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A reliable field method to quantify ankle strength deficit in a population with chronic ankle instability

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~ 300 000
Ankle sprain by year



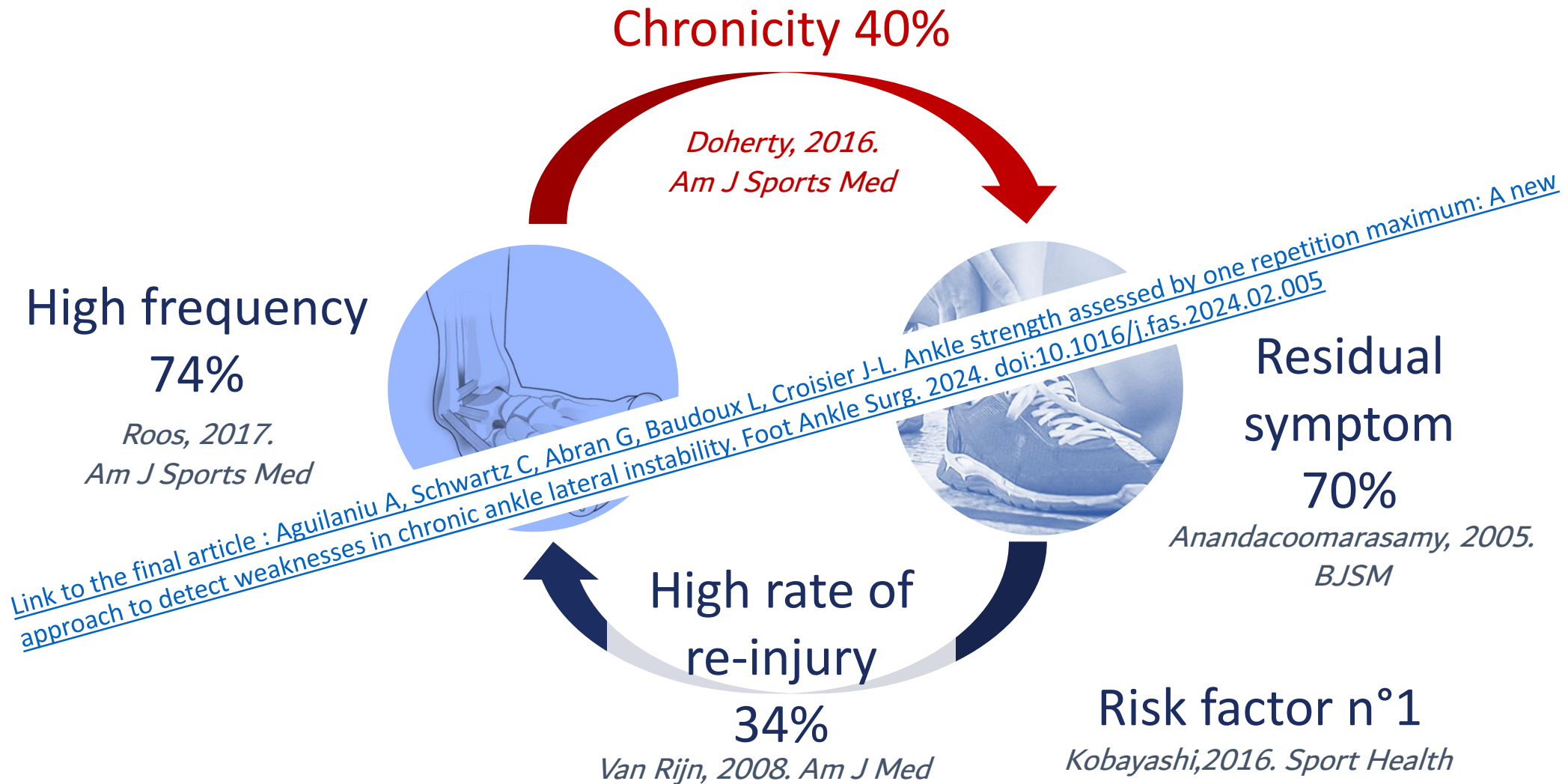
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in Belgium

*(estimation by calculation according to
a population in the Netherlands)*

Kemler et al. 2015. Scand J Med Sci Sports.

