Bike fit:
Applying the research to the clinic

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WH BIKE FIT

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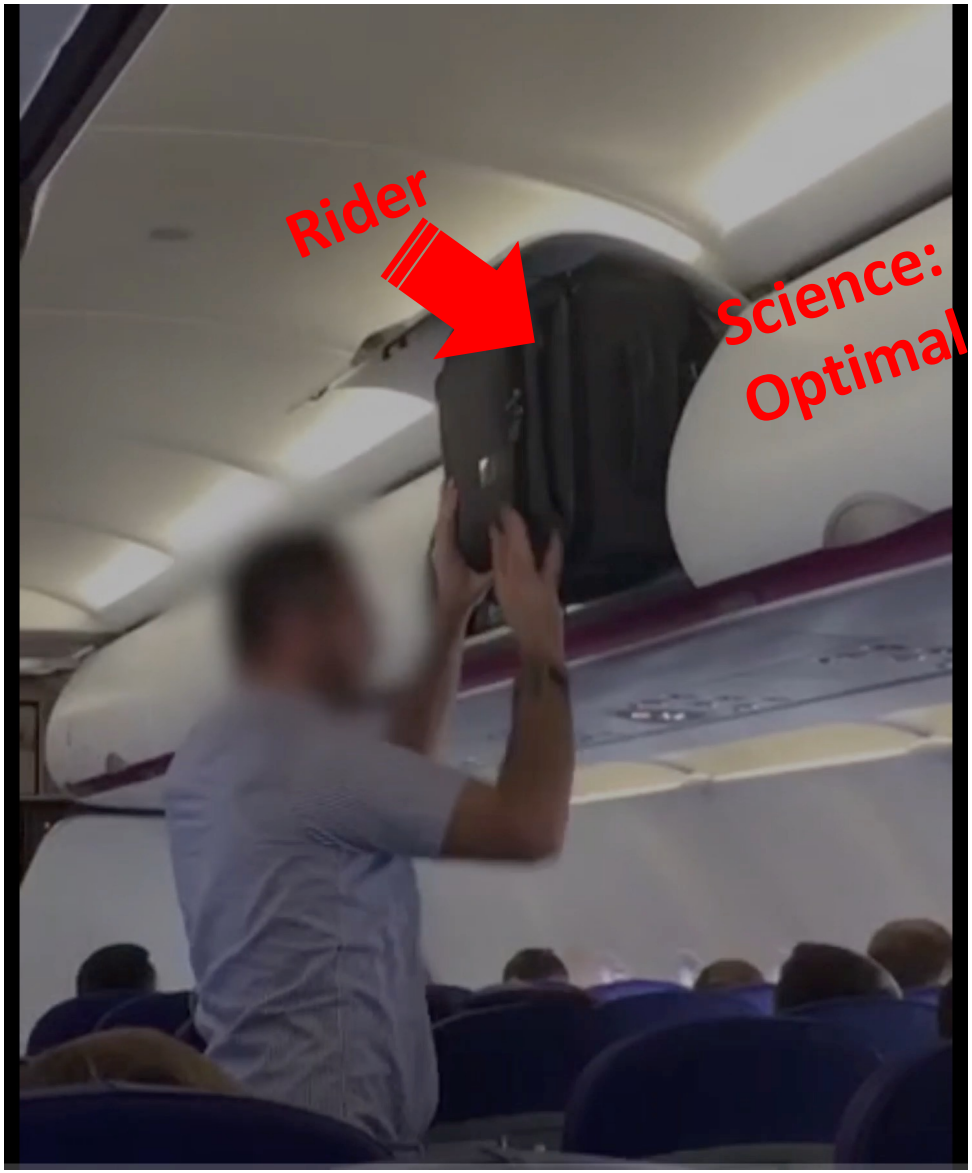

