Materiales docentes para el alumnado
Clases teóricas

Mecanismo de lesión
Parte 1. Isquiosurales y ligamento cruzado anterior

Asignatura: Readaptación deportiva y reentrenamiento físico-deportivo

Docentes

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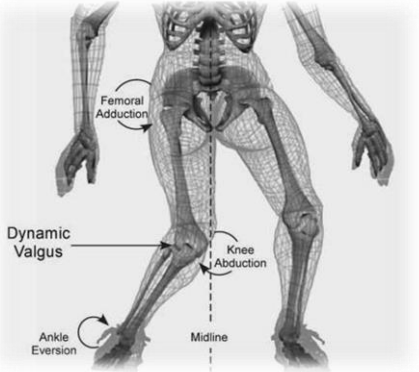
¿MECANISMO?

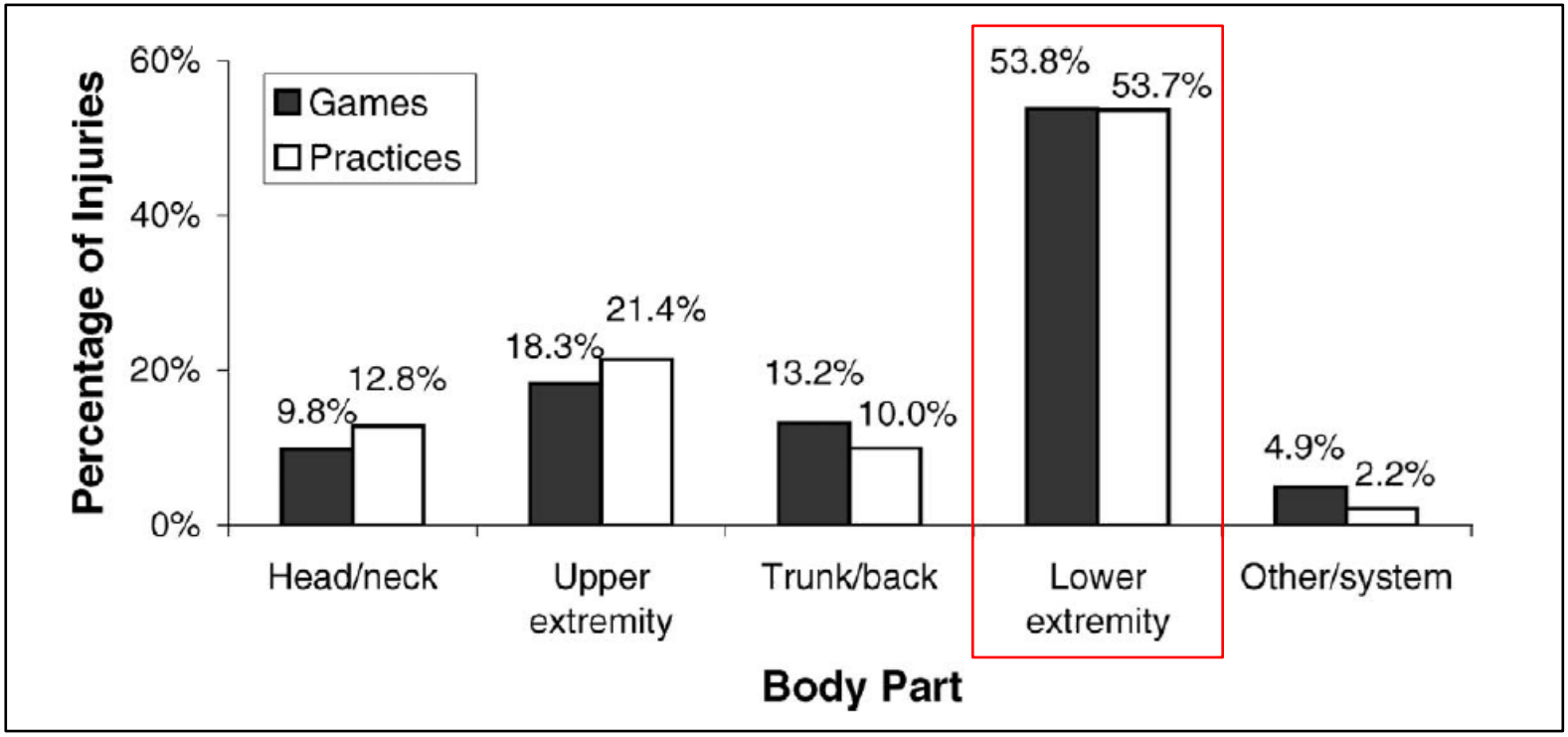
CONTEXTUALIZACIÓN

TABLE 1
Examples: Assessment of Mode of Onset

Mechanism	Presentation	Example
Acute	Sudden onset	1. A sprinter pulls up suddenly in a race, stops, and hobbles a few steps in obvious pain with a hamstring injury.
Repetitive	Sudden onset	2. A gymnast experiences a frank tibial and fibular fracture on landing from a vault; computed tomography imaging reveals pre-existing morphological changes consistent with bone stress, that is, a stress fracture.
Repetitive	Gradual onset	3. A swimmer experiences a gradual increase in shoulder pain over the course of a season; diagnosed as rotator cuff tendinopathy on magnetic resonance imaging.



CONTEXTUALIZACIÓN



Hootman, Dick & Agel, 2007

CONTEXTUALIZACIÓN

CONCUSSION
(4-15%)

HAMSTRING MUSCLE STRAINS
(10-40%)

LOW BACK PAIN
(10-30%)

ACL TEARS
(1-5%)

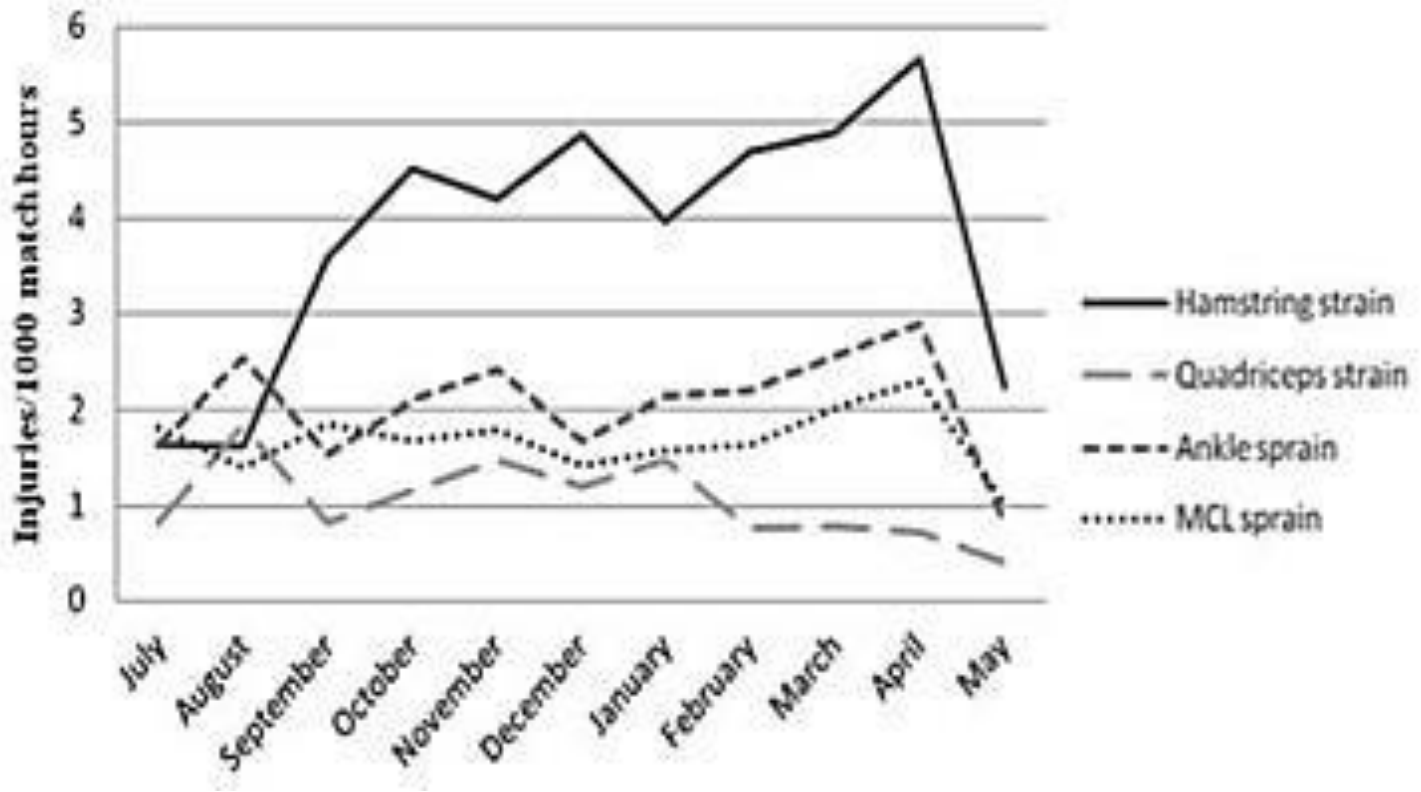
ANKLE SPRAINS
(2-26%)