Vicious circle of lateral ankle sprain



Why do we have to assess ankle strength ?



Right strength \neq Left strength $> 15\%$
→ Risk factor of **ankle sprain**

Fousekis et al. 2012. Am J Sports Med

Evertors and invertors weaknesses in
patient with chronic ankle instability

Khalaj et al. 2020. Br J Sports Med

Recommended to assess ankle strength in recent guideline

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**ROAST
framework**



Recommended
in acute or sub-acute phases

Delahunt et al. 2018. BJSM

**PAASS
framework**



Recommended
Return to play phases

Smith et al. 2021. BJSM

Objective

to establish a newly adapted 1-RM method
to assess evertor, invertor, and dorsiflexor
strength

1. Reliability and measurement error
2. Comparison between healthy and CAI
3. Determine threshold strength values



Population

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Young and active volunteers



BMI 22,3



BMI 22,3

Method : 1-RM assessment

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Maximal weight

Lifted once

Maintaining the correct lifting technique



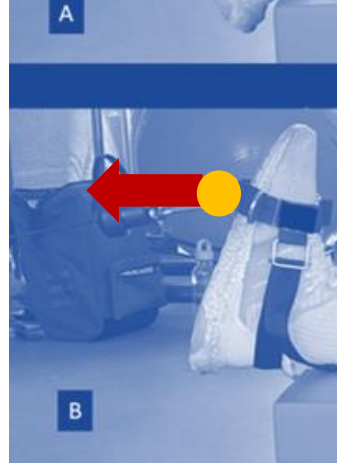
Solving problem

How to apply weight in order to assess ...

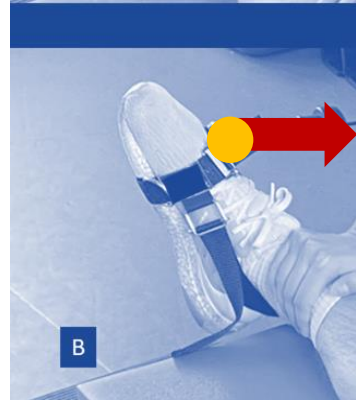
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Evertors



Dorsiflexors

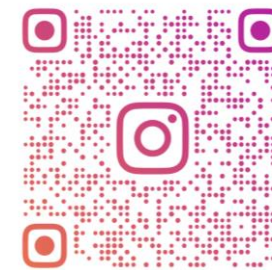


Invertors



Strap prototype with metal rings

I also went further to make it available for physio



WONDERANKLE





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PROTOCOL

1. Warm-up

2. Familiarisation

2*10 rep. (light load)

90'' rest

2*6/4 rep. (medium load)

90'' rest

1*3-10 rep. (sub-max load)

90'' rest

3. 1-RM test

One rep. maximal load

Load increase or decrease of 5-20%

RELIABILITY

Session 1

Session 2

1-RM Strength values

1-RM Strength values



COMPARISON BETWEEN GROUPS



Healthy vs Chronic ankle instability

Results : 1-RM Assessment Reliability

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Reliability

$ICC = 0,76 - 0,88$
ICC (Intraclass Coefficient Correlation)

$ICC \geq 0,70$
Good to compare population

$ICC > 0,90$
Good for individual follow up and to make decision

Aaronson et al. 2002. Qual Life Res.

Measurement error

$MDC = 1,02 - 1,19 \text{ N/kg}$
(19-31%)
MDC (Minimal detectable Change)

Considered as acceptable

Hagen et al. 2015. J Foot Ankle Res.
Kamper et al. 2019. J Orthop Sports Phys Ther.