Rider
Science:
Optimal ranges

Fitting the rider on the bike

or

fitting the bike to the rider

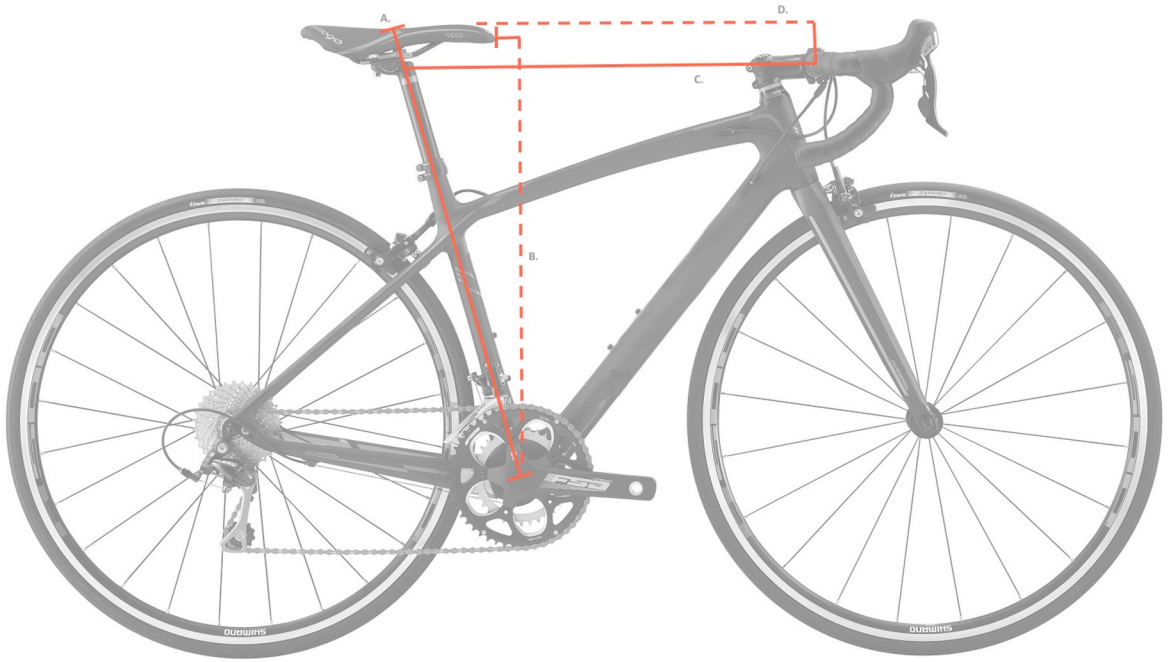
and their goals?

An online survey indicated that 90% of cyclists agreed that comfort is a concern when riding

46% of enthusiastic riders agree that comfort is reached at the expense of performance

Priego Quesada et al 2017

Bicycle configuration



(Hamley & Thomas, 1967)	Percentage of inseam length	Time to exhaustion during constant load cycling	100	109% inseam leg minimised time to exhaustion	109% inseam length
(Shennum & DeVries, 1976)	100%, 103%, 106%, 109%, and 112% of inseam length	VO2, VCO2, VE, HR	5		Saddle set at 103-104% inseam length resulted in maximum power output
(Nordeen-Snyder, 1977)	100% Trochanteric height, 105% Trochanteric height	VO2	10 women		100% Trochanteric saddle height most economical
(Holmes et al., 1994)	Knee flexion angle	Lower extremity overuse injuries	Review	To minimise knee joint load, aim for 25-35° KFA	25-35° KFA
(W Peveler et al., 2005)	109% Inseam length (Hamley and Thomas) LeMond method Heel-Toe method	To determine which method best fit into the recommended 25-35° KFA	14 male cyclists 5 female cyclists	No significant difference between Hamley and Le Mond method. Significant difference between Hamley and heel-toe method. Hamley method fell into the 25-35° KFA 55% of the time.	Holmes method, 25-35° KFA
(W Peveler et al., 2007)	25° KFA 35° KFA 109% Inseam length (Hamley and Thomas)	Anaerobic Power	9 male trained cyclists 3 non-trained male cyclists 15 female non-trained cyclists	a) Using 109% inseam to set saddle height, fell outside 25-35° KFA 67% of the time. b) When outside recommended KFA there was a loss in power, especially at lower saddle heights. c) When within recommended KFA there was no difference in power.	Holmes method, 25-35° KFA
(W Peveler, 2008)	25° KFA 35° KFA 109% Inseam length (Hamley and Thomas)	VO^2	5 male cyclists 2 male non-cyclists 9 female non-cyclists	A 25° KFA produced a significantly lower VO^2 compared to 35° KFA and 109% inseam.	For increased economy, a KFA closer to 25°
(W Peveler & Green, 2011)	25° KFA 35° KFA 109% Inseam length (Hamley and Thomas)	VO^2 Anaerobic power	11 well trained males	Economy was better at 25° KFA compared to 35° and 109% inseam length. Power production was better at 25° compared to 109% inseam length.	For better economy and power production recommends a KFA closer to 25°
(R Bini, Hume, & Croft, 2011)	Review of literature	a) Comparison of flexion angle measurements and knee angle methods. b) Effects of saddle height on performance. c) Effects of saddle height on knee injury risk	Review	a) The knee flexion angle method recommended b) Saddle height set to the Holmes method has better evidence for improved performance. c) A knee flexed at 25-30° has been related to lowering the knee joint load and thus injuries.	Holmes method, 25-35° KFA