Musculatura isquiosural

Mecanismos de lesión

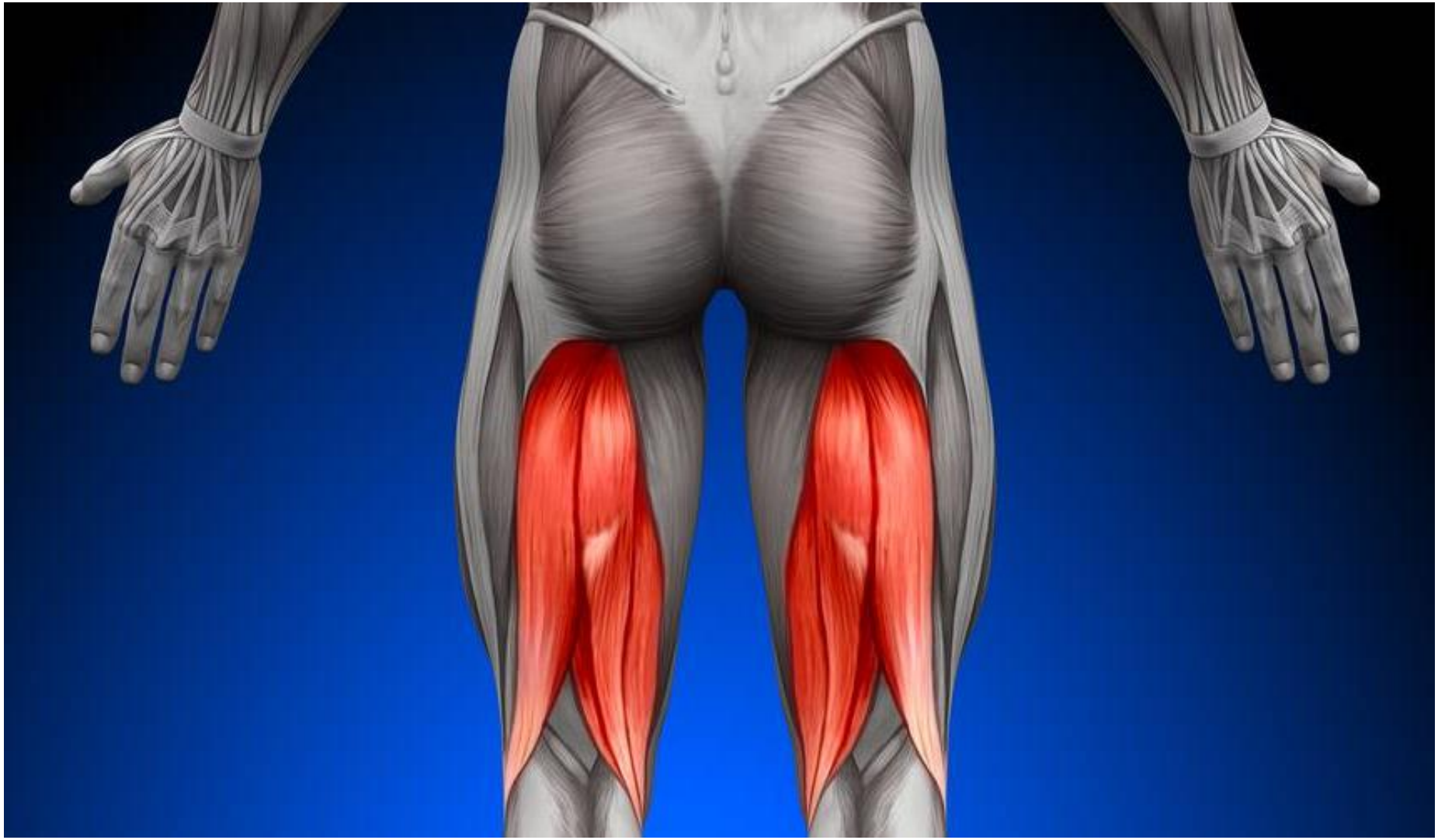
INCIDENCIA

HAMSTRING MUSCLE STRAINS



Ekstrand et al. (2011)

ANATOMÍA



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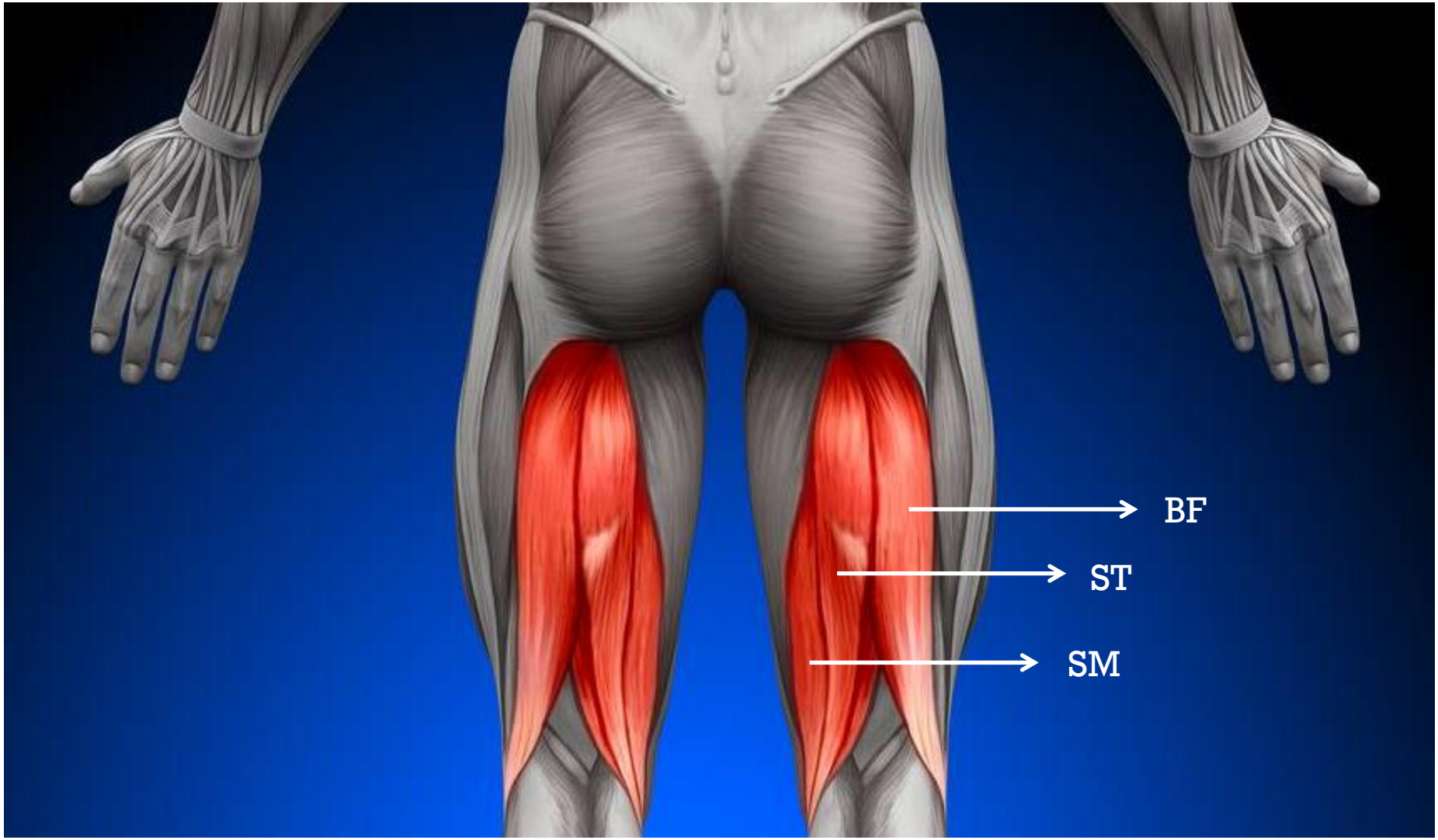


DISTRIBUCIÓN LESIONES

Table 6. Location of hamstring injuries.

Location of Injury	N	Incidence (95% CI)
Biceps femoris	25	0.21 (0.14–0.31)
Semitendinosus	9	0.08 (0.04–0.15)
Semimembranosus	7	0.06 (0.03–0.12)
Unspecified	22	0.18 (0.12–0.28)
Total	63	0.53 (0.41–0.68)

CI: Confidence intervals.

Raya-González et al. (2020)

¿CÓMO SE PRODUCE LA LESIÓN DE ISQUIOSURALES?