Results : Comparison between healthy and CAI

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31 healthy



32 with chronic ankle instability (CAI)



Dorsiflexors * 6,5 N/kg

Evertors ** 3,5 N/kg

Invertors * 3,7 N/kg

5,9 N/kg

3,0 N/kg

2,9 N/kg

CAI significantly weaker than healthy

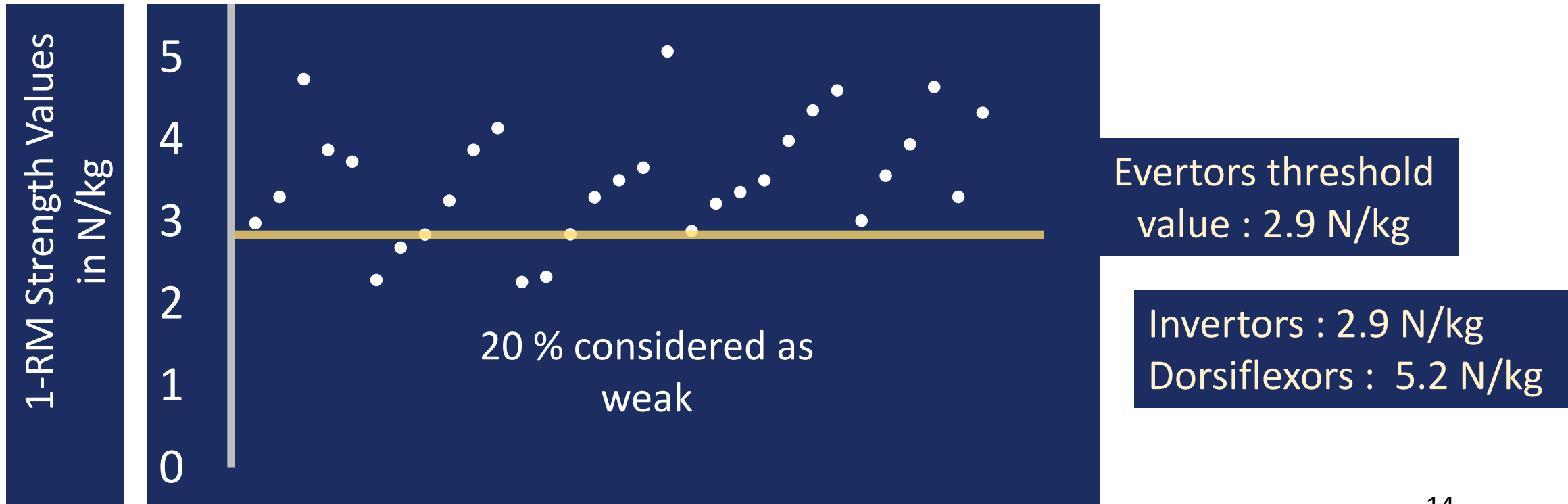
p < 0,05

*T-test de student or
Test de Wilcoxon*

Results : Threshold values estimation

Résultats : Determination of threshold values (n=31 healthy volunteers)

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Limits

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Time to assess



+ Other assessment required
(Flexibility, Postural control, functional ability,)

Reliability could be better

+/- Reliability
Measurement error

But similar to other Field
method Hand held
dynamometer

*Kelln et al. 2008. J Sport Rehabil –
Spink et al. 2010. Gérontologie*

Conclusion

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Quantitative assessment of ankle muscle strength after Lateral ankle sprain ?



New alternative

Weight lifting

Hand Held
Dynamometer

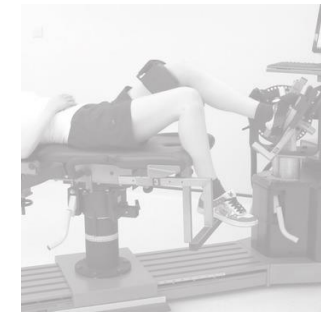


Isometric strength



Dynamic strength
Quantitative measure

Isokinetic
Dynamometer



Accessibility
(cost / expertise)



Thank you



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Questions

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Publication orbi