Optimal cycling performance

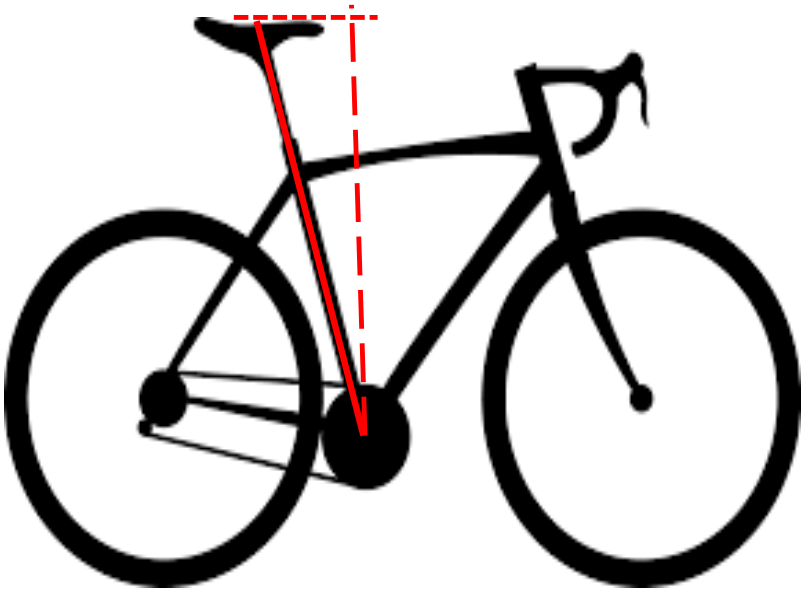
Efficiency

Optimise muscle activity

Knee joint forces

Injury prevention

Saddle height



Knee flexion angle 25-35° static

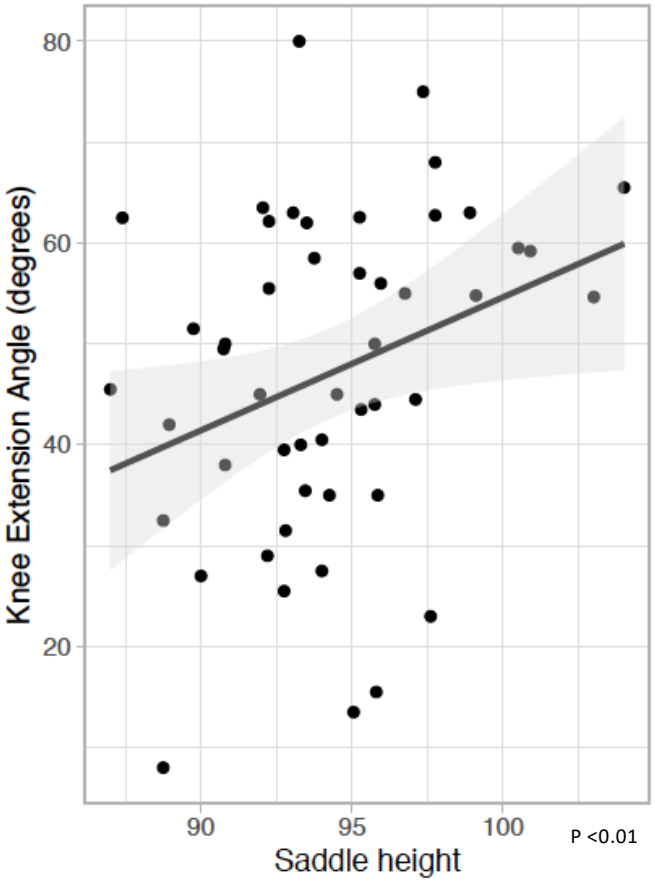
Knee flexion angle 33-43° dynamic [low intensity]

Knee flexion angle 30-40° dynamic [high intensity]

Competitive rider: stage race with ITT

- What will you consider wrt his fit?
- How high will you set his saddle?
- How aero will you get him?

