau (i.e., 4°, 8°, and 12° shown in the legend box) in the ACL-deficient knee.

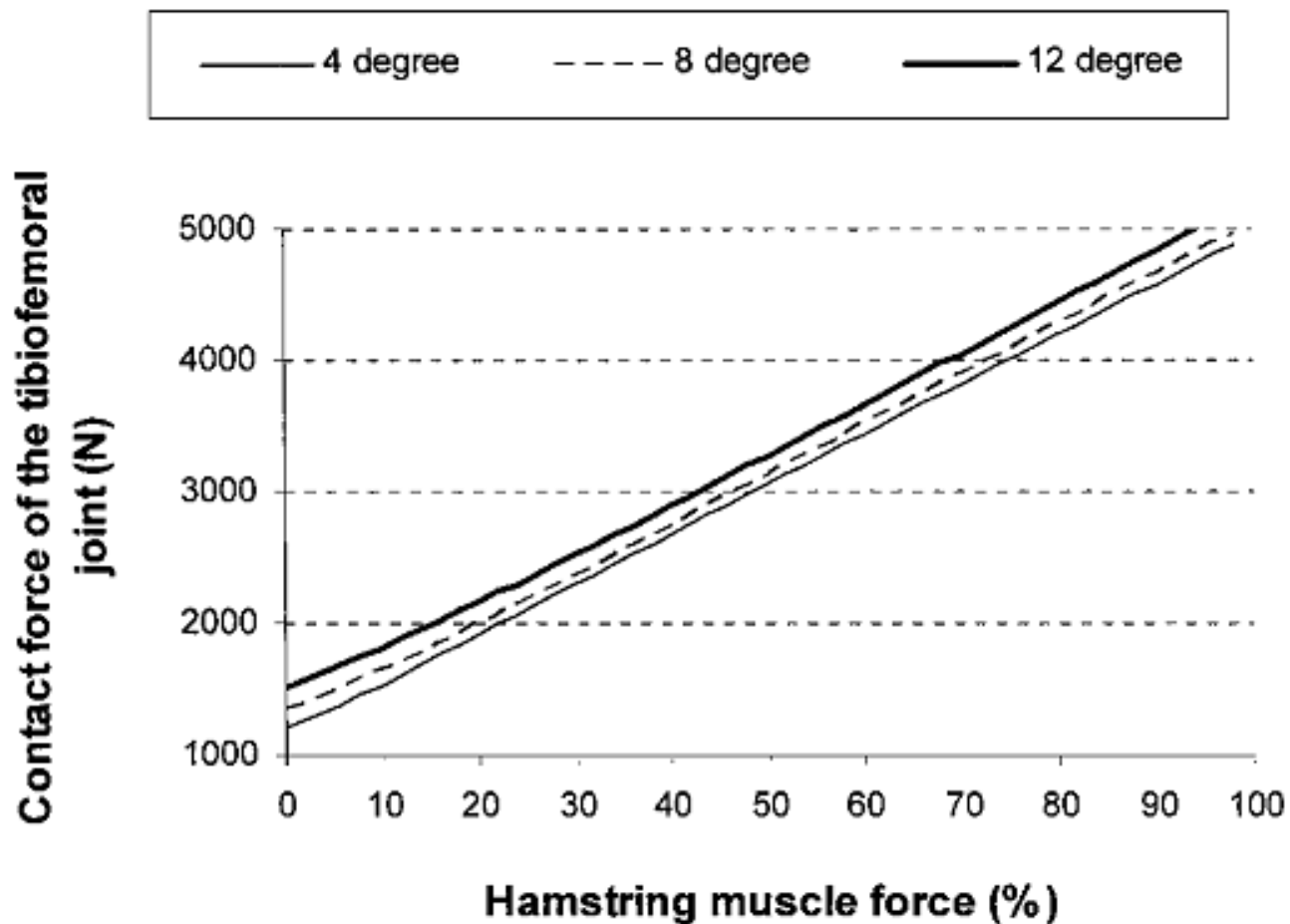


FIGURE 3. Simulated results of contact forces of the tibiofemoral joint as the function of incremental hamstring muscle forces with three different values of the slope of tibial plateau (i.e., 4°, 8°, and 12° shown in the legend box) in the ACL-deficient knee.

Aplicaciones...

- Incremento de la traslación tibial en LCA lesionado.
- Se deben considerar las variaciones morfológicas del individuo (inclinación patillos tibiales).
- Las características antropométricas del individuo también influyen en el deslizamiento tibial.

Rate of Force Application During Knee Arthrometer Testing Affects Stiffness But Not Displacement Measurements