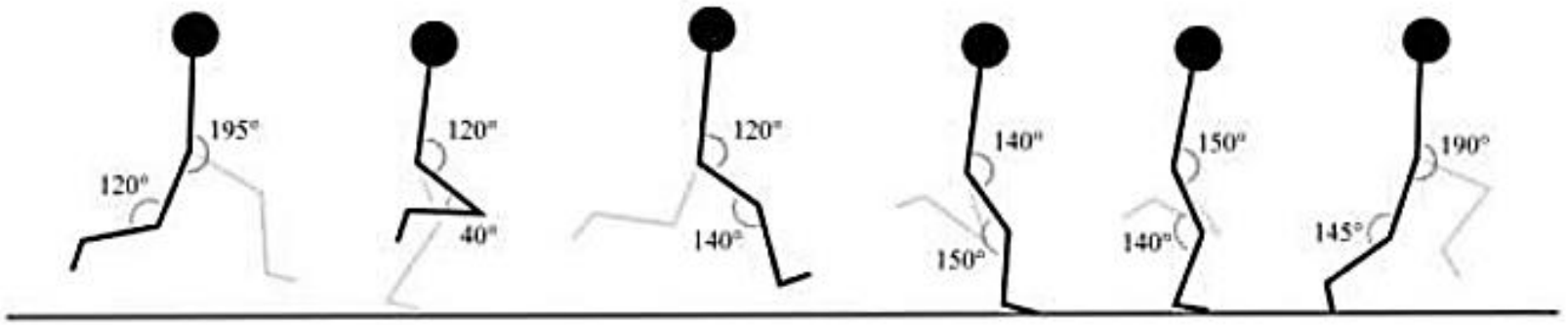
MECANISMO

 # Vídeo 1

MECANISMO

 # Vídeo 2

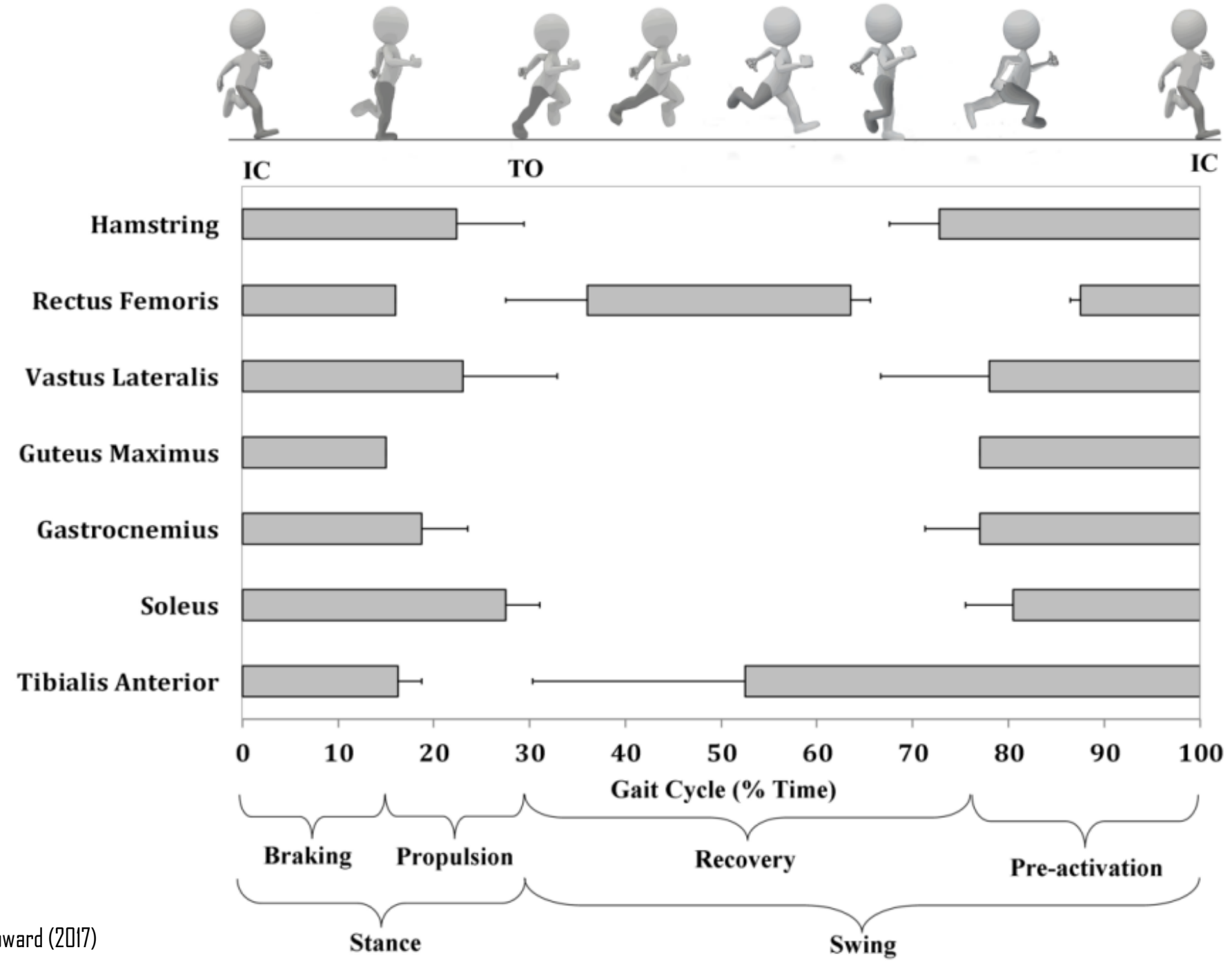
MECANISMO



Early swing | Mid swing | Late swing | Early stance | Mid stance | Late stance

The sprinting gait cycle

Kenneally-Dabrowski et al. (2019)


IC
TO
IC
Hamstring
Rectus Femoris
Vastus Lateralis
Guteus Maximus
Gastrocnemius
Soleus
Tibialis Anterior
0
10
20
30
40
50
60
70
80
90
100
Gait Cycle (% Time)
Braking
Propulsion
Recovery
Pre-activation
Stance
Swing

Howard (2017)

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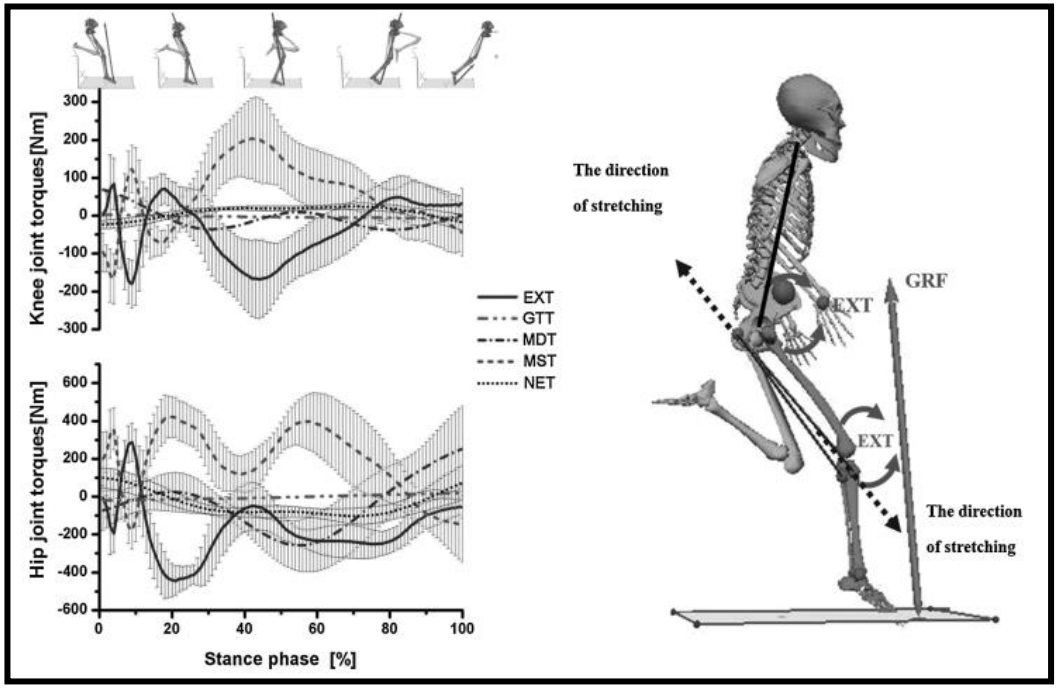
Early stance

Hamstring action and moments
Strong concentric contraction to resist opposing forces and help produce a hip extensor moment

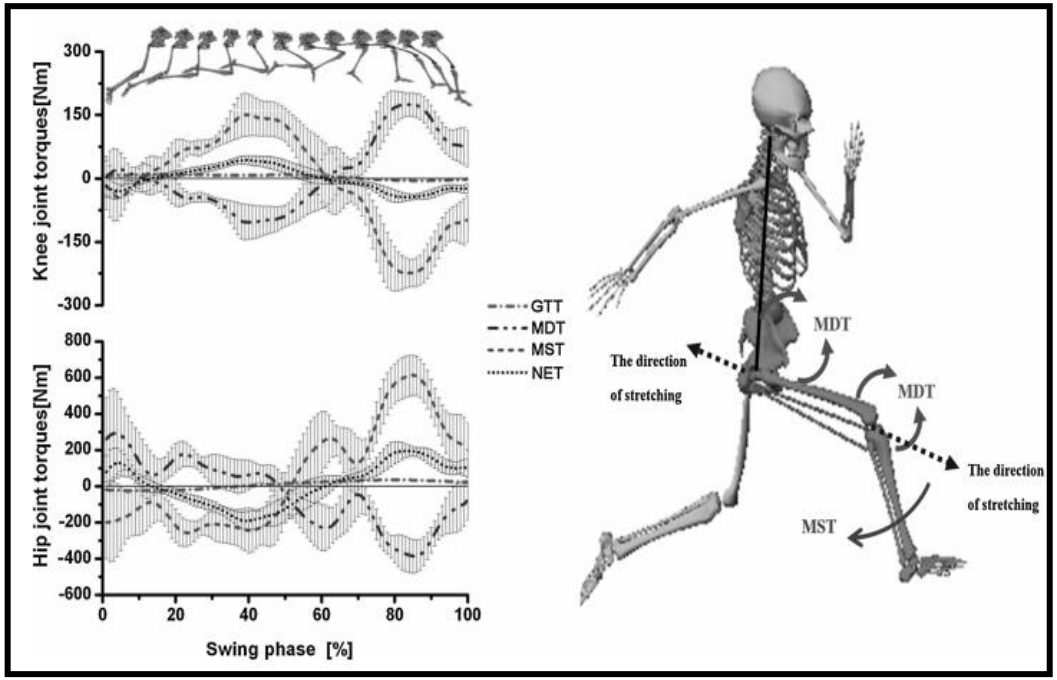
Opposing moments – Internal (quadriceps and hip flexors)
Vastus muscles increase their activation in early stance, producing a stronger contraction, whilst rectus femoris starts to contract.

Opposing moments – External
Potentially large hip flexor & knee extensor joint reaction moments (i.e. GRF vector is anterior to the knee and hip joints, due to forefoot-strike).



Orchard, J. W. (2012). Hamstrings are most susceptible to injury during the early stance phase of sprinting.

MECANISMO



Sun, Y., et al. (2015). How joint torques affect hamstring injury risk in sprinting swing–stance transition. *Med Sci Sports Exerc*, *47*(2), 373.

Late swing

Hamstring action and moments

Strong eccentric contraction (whilst at submaximal length) to decelerate the shank, producing in particular a high knee flexion moment

Opposing moments – Internal (quadriceps and hip flexors)

Vastus muscles begin to activate at the end of swing producing a weak (early) contraction. Hip flexors are almost inactive

Opposing moments – External

Minimal opposing forces (the light force of air resistance would actually assist hamstring in decelerating the shank).