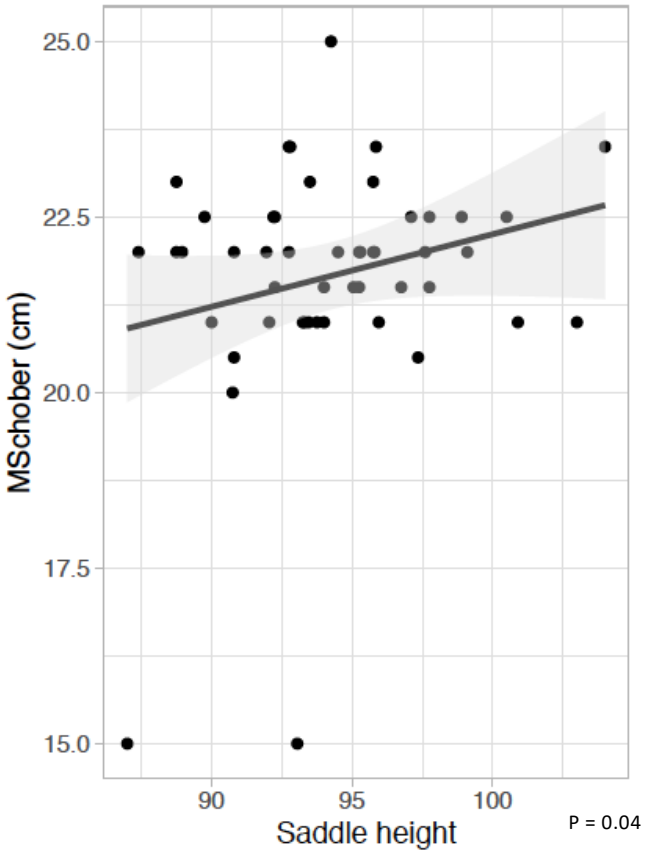
HAMSTRING FLEXIBILITY



Holliday & Swart 2021

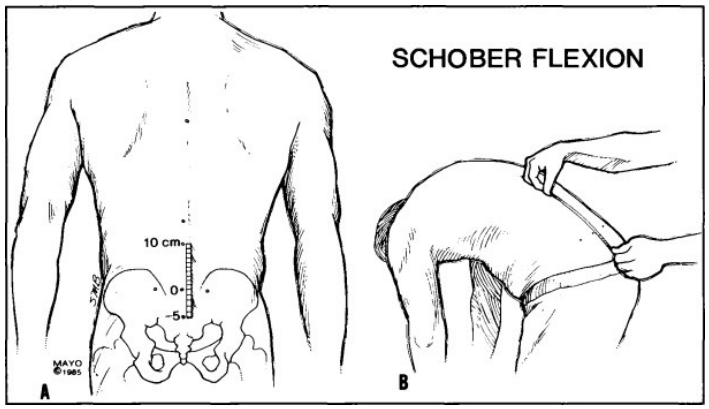
Cyclists tended to select saddle height according to their hamstring flexibility, and cyclists with limited hamstring flexibility self selected lower saddle heights.