Steven M. Gross, MEd, ATC¹

Christopher R. Carcia, PT, PhD, SCS²

Bruce M. Gansneder, PhD³

Sandra J. Shultz, PhD, ATC, CSCS⁴

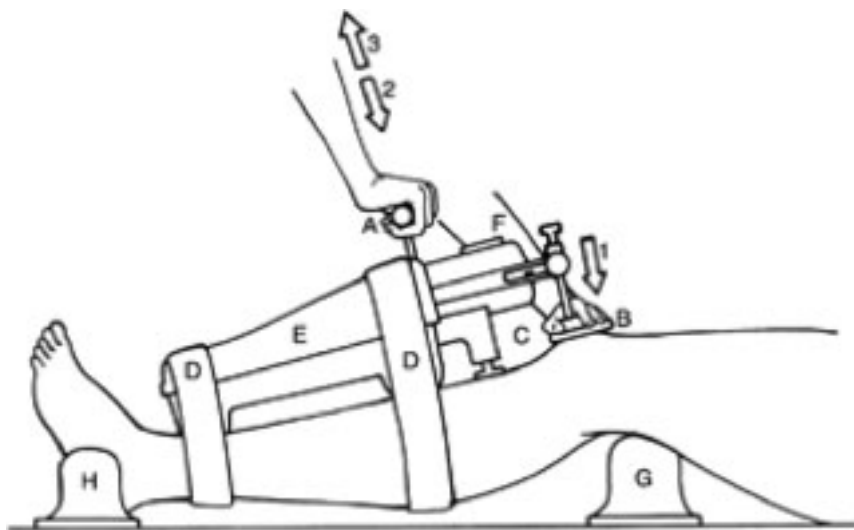


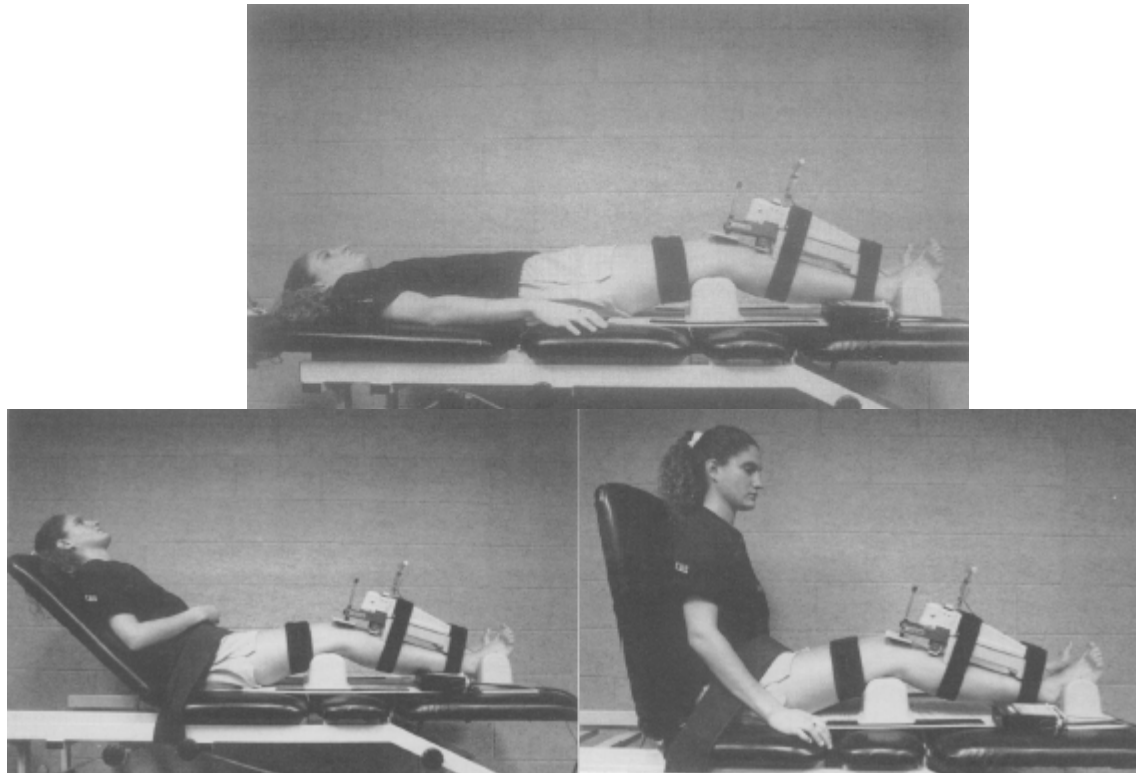
Table 1 Kneelax and KT-1000 Measurements

Force	Right	Left	R-L
Kneelax			
67N	4.2 (1.2)	4 (1.7)	0.2
89N	5.0 (1.4)	4.8 (1.8)	0.2
134N	6.2 (1.6)	6.1 (2.3)	0.1
Mmax	7.5 (1.8)	7.2 (2.6)	0.3
KT-1000			
67N	5.7 (1.3)	5.3 (1.6)	0.4
89N	6.4 (1.6)	6.3 (1.8)	0.1
134N	7.6 (1.8)	7.5 (2.3)	0.1
Mmax	8.7 (1.3)	8.7 (2.9)	0

Note: Expressed in millimeter translation.

Effect of Trunk Position on Anterior Tibial Displacement Measured by the KT-1000 in Uninjured Subjects

William G. Webright, MEd, PT, ATC; David H. Perrin, PhD, ATC;
Bruce M. Gansneder, PhD



Participantes: 15 adultos jóvenes saludables (10 hombres y 5 mujeres).

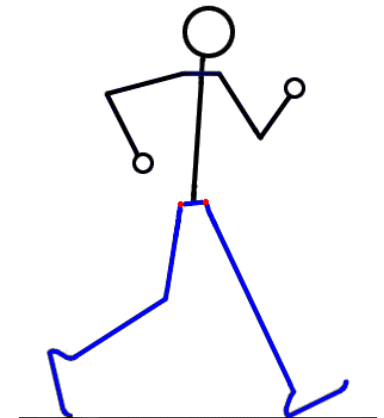
- El desplazamiento fue de 7.9 ± 2.3 mm (supino), 8.1 ± 2.5 mm (45°) y 8.3 ± 2.6 mm (90°).

Average Anterior Displacement (mm) of Uninjured Knees at 133 N (30 lb) with Subject in Supine Lachman Position

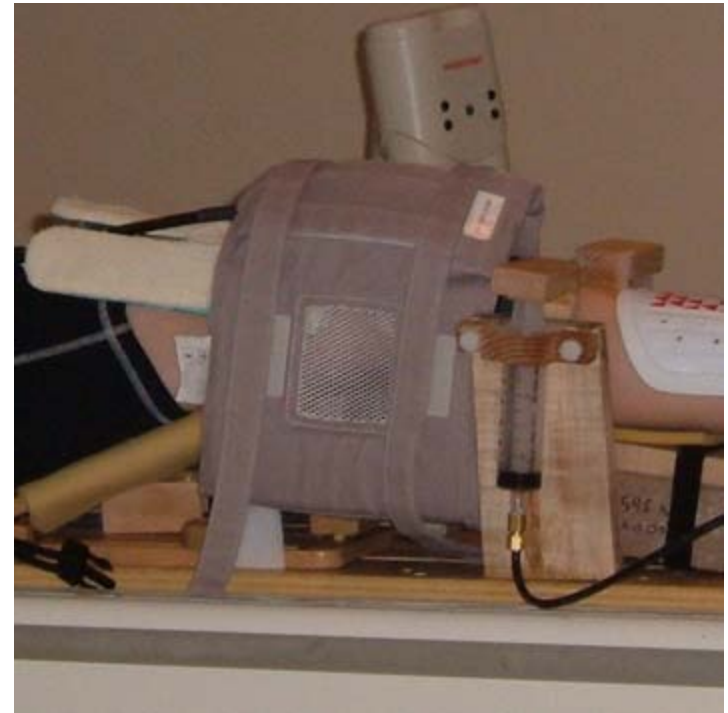
Source	<i>n</i>	Mean	SD
Daniel and Stone ¹⁹	37	6.8	NA
Highgenboten et al ⁷	30	6.1, 7.6*	± 2.0, ± 2.3*
Steiner et al ²²	28	4.6	NA
Present study	15	7.9	± 2.3