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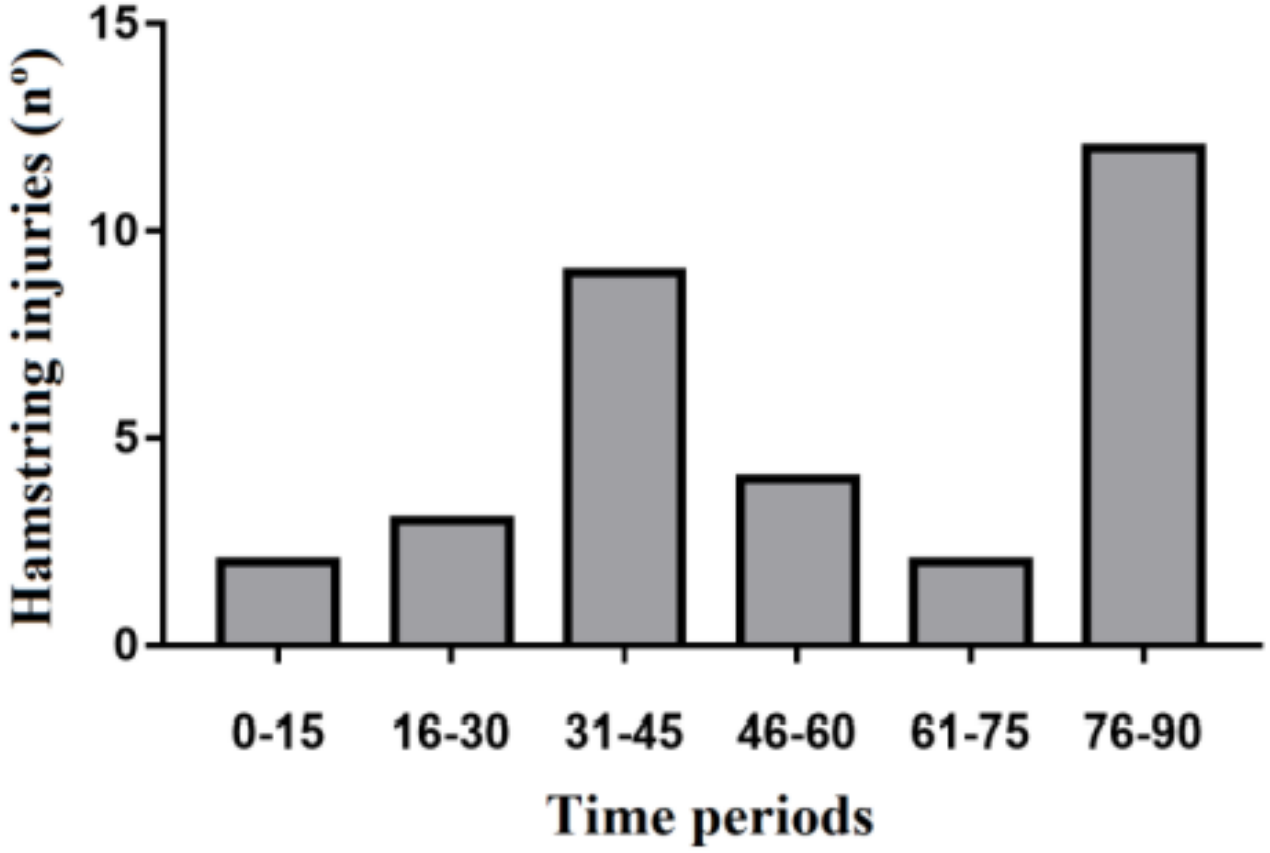

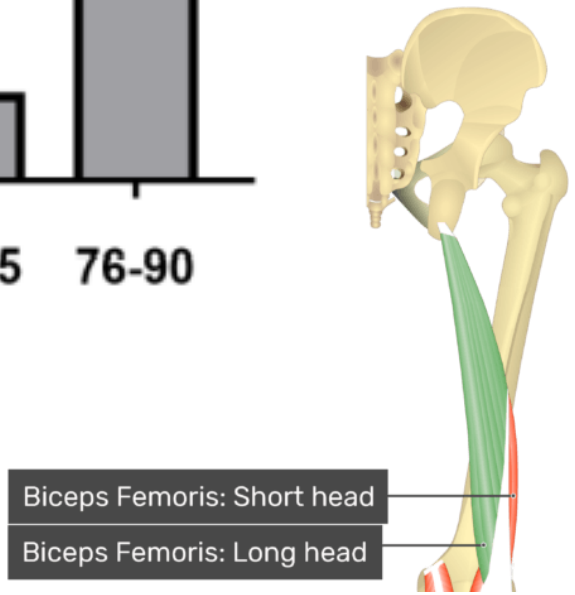

Raya-González et al. (2020)

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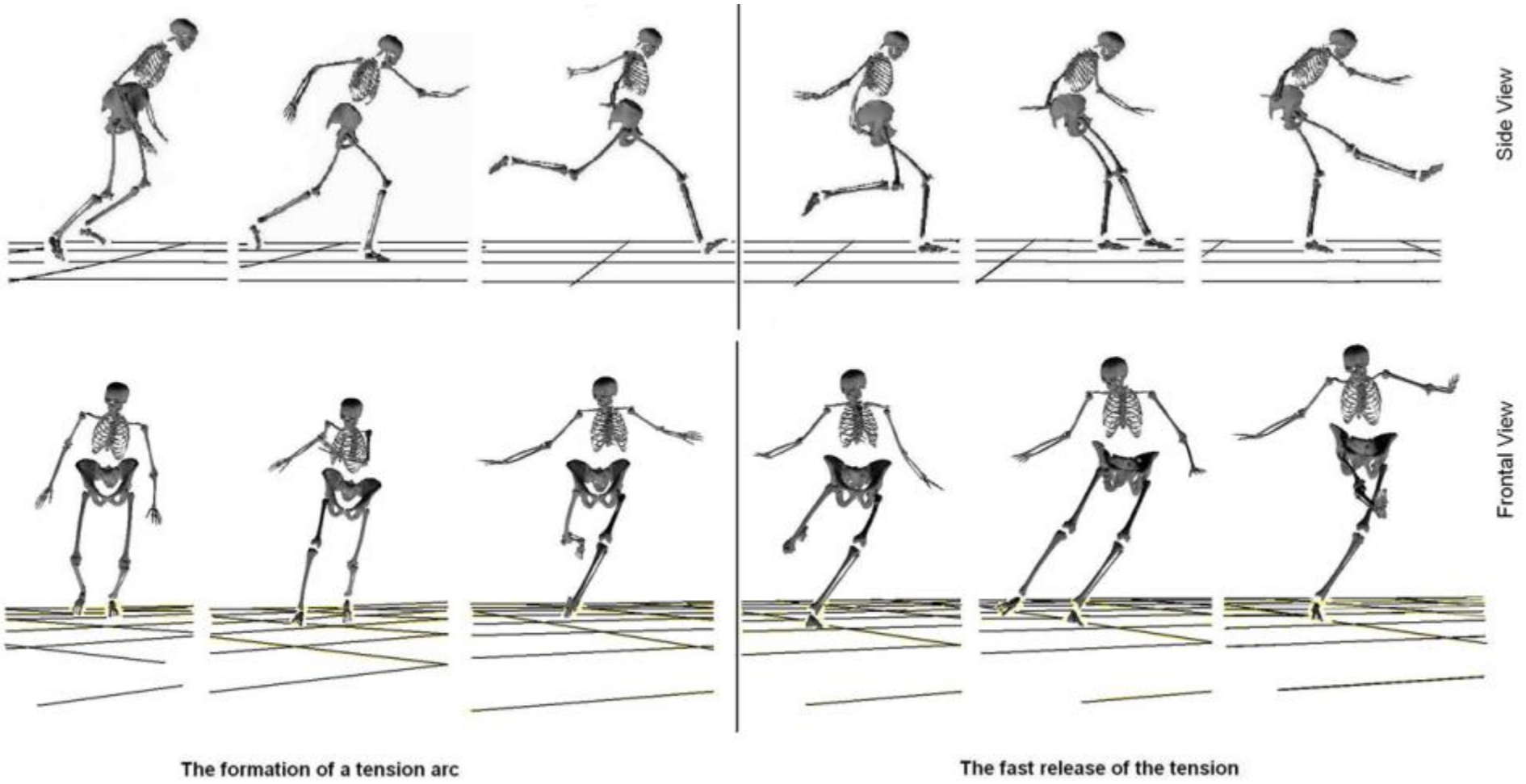
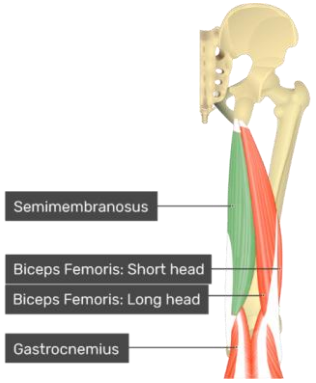
 # Vídeo 3