Ferrera Roca et al 2012
Holmes et al 1993

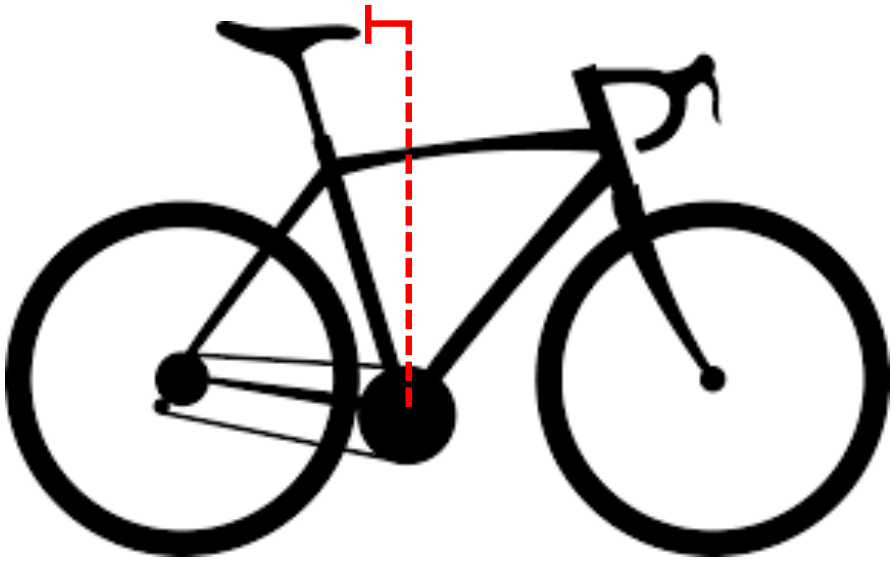


Holliday & Swart 2021

Saddle height was predicted to increase by 6mm for every extra cm achieved in the mSchober test

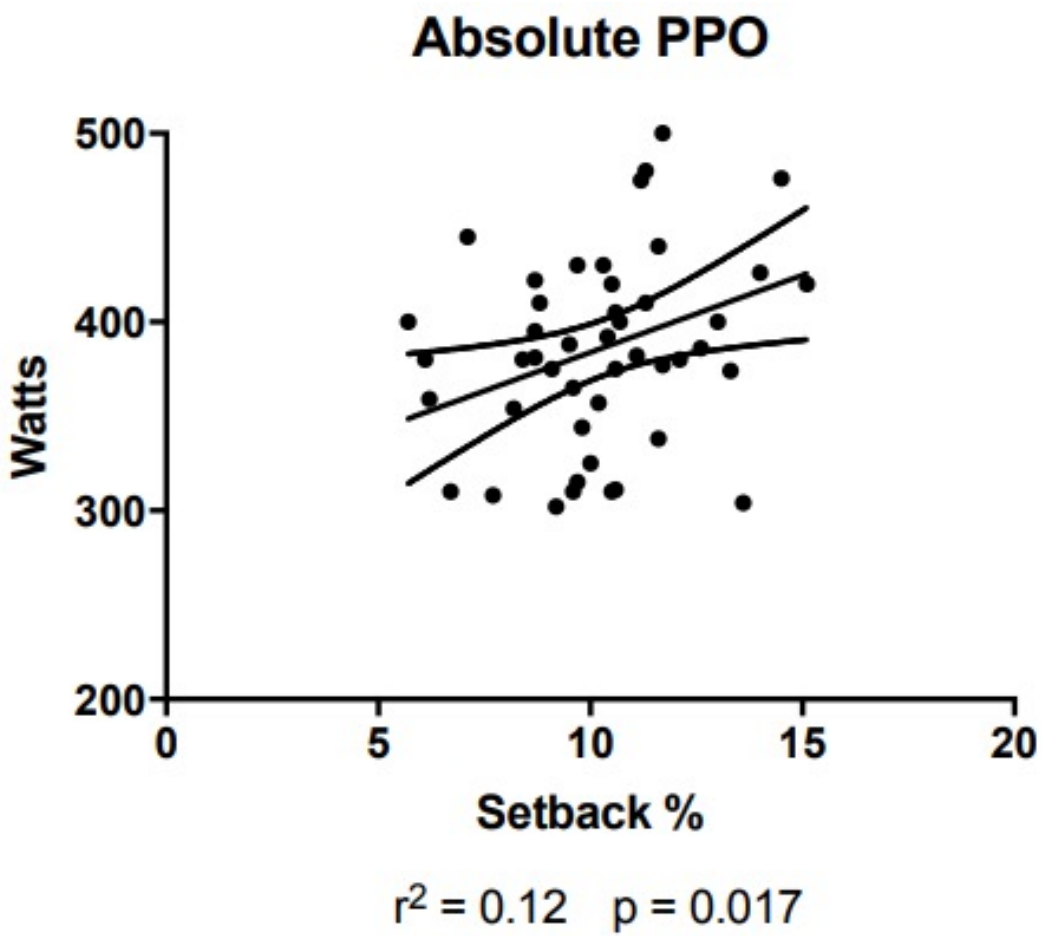


Saddle setback



Saddle setback

Recommendations	Based upon	Study
Formula related to upper leg length	Personal perspective	(de Vey Mestdagh, 1998)
Plumbline and knee over pedal spindle in the 3 o'clock position (static)	Personal experience and recommendations	(Burke, 2003; Burt, 2014; Silberman et al., 2005)
Setback <5% of saddle height favours power production in the quads Setback >10% saddle height favours production from gluteals and posterior muscles	10 male trained cyclists	McDonald et al 2021