* = right, left knees

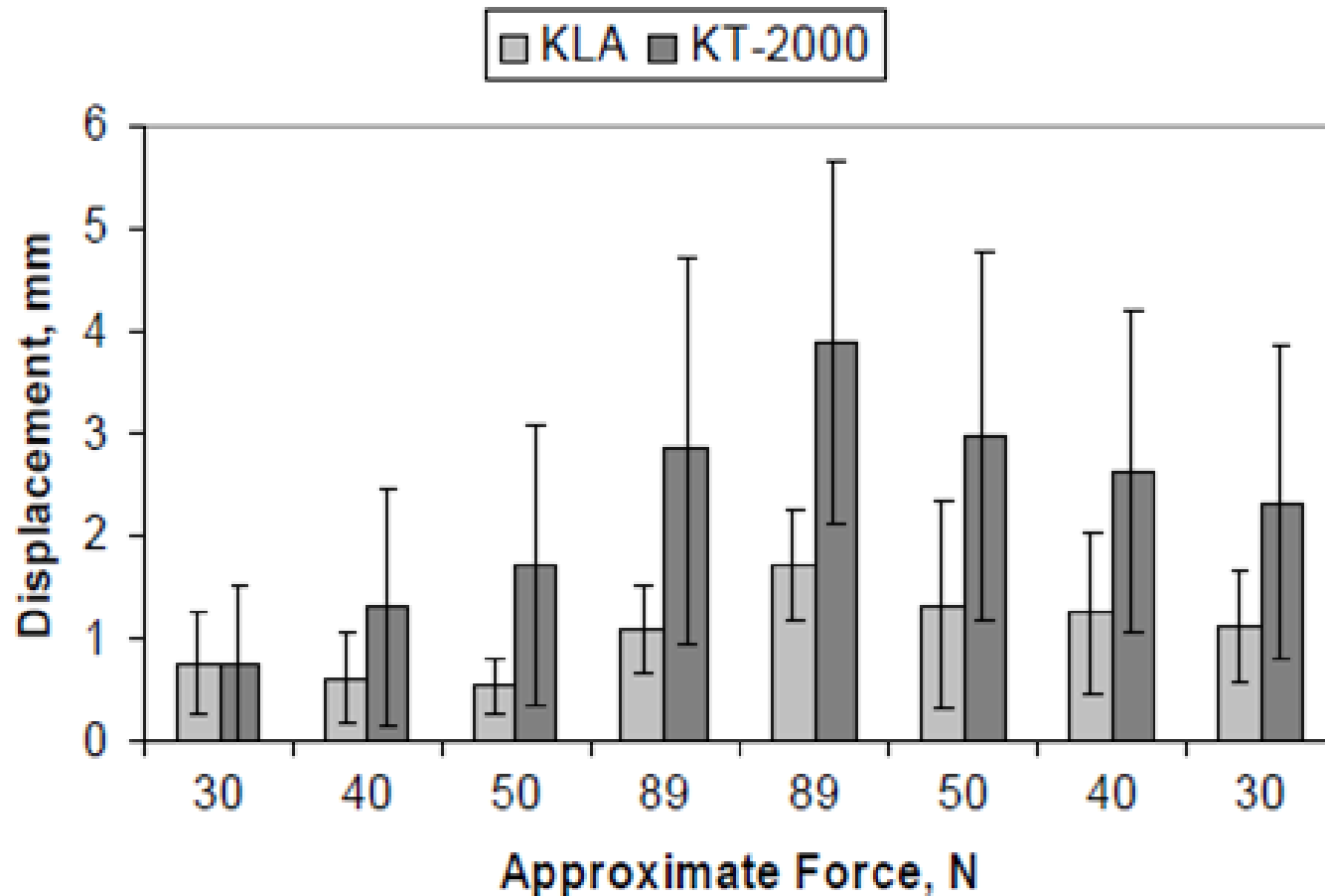
NA = not available



UNIVERSITY OF CALGARY
Küpper J. A Novel Measure of In-Vivo Knee Joint Laxity.



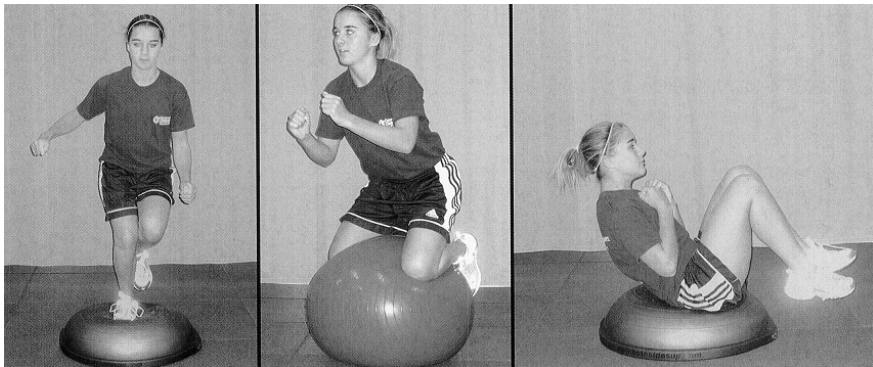
Participantes: 5 adultos saludables, evaluados con artrómetro y equipo de resonancia