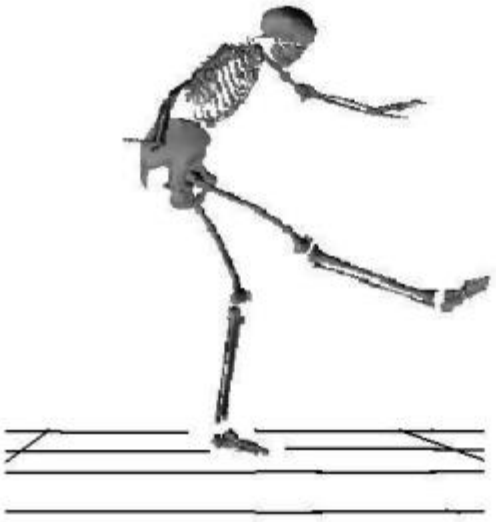
MECANISMO



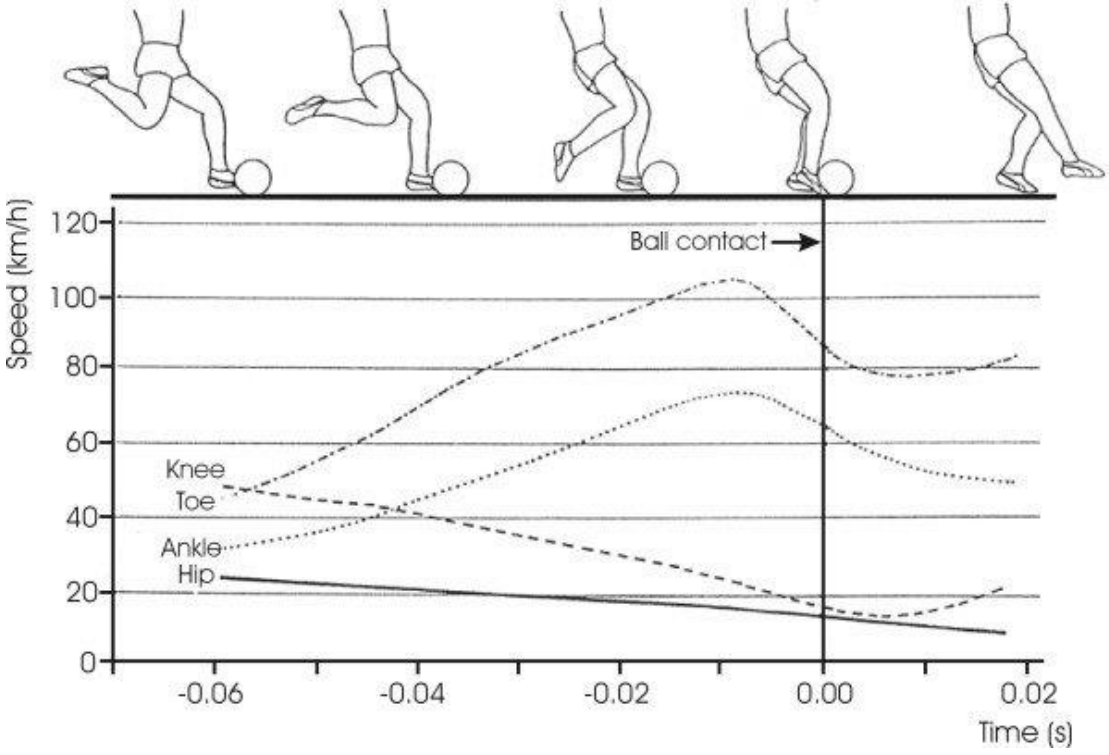
Shan & Zhang (2011)

MECANISMO





Side View



Frontal View

¿ES INTERESANTE CONOCER QUÉ MECANISMO ESPECÍFICO HA PROVOCADO LA LESIÓN?

ENTENDER

ADAPTAR

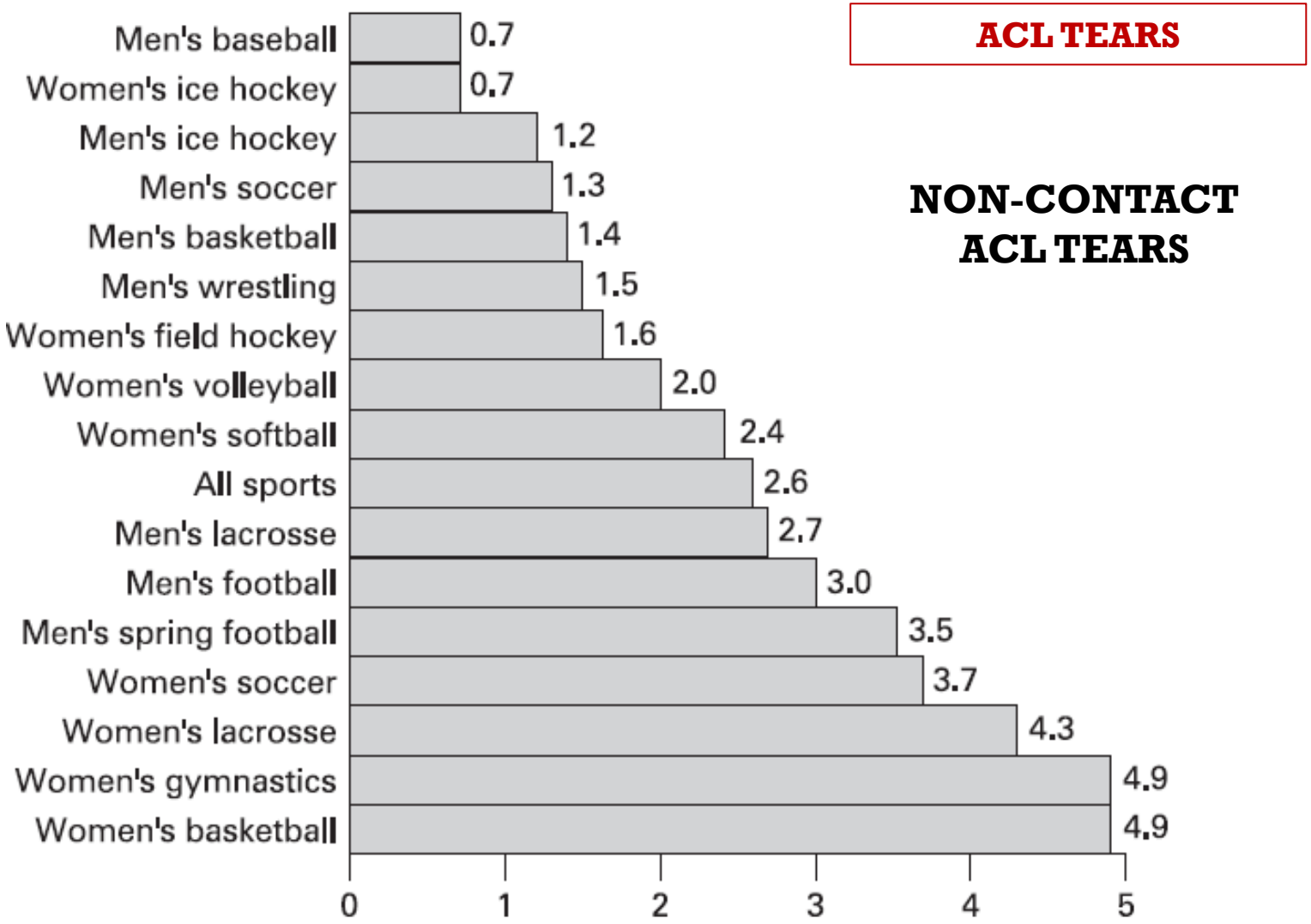
ESTIMAR

PLANIFICAR

Ligamento cruzado anterior

Mecanismos de lesión

INCIDENCIA


ACL TEARS
NON-CONTACT ACL TEARS
Men's baseball 0.7
Women's ice hockey 0.7
Men's ice hockey 1.2
Men's soccer 1.3
Men's basketball 1.4
Men's wrestling 1.5
Women's field hockey 1.6
Women's volleyball 2.0
Women's softball 2.4
All sports 2.6
Men's lacrosse 2.7
Men's football 3.0
Men's spring football 3.5
Women's soccer 3.7
Women's lacrosse 4.3
Women's gymnastics 4.9
Women's basketball 4.9
0
1
2
3
4
5

Trends in paediatric and adolescent Anterior Cruciate Ligament (ACL) injuries

ACRISP
AUSTRALIAN CENTRE FOR RESEARCH INTO INJURY IN SPORT & ITS PREVENTION

Background

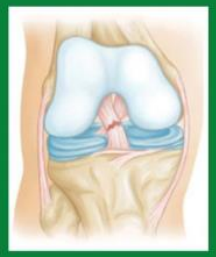
- **Media attention and parental concern** brought higher awareness to ACL injuries in paediatrics and adolescents
- Potential for **unfavourable healthcare costs** and outcomes in the long term

Methods

- Victorian Admitted Episodes Dataset (VAED)
- Admitted ACL injuries aged 5-14 years, between 2005-2015

Results

320
hospital-treated ACL injuries over 10 yrs



147.8%
overall increase 2005-2015

Increase from
2.74/ 100,000 population
to
6.79/ 100,000 population

Male versus female

145 **(45.3%)** injuries in girls

175 **(54.7%)** injuries in boys

Age differences

5-9 year olds: 10 diagnoses **(3.1%)**

10-14 year olds: 310 diagnoses **(96.9%)**

Those with known activity at time of injury*:

Sport = **56.6%** ACL injuries

Boys: **35.4%** while playing ball sports

Girls: **52.4%** while playing ball sports

* activity at time of injury unknown for 40.3% of cases

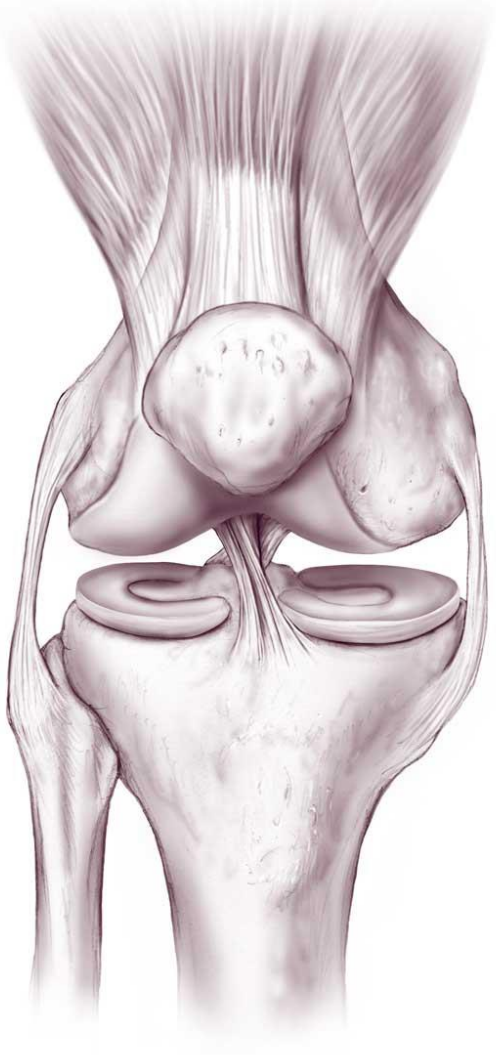
Take home messages

- Large increases in ACL injuries in 5-14 y/o in Victoria, Australia over 10 yrs highlights **significant health burden**
- Population-wide ACL **prevention policies required** to halt trends
- Investigation needed into design and implementation of prevention programmes involving **neuromuscular training**