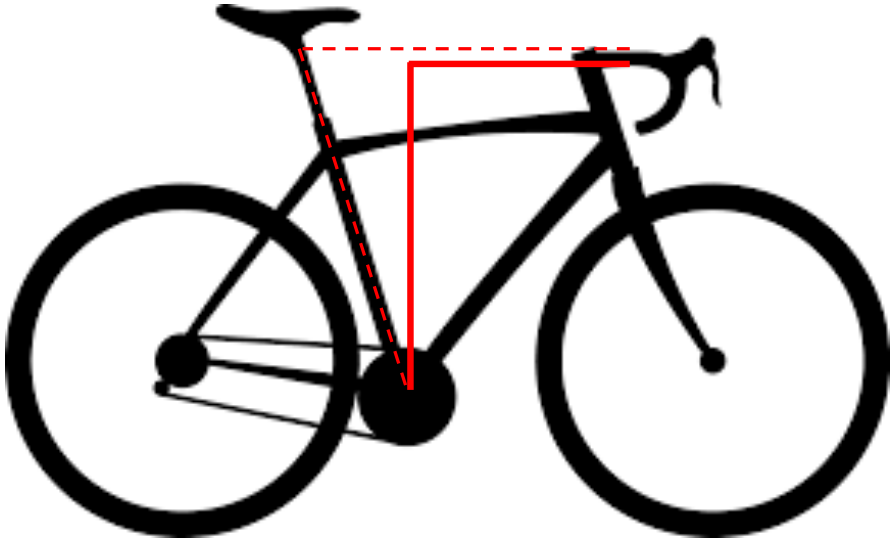


Holliday & Swart 2020

Clinical

- Cyclist complains of tight hips or fatigue in the quads
- Move saddle back a small amount

Handlebar reach



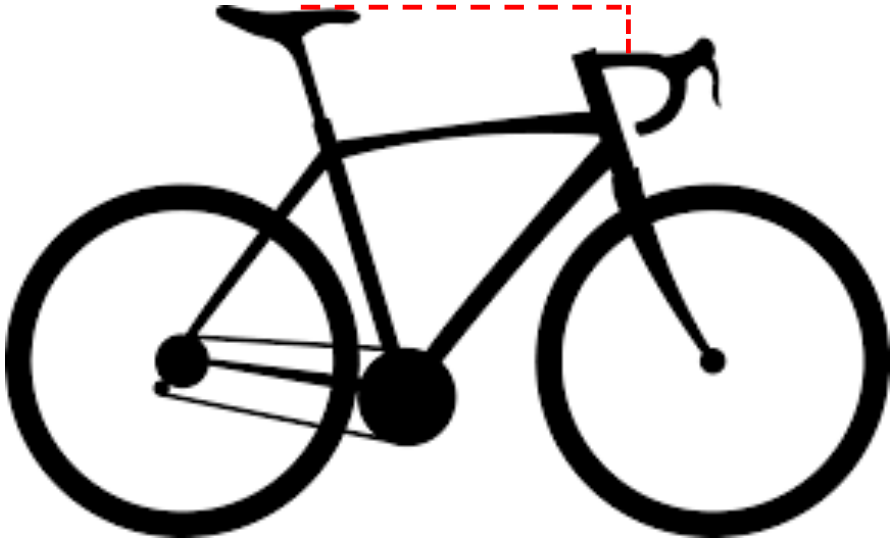
Handlebar reach

Recommendations	Based upon	Study
Formula determined by arm length and torso length	Personal perspective	(de Vey Mestdagh, 1998)
Plumbline from cyclist's nose dropped to centre of stem, hands in drops	Personal experience and recommendations	(Burke, 2003)
Comfort in the drops, elbows flexed 60◦ to 70◦	Personal experience and recommendations	(Silberman et al., 2005)
Related to forearm length	Personal experience and recommendations	(Pruitt & Matheny, 2006)
Individual, comfort	Personal experience and recommendations	(Burt, 2014)

Clinical

- Social rider or older population
- Beginner?