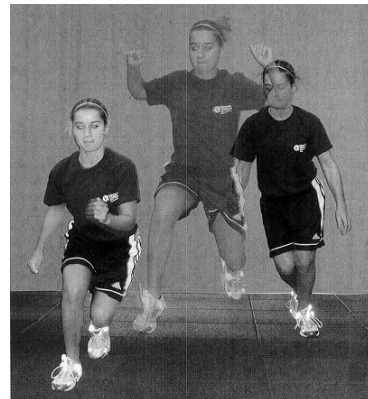
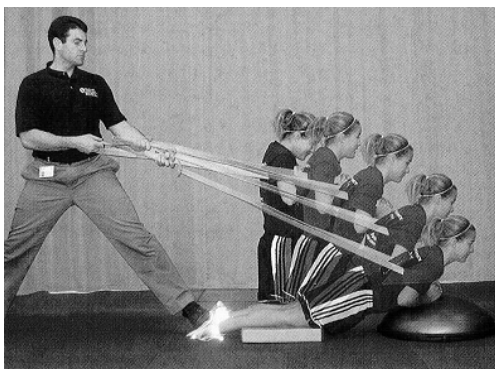
Mean displacement at each load level for the KLA and KT-2000 (n=5)

NEUROMUSCULAR TRAINING IMPROVES PERFORMANCE AND LOWER-EXTREMITY BIOMECHANICS IN FEMALE ATHLETES

GREGORY D. MYER,¹ KEVIN R. FORD,¹ JOSEPH P. PALUMBO,¹ AND TIMOTHY E. HEWETT²



N= 53 atletas, mujeres
15.3 ± 0.9 años, 64.8
± 9.96 kg, 1.71 ± 0.07 m.



G entrenado (41) y G no
entrenado (12), durante 6
semanas.

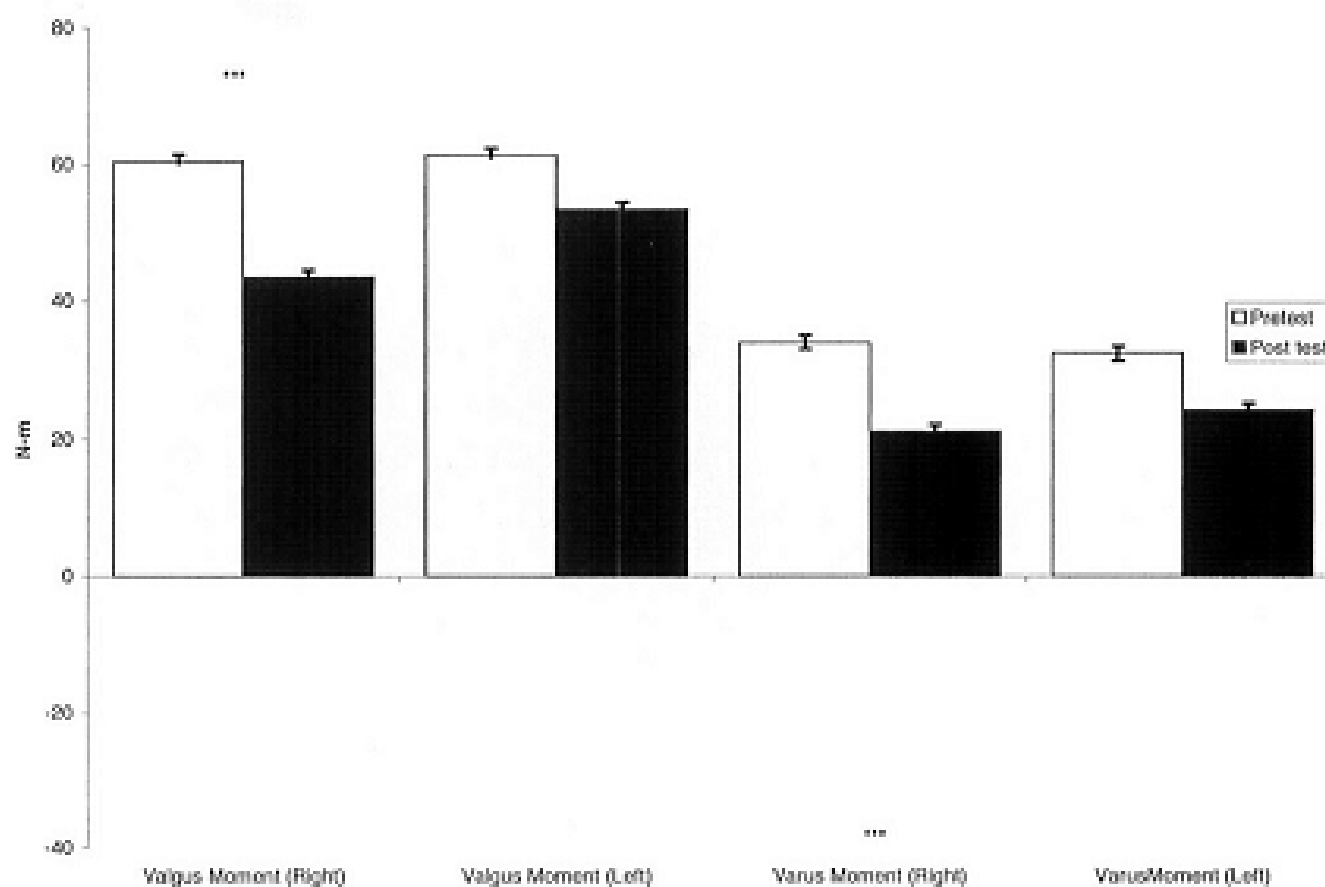
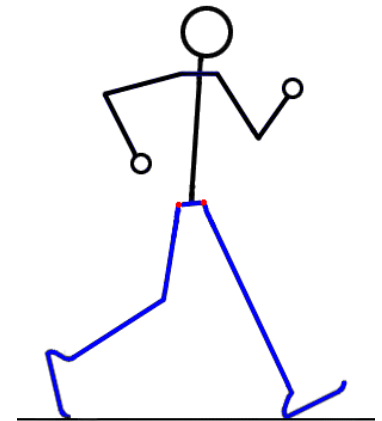


FIGURE 8. Knee varus and valgus torques. Knee joint maximum valgus and maximum varus torques were significantly reduced in the right side after the training program ($p < 0.001$). A trend was present in the left side (valgus, $p < 0.08$; varus, $p < 0.085$) for a reduction in varus and valgus torques; however, this difference was not statistically significant.