@ACRISPFedUni
@CarolineFinch

Shaw & Finch
Trends in Pedeatric and Adolescent Anterior Cruciate Ligament Injuries in Victoria, Australia 2005-2015
Int. J. Environ. Res. Public Health 2017; 14(599): doi:10.33.90/ijerph14060599

ANATOMÍA



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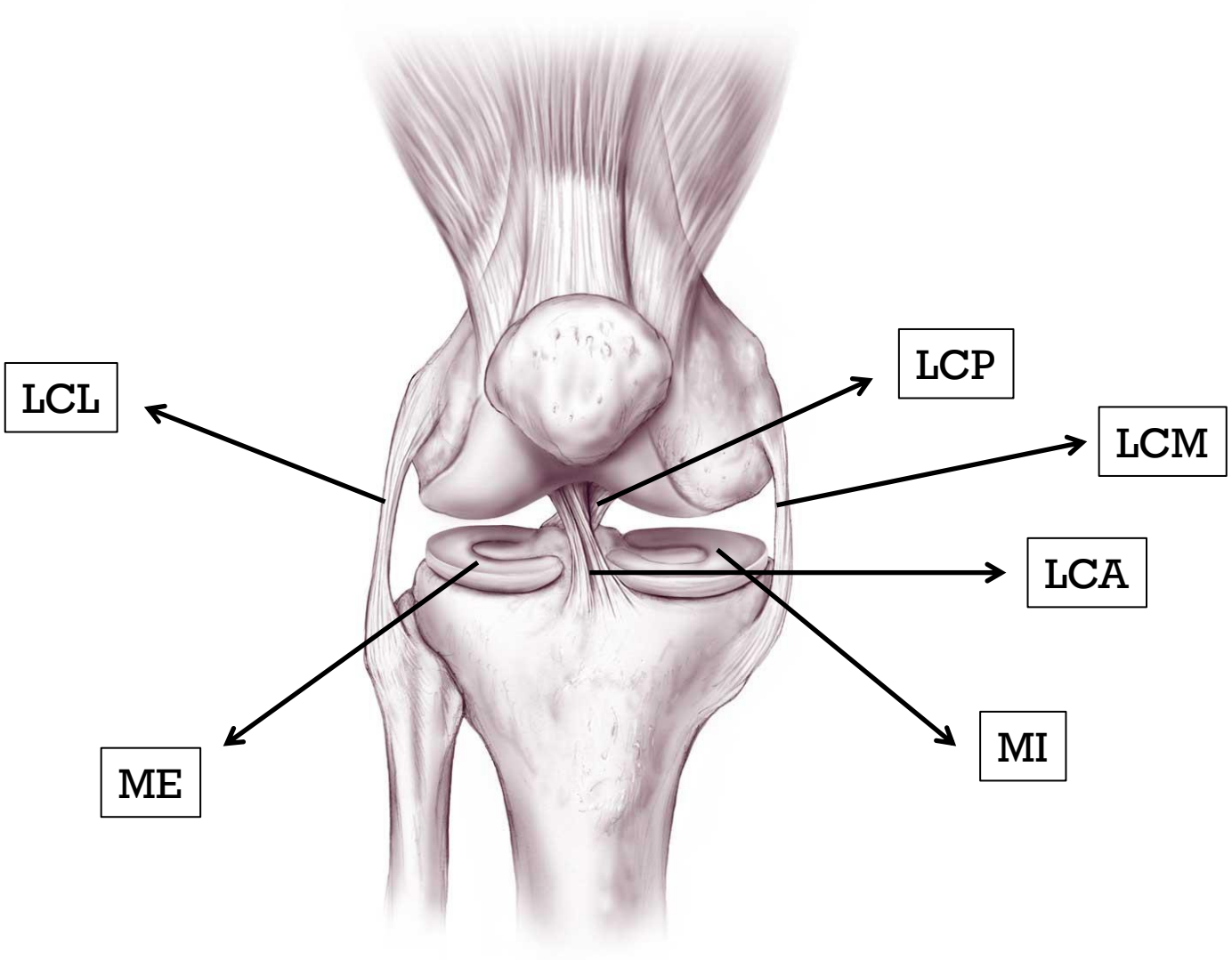
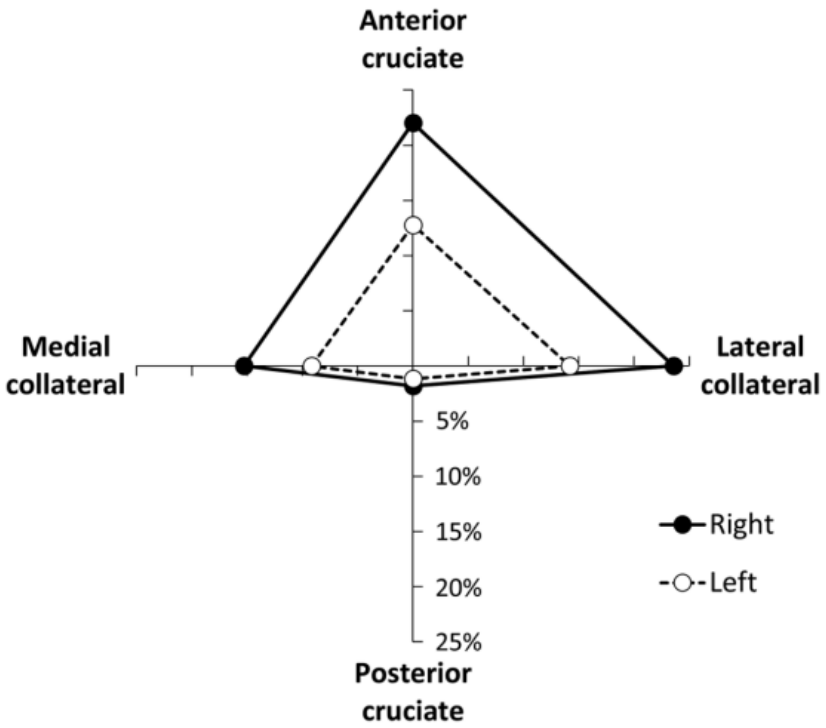
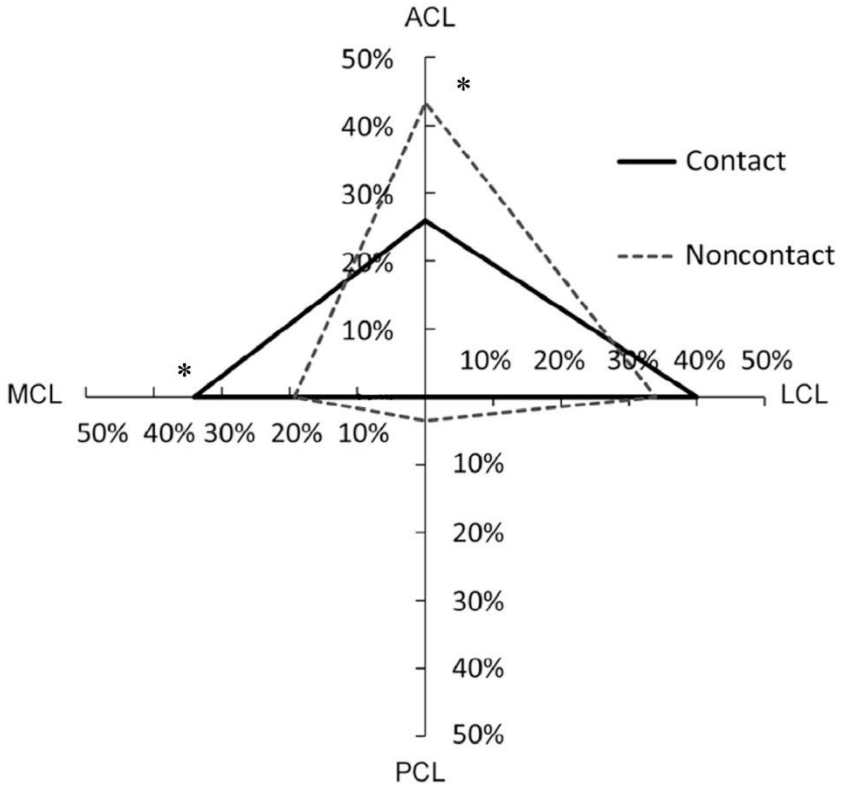


DISTRIBUCIÓN LESIONES



Herrero et al. (2014)



Del Coso et al. (2018)

¿CÓMO SE PRODUCE LA LESIÓN DE LIGAMENTO CRUZADO ANTERIOR?