Handlebar drop

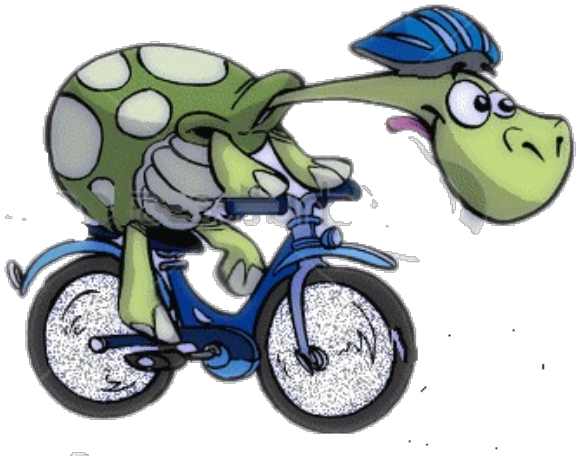


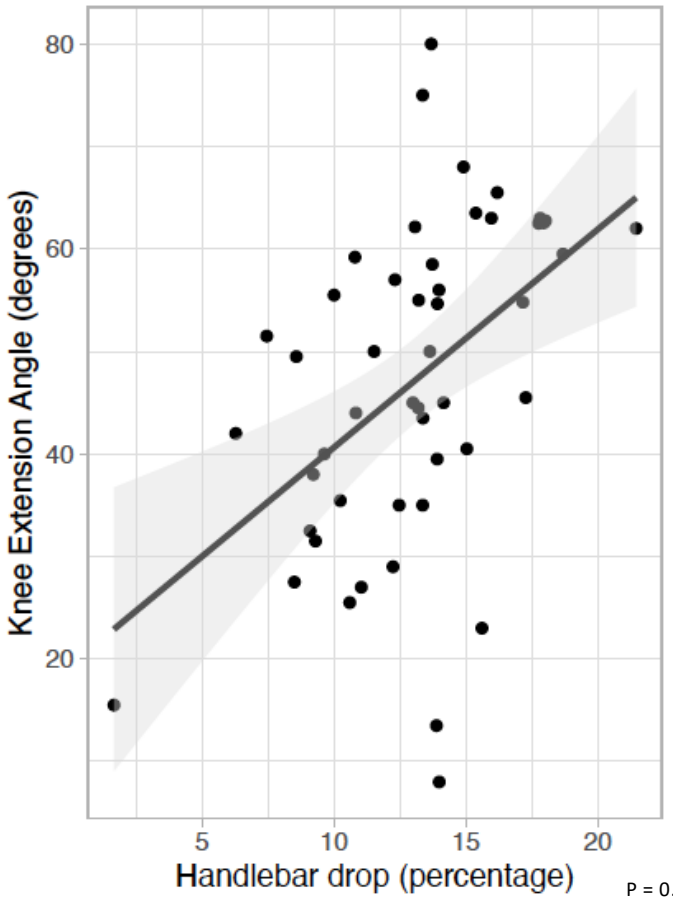
Handlebar drop

Recommendations	Based upon	Study
Formula determined by arm length and torso length	Personal perspective	(de Vey Mestdagh, 1998)
2.5 -5 cm below saddle for small cyclists 10 cm below saddle for tall cyclists	Personal experience and recommendations	(Burke, 2003)
Hands on the brake hoods, arms slightly flexed	Personal experience and recommendations	(Silberman et al., 2005)
Racer/competitive recreational torso angle 30-45◦ Casual cyclist 50-60◦ torso angle	Personal experience and recommendations	(Pruitt & Matheny, 2006)
Individual, comfort	Personal experience and recommendations	(Burt, 2014)

Clinical

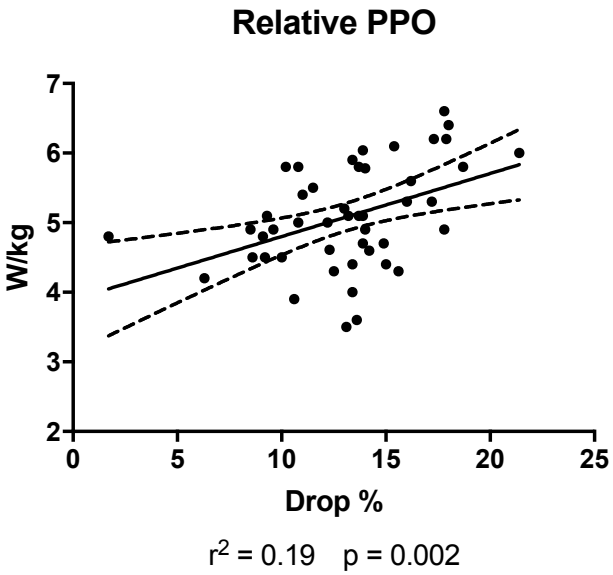
- Neck or lower back pain and/or stiffness?





P = 0.01

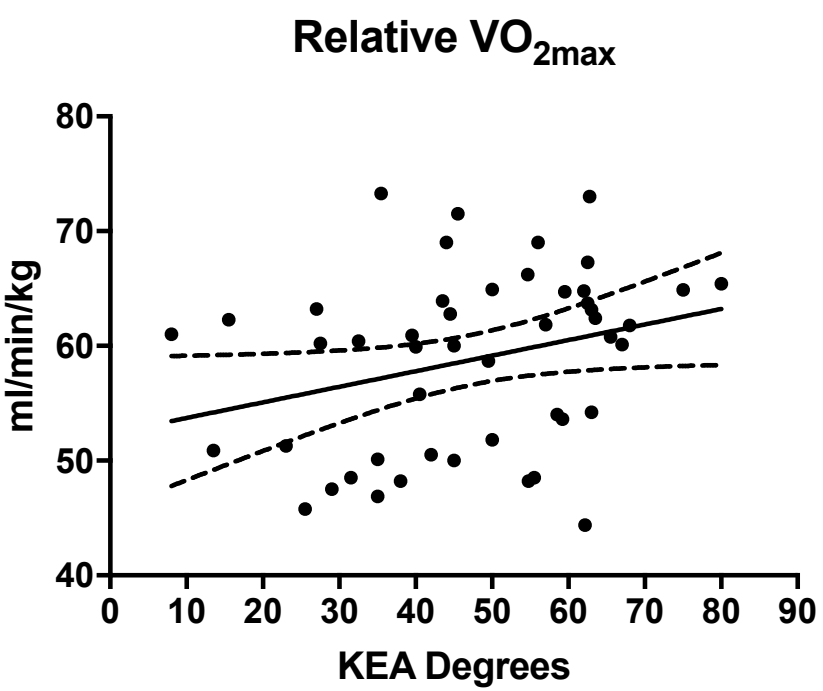
Holliday & Swart 2021



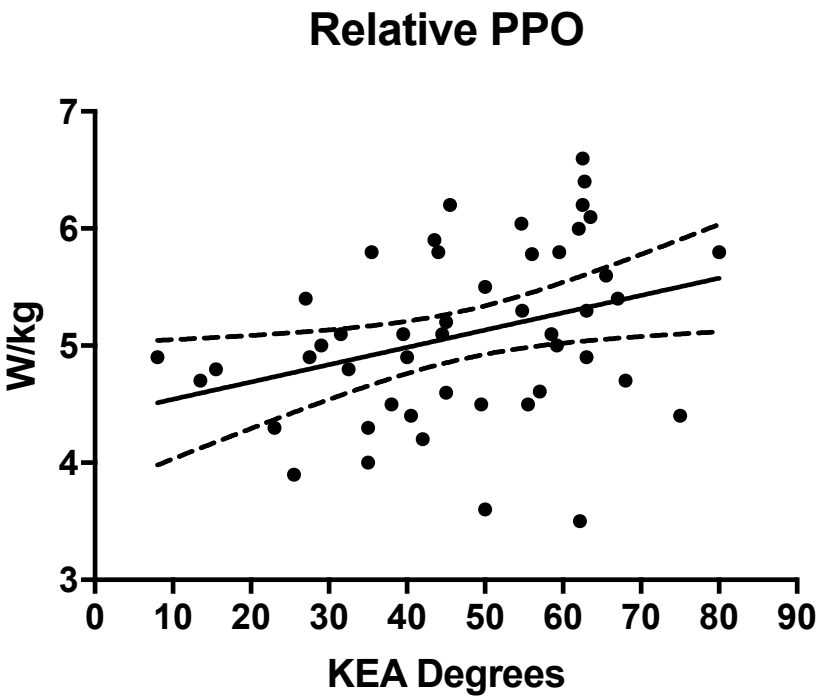
Research has also demonstrated that increased hamstring flexibility and a lower handlebar position was associated with improved performance.

Holliday & Swart 2020

WHY IS HAMSTRING FLEXIBILITY SO IMPORTANT?



$r^2 = 0.08$ $p = 0.046$



$r^2 = 0.11$ $p = 0.022$

Holliday & Swart 2020

FULL BODY MOBILITY


FLOBIKES

Aerodynamics