Aplicaciones...

- El entrenamiento neuromuscular reduce el torque en varo y valgo de rodilla.
- La importancia que el programa de entrenamiento incluya fuerza, velocidad, estabilidad proximal y resistencia, para prevenir la lesión o sobrecarga de tejidos.



Ankle-Dorsiflexion Range of Motion and Landing Biomechanics

Chun-Man Fong, LAT, ATC*; **J. Troy Blackburn, PhD, ATC†;** **Marc F. Norcross, MA, ATC†;** **Melanie McGrath, PhD, ATC‡;** **Darin A. Padua, PhD, ATC§**

N= 35 individuos físicamente activos, 20.5 ± 1.5 años, 73.4 ± 14.1 kg, 1,70 ± 0.1 m,

En el aterrizaje, la disminución en la flexión de rodilla se asocia con aumento de la FRS y aumento del stress en valgo → lesión LCA.

Table 1. Dependent Variable Descriptive Statistics

Variable	Mean \pm SD
Ankle-dorsiflexion range of motion, °	
Extended knee	14.3 \pm 5.5
Flexed knee	18.9 \pm 5.9
Knee-flexion displacement, °	69.1 \pm 12.0
Knee-valgus displacement, °	7.0 \pm 5.0
Vertical ground reaction force, \times body weight	2.2 \pm 0.6
Posterior ground reaction force, \times body weight	0.6 \pm 0.2

Medición goniométrica, en el miembro dominante

Table 2. Correlations for Extended-Knee Ankle-Dorsiflexion Range of Motion

Criterion Variable	<i>r</i>	<i>P</i> Value
Knee-flexion displacement	0.464	.029 ^a
Knee-valgus displacement	-0.290	.091
Vertical ground reaction force	-0.411	.014 ^a
Posterior ground reaction force	-0.412	.014 ^a

^a Indicates significant correlation between variables.

Table 3. Correlations for Flexed-Knee Ankle-Dorsiflexion Range of Motion

Criterion Variable	<i>r</i>	<i>P</i> Value
Knee-flexion displacement	0.327	.055
Knee-valgus displacement	-0.330	.053
Vertical ground reaction force	-0.311	.069
Posterior ground reaction force	-0.295	.085

Aplicaciones...

- La correlación está entre baja y moderada, ya que la dorsiflexión medida en extensión, solo explica el 22%, 17% y el 17% de la variación en el desplazamiento de la rodilla en flexión, FRSv-p.
- El arco de dorsiflexión influye en la biomecánica del aterrizaje.
- El arco del tronco influye en la flexión de rodilla y en la FRS.

Eccentric Peak Torque of the Plantar and Dorsiflexors Is Maintained in Older Women

Michelle M. Porter, Anthony A. Vandervoort, and John F. Kramer

Table 1. Subject Characteristics (mean \pm SD)

	Age (years)	Height (cm)	Weight (kg)
Older women ($n = 16$)	67 \pm 4	162.1 \pm 5.2	65.6 \pm 9.0
Younger women ($n = 16$)	27 \pm 4	163.9 \pm 6.1	60.5 \pm 10.1

Table 2. Mean Values ($\pm SD$) for the Individual Peak Torques (N·m) for Muscle Actions and Groups for the Older and Younger Women

	CONC	ECC
Older women DF	16.1 \pm 6.1	29.9 \pm 6.3
Younger women DF	21.8 \pm 6.1	30.9 \pm 7.6
Older women PF	72.8 \pm 14.0	108.6 \pm 18.4
Younger women PF	81.6 \pm 17.2	108.9 \pm 23.8

- Con la edad, la fuerza excéntrica se mantiene y se pierde la concéntrica.
- Se descarta la contribución del stiffness pasivo, para generar torque excéntrico.

Chung M y cols. Electromyographic analysis on lower extremity muscles during overground and treadmill running.

N= 13 familiarizados con correr en banda

22.4 3.9 años,

63.6 9.2 kg,

170.6 6.2 cm,

Velocidad banda: 3.8 ms⁻¹

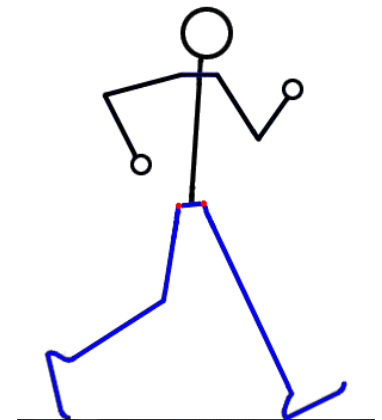


Table 1 Mean and SD of muscle activity parameters (magnitude normalized to reference contraction)

Mean and SD of muscle activity parameters	Treadmill	Tartan	Grass	Concrete	p value	Tukey
Rectus Femoris TO	1.839 (0.540)	14.576 (8.706)	7.003 (5.584)	8.477 (2.990)	< 0.05	(T-Ta)**
Gastrocnemius TO	8.534 (5.950)	39.011 (16.098)	19.091 (5.013)	21.200 (0.278)	< 0.05	(T-Ta)**
Rectus Femoris Phase 1	3.673 (2.311)	21.279 (7.611)	15.432 (4.541)	24.729 (13.011)	< 0.01	(T-Ta)*, (T-G)*, (T-C)*, (G-C)**
Biceps Femoris Phase 1	4.776 (2.791)	13.310 (7.165)	9.854 (6.210)	12.783 (12.594)	< 0.05	(T-Ta)**, (T-G)**, (T-C)**, (G-C)**