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 # Vídeo 4

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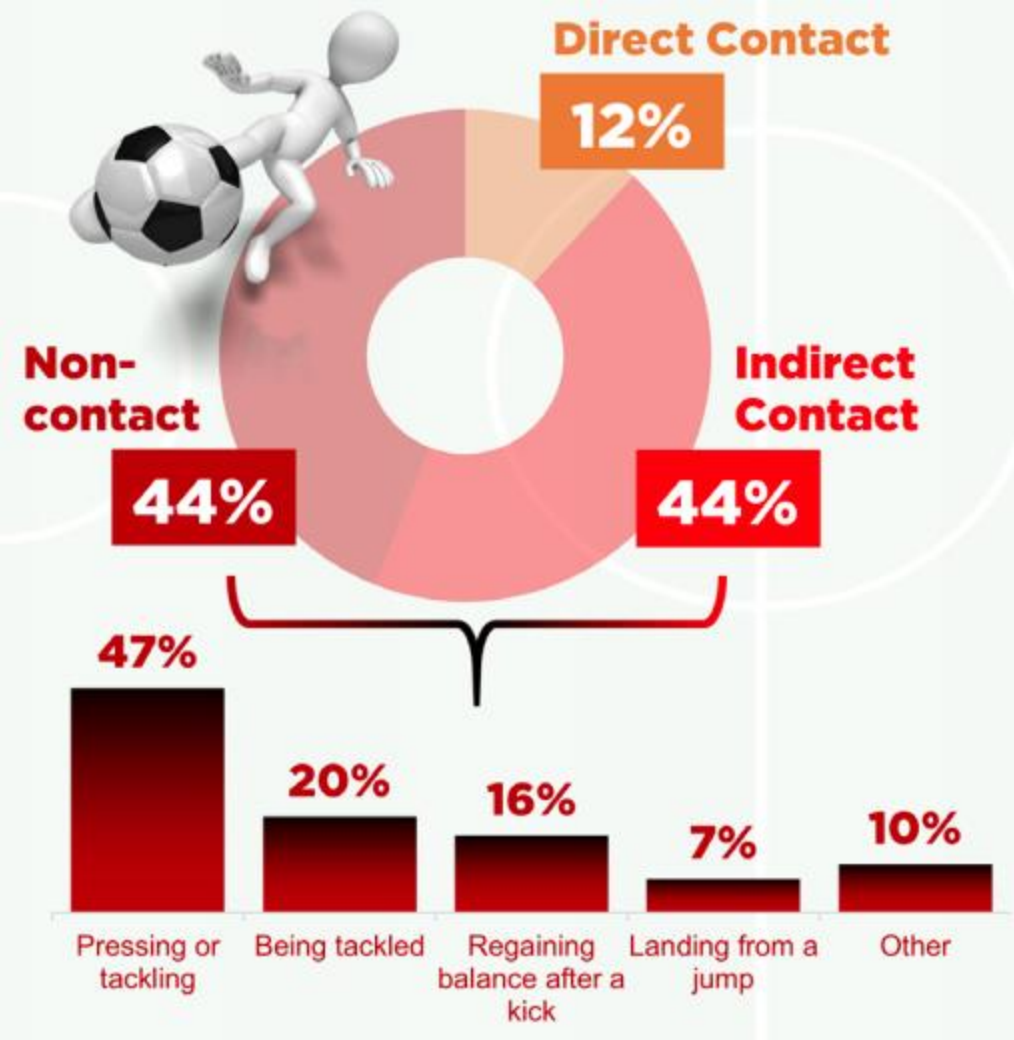

Della-Villa et al. (2021)

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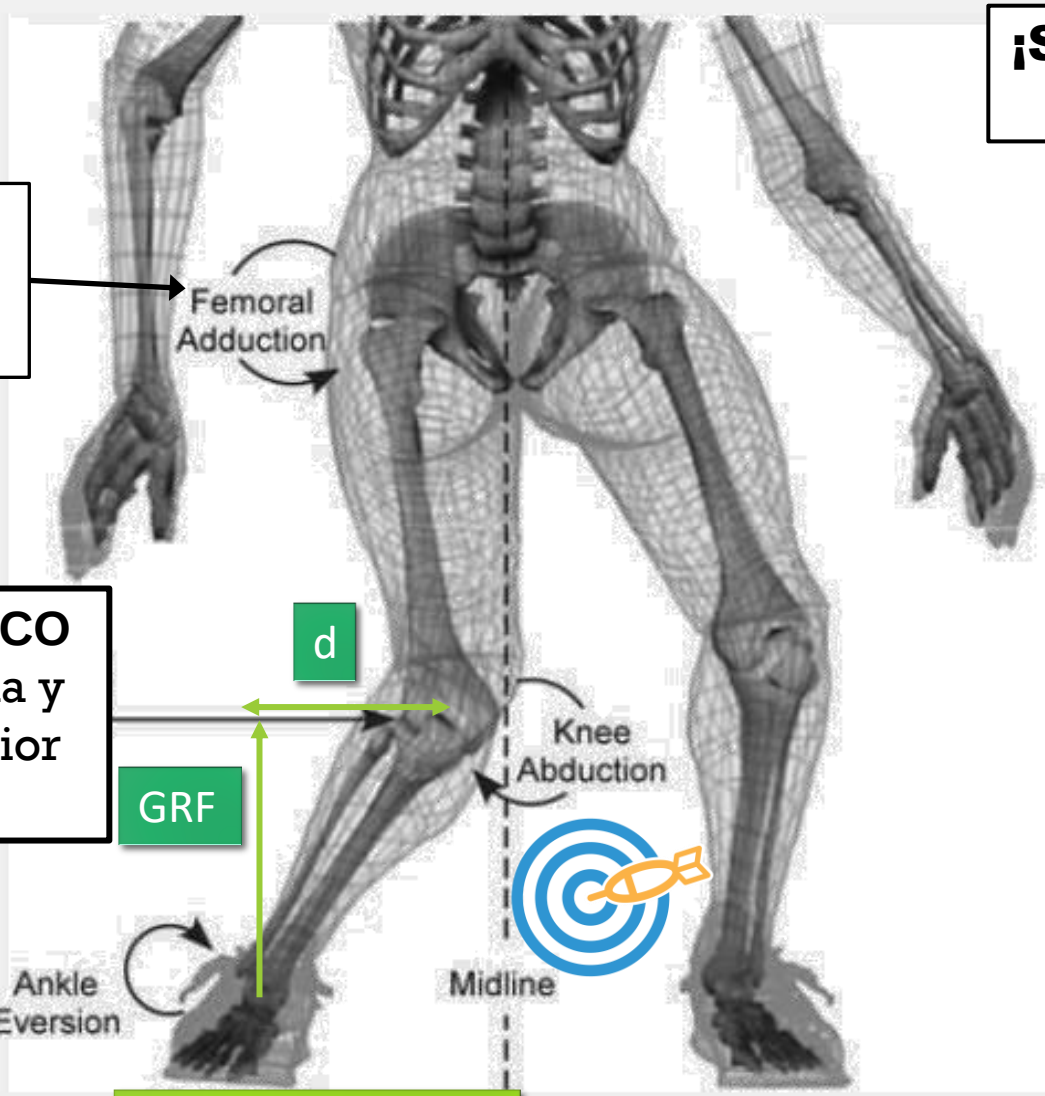
CADERA
Aducción y rotación interna

VALGO DINÁMICO
Rotación externa y traslación anterior de la tibia

TOBILLO



$KAM = GRF\ x\ d$

¡SOBRECARGA DEL LCA!

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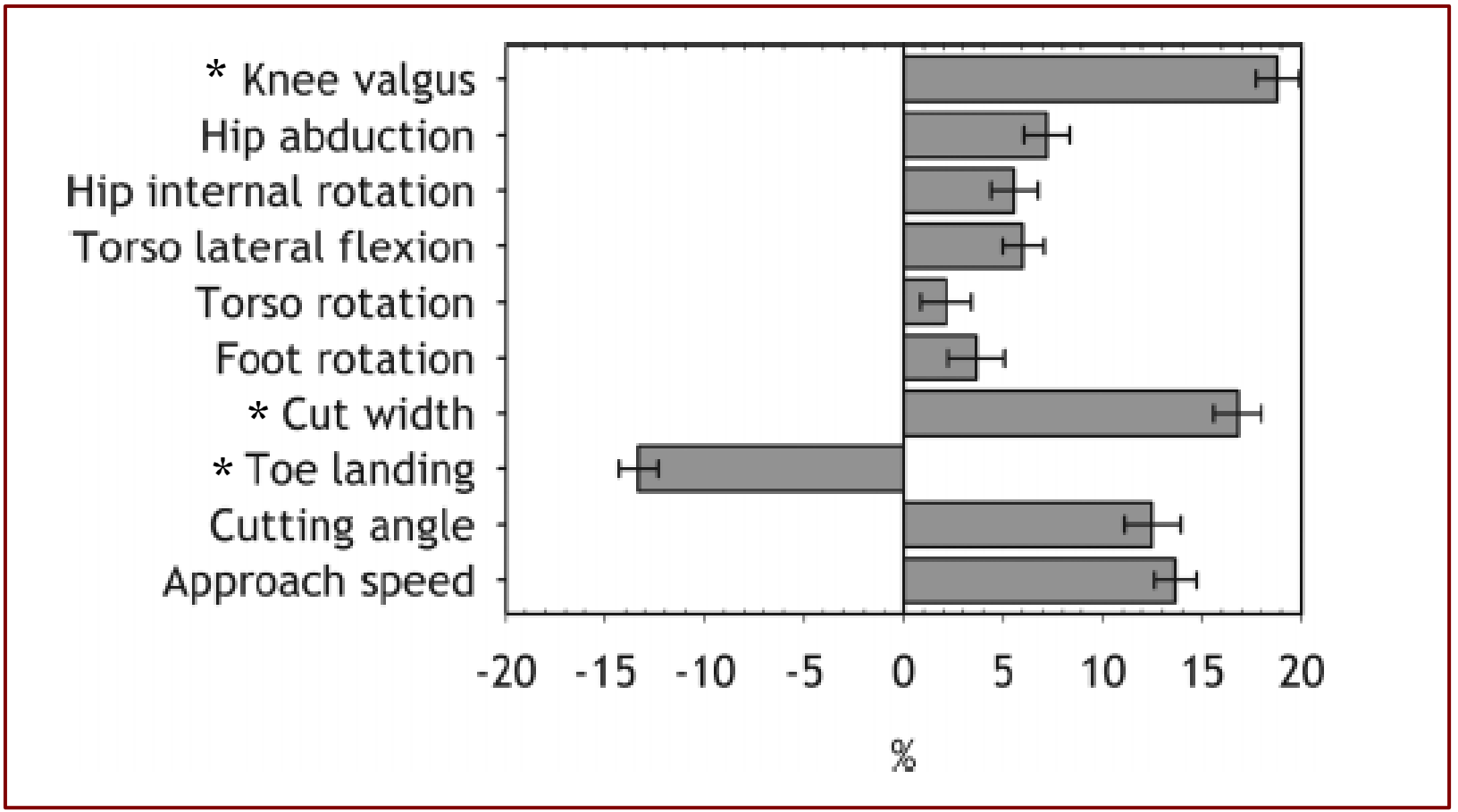
These technique factors explained 62% of the variance in maximum knee abduction moment



Kristianslund et al. (2012)