T:Treadmill, Ta:Tartan, G:Grass, C:Concrete

Phase 1:Stance phase, Phase 2:Early swing, Phase 3:Middle swing, Phase 4:Late swing, TO:Toe off

*p < 0.01, **p < 0.05

Datos procesados con filtro pasa-bajo de 20-500Hz

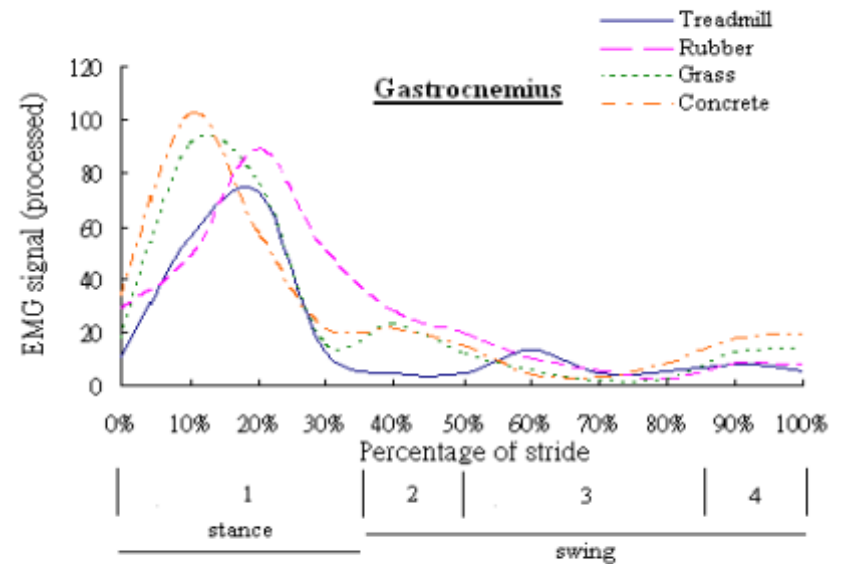
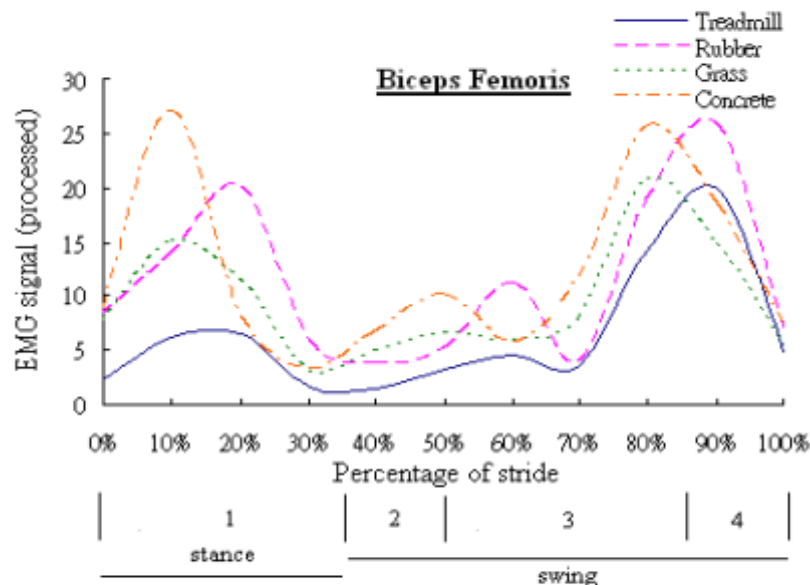
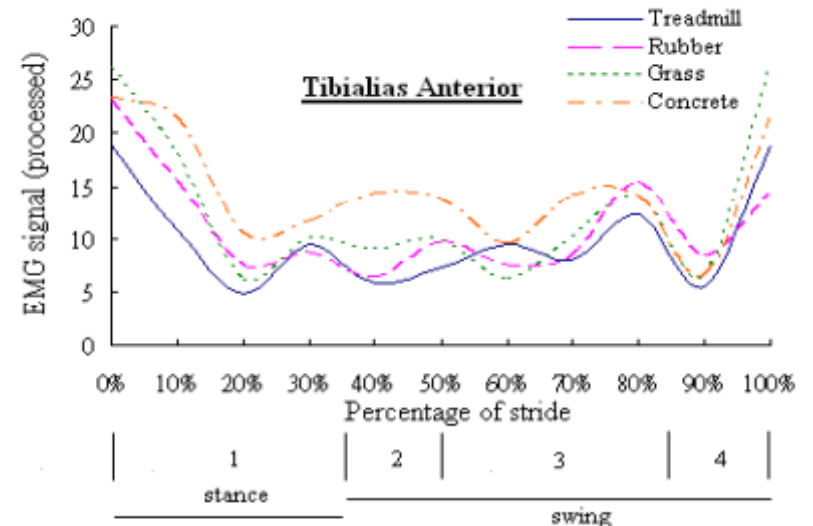
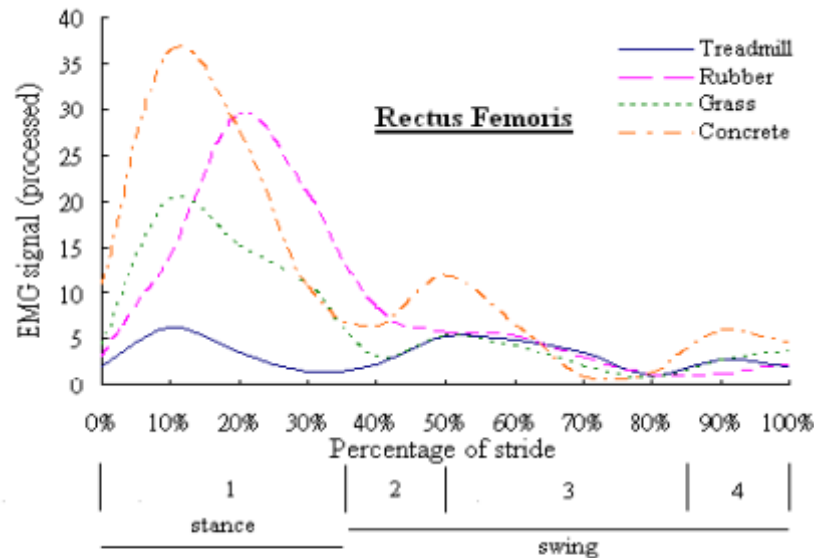


Figure 2: The EMG profile with the normalized average for all subjects

Aplicaciones...

- Diferencias EMG significativas entre las superficies.
- El calzado debe adaptarse a cada superficie.
- Los resultados del entrenamiento en el suelo y la banda son diferentes.

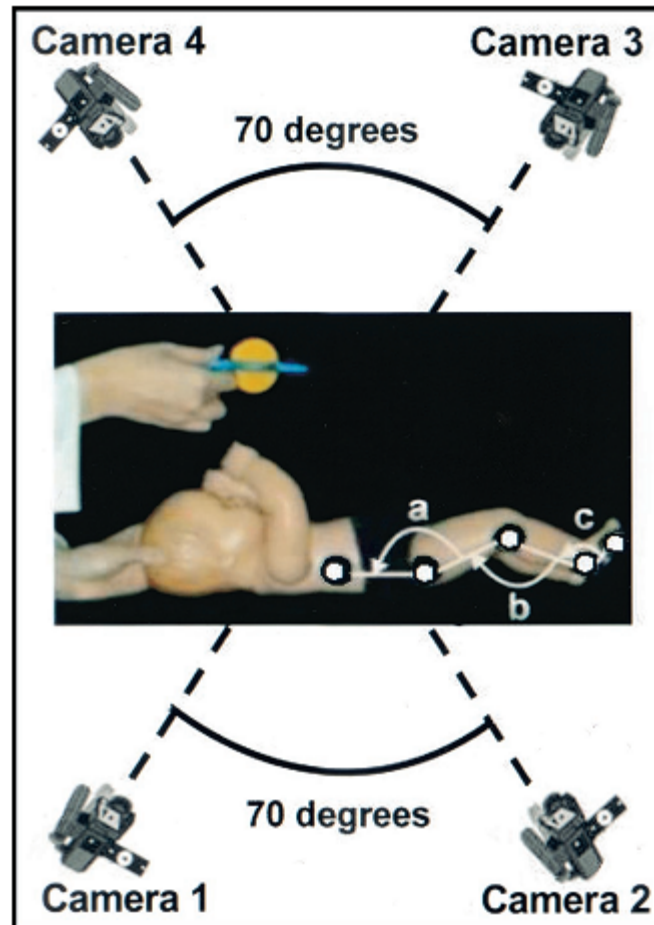
Physical Therapy

Journal of the American Physical Therapy Association



Kinematic Analysis of Kicking Movements in Preterm Infants With Very Low Birth Weight and Full-Term Infants

Suh-Fang Jeng, Li-Chiou Chen and Kuo-Inn Tsou Yau
PHYS THER. 2002; 82:148-159.



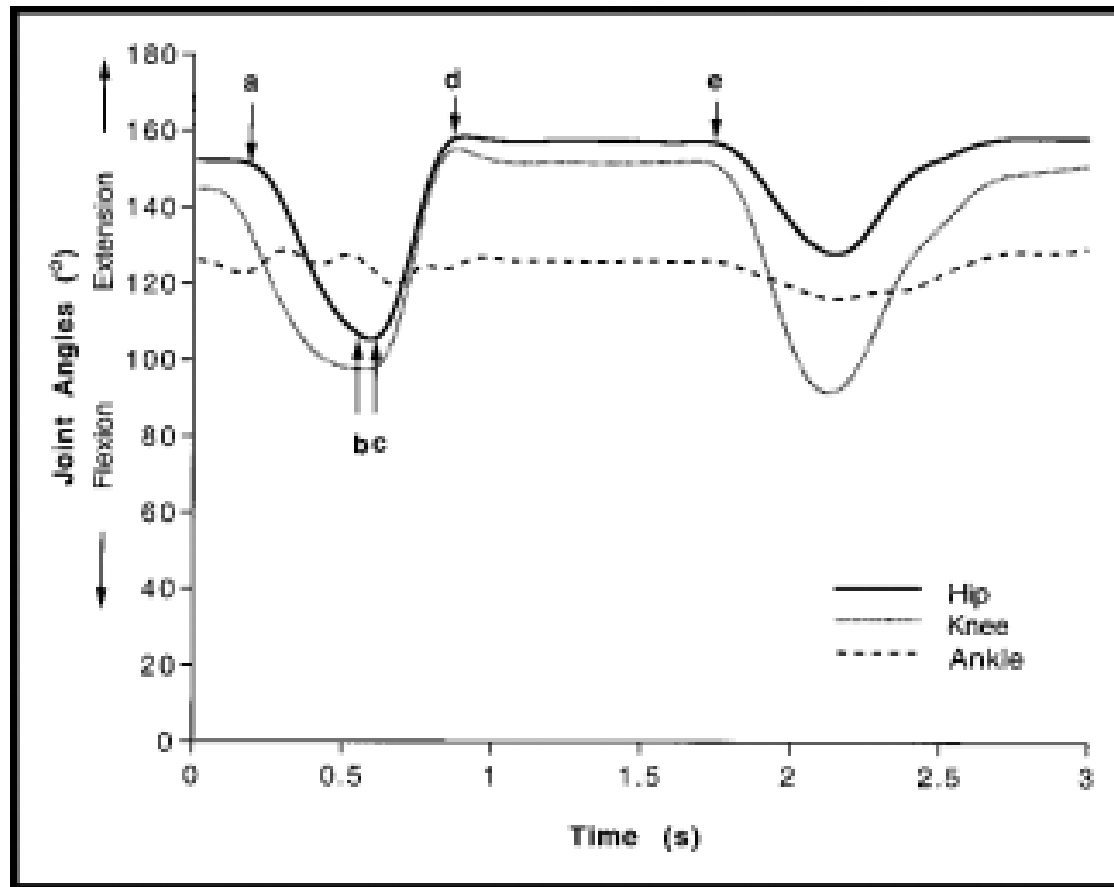


Figure 2.

Determination of 4 phases from the joint-angle time series of kick cycles: (1) the flexion phase, lasting from the initiation of hip flexion (time a) until the movement ceased (time b), (2) the intrakick pause phase, lasting from the end of hip flexion until the initiation of hip extension (time c), (3) the extension phase, lasting from the initiation of hip extension until the movement ceased (time d), and (4) the interkick pause phase, lasting from the end of hip extension until the initiation of next flexion phase (time e).

Table 4. Number and Percentage of Preterm Infants With Very Low Birth Weight (VLBW) and Full-Term Infants Who Adopted Alternate, Unilateral, and Synchronous Kicks as the Predominant Interlimb Coordination Pattern at 2 and 4 Months of Corrected Age^a

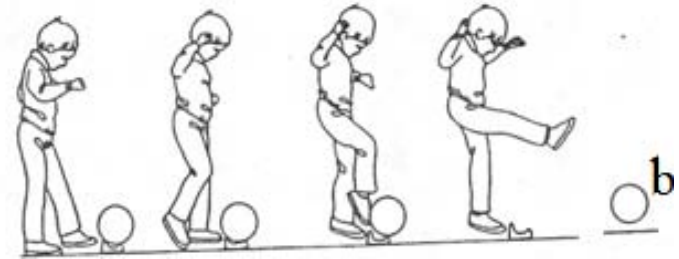
Predominant Pattern	2 Months of Corrected Age			4 Months of Corrected Age		
	Infants With VLBW		Full-Term Infants (N=22)	Infants With VLBW		Full-Term Infants (N=22)
	Low GA (n=9)	High GA (n=13)		Low GA (n=9)	High GA (n=13)	
Alternate kicks	2 (22.2%)	2 (15.4%)	4 (18.2%)	1 (11.1%)	5 (38.5%)	2 (9.1%)
Unilateral kicks	6 (66.7%)	4 (30.8%)	10 (45.4%)	0 (0%)	2 (15.4%)	4 (18.2%)
Synchronous kicks	1 (11.1%)	7 (53.8%)	8 (36.4%)	8 (88.9%)	6 (46.1%)	16 (72.7%)

^a GA=gestational age.

- Diferencias en el patrón del pataleo y en la coordinación intermiembros en niños nacidos a pretérmino.
- Los niños con bajo peso y baja edad gestacional tiene mayor frecuencia en el pataleo, pero menor fase de flexión, a los 4 meses de edad corregida.
- También se observó poca variabilidad en la coordinación intermiembros.

Cinemática del pateo





- Entre 3-5 años, balancea la pierna que patea y flexiona la rodilla; con un ligero incremento en el movimiento de los brazos y el tronco en la línea media.
- Entre 5-7 años, en la fase inicial del pateo se observa extensión de cadera, con mayor oscilación del miembro inferior y mejor control del tronco.
- Entre 7-9 años hay un mayor balanceo de los brazos que lo hacen en dirección opuesta, el tronco se inclina y la pierna que patea aumenta la flexión de cadera y rodilla.



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Contributions of trunk muscles to anticipatory postural control in children with and without developmental coordination disorder

Kyra Kane^{a,b,*}, John Barden^a

Table 1

Mean values for age, height, weight, and Body Mass Index (BMI) for each group.

	Group	
	DCD	Control
Age (years)	11.1 (Range 7.17–14)	10.92 (Range 6.67–14.6)
Height (cm)	167.5 (Range 122–168)	146.6 (Range 128–170)
Weight (kg)	40.1 (Range 22–54)	38.4 (Range 28–57)
BMI	28 (Range 18–32)	26 (Range 21–34)

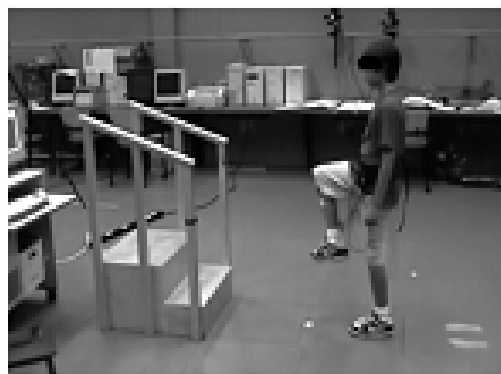


Table 3

Mean onset latencies for each muscle by group

Muscle	Onset latency (ms): mean (SD)		F value (df: 1,20)	Significance (P value)	Cohen's d
	Control group	DCD group			
TbA	-3.81 (3.48)	2.744 (10.71)	3.729	0.07*	0.92 [‡]
ITA/IO	8.31 (9.04)	19.41 (15.32)	4.288	0.05*	0.91 [‡]
IEO	15.57 (8.57)	35.078 (22.46)	7.24	0.01*	1.26 [‡]
IES	22.84 (22.41)	33.61 (29.51)	.931	0.35	0.42 [‡]
CTA/IO	20.89 (12.23)	22.15 (17.5)	.038	0.85	0.08
CEO	17.33 (11.09)	49.42 (34.03)	8.84	0.008*	1.42 [‡]
CES	32.75 (9.32)	16.36 (10.29)	2.59	0.123	1.67 [‡]

TbA: Ipsilateral tibialis anterior; ITA/IO: Ipsilateral transversus abdominis/internal oblique; CTA/IO: Contralateral transversus abdominis/internal oblique; IEO: Ipsilateral external oblique; CEO: Contralateral external oblique; IES: Ipsilateral erector spinae; CES: Contralateral erector spinae.

* Denotes that value was significant or approached significance.

[‡] Large effect.

- Los niños con DCD, presentaron activación mas temprana del TA derecho, OE, del TA y del OI.
- La alteración en los ajustes anticipatorios se pueden asociar con problemas de movimiento en niños con DCD y con los tiempos de activación de los músculos proximales y distales.



GRACIAS