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Anchura de pierna

Abducción de cadera

Rotación del pie

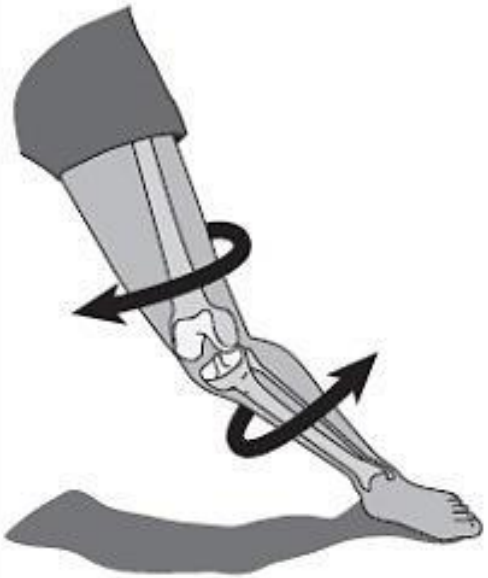
Rotación del torso y rotación interna de cadera

Flexión lateral del torso y valgo de rodilla

Flexión de rodilla

MECANISMO

	Position of Safety Body position	Position of Risk Body position
Back	Normal lordosis	Forward flexed, rotated to opposite side
Hips	Flexed neutral abduction adduction, neutral rotation	Adduction internal rotation
Knee	Flexed	Less flexed, valgus
Tibial rotation	Neutral	External
Landing pattern	In control, neutral position	Poorly controlled, pronated



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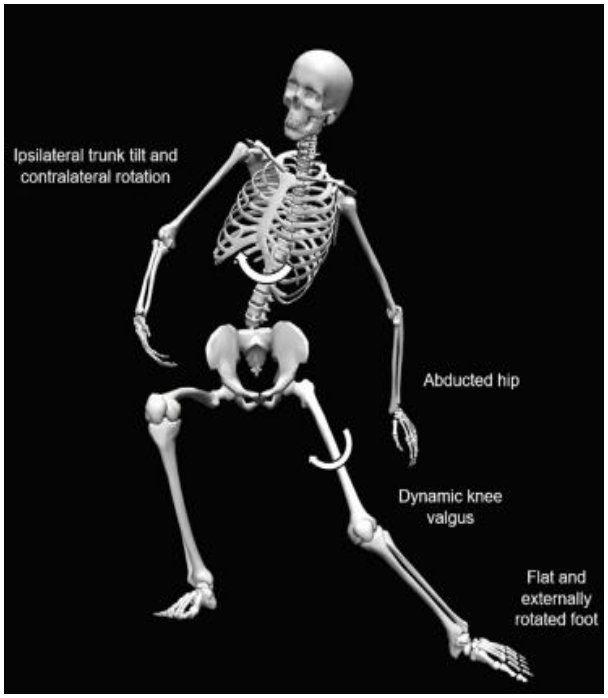

Della Villa et al. (2021)

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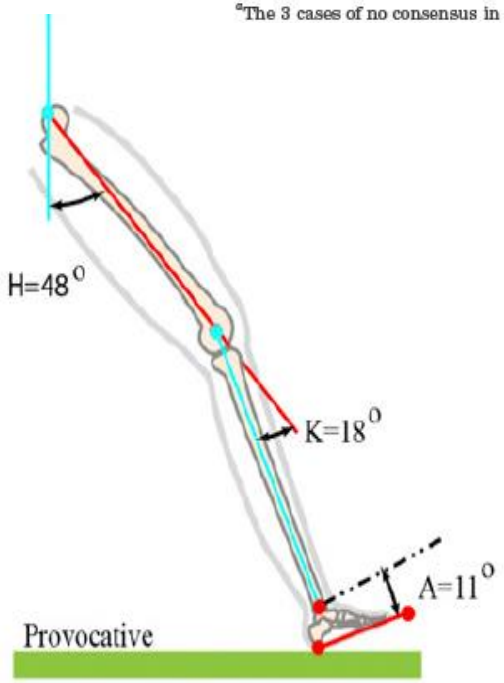
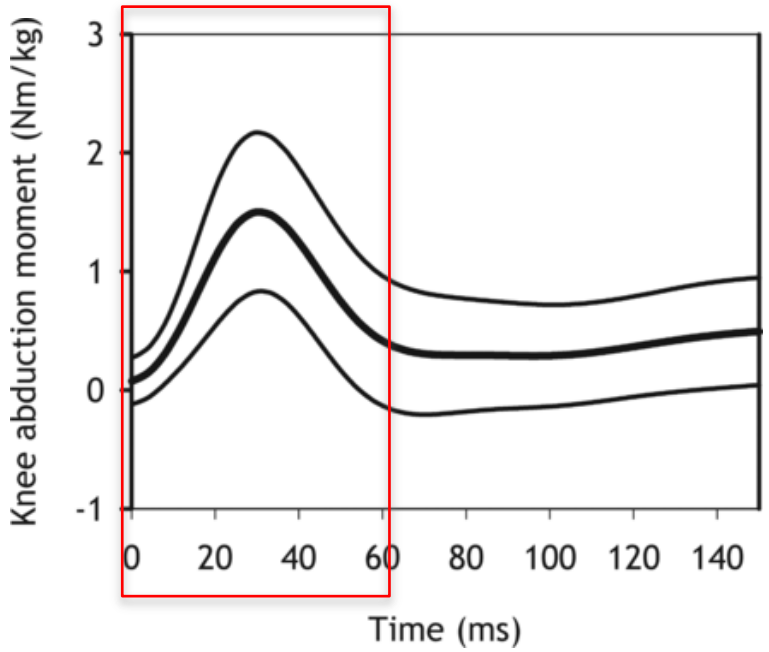
TABLE 2
Mean Time Point of Rupture (ms) and SDs With Range (n = 27)[a]

	Male Players		Female Players	
Action	Mean ± SD	Range	Mean ± SD	Range
1-legged landing	37 ± 9	25-50	37 ± 5	33-42
2-legged landing	33 ± 7	25-42	39 ± 10	25-50
Cutting	46 ± 6	42-50	25 ± 12	17-33

[a]The 3 cases of no consensus in player action are not included in the table.





Carlson et al. (2016)

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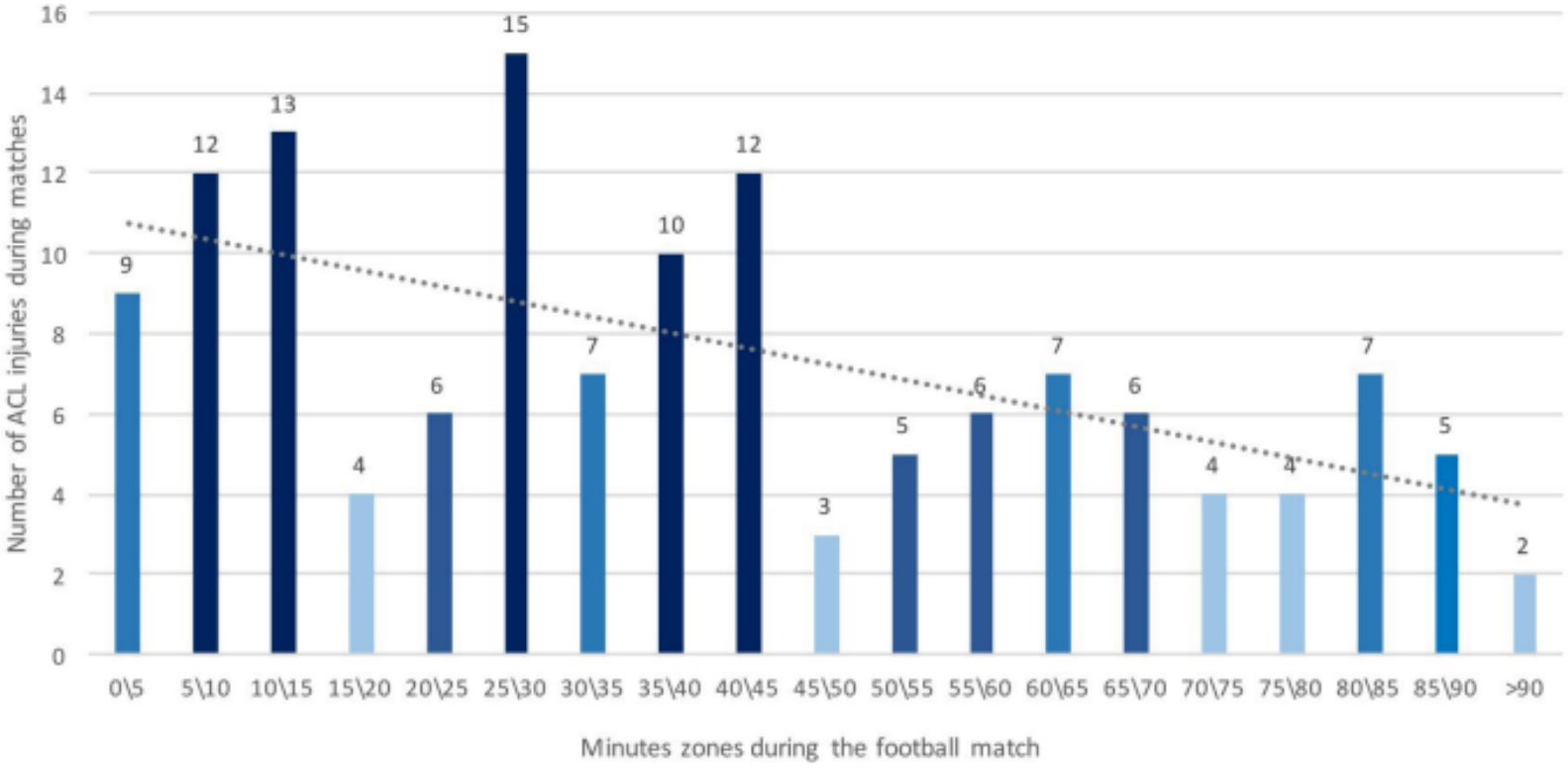

"Fatigue over the course of match play appears not to be a major risk factor for ACL injuries in professional male football"

Della Villa et al. (2021)

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 # Vídeo 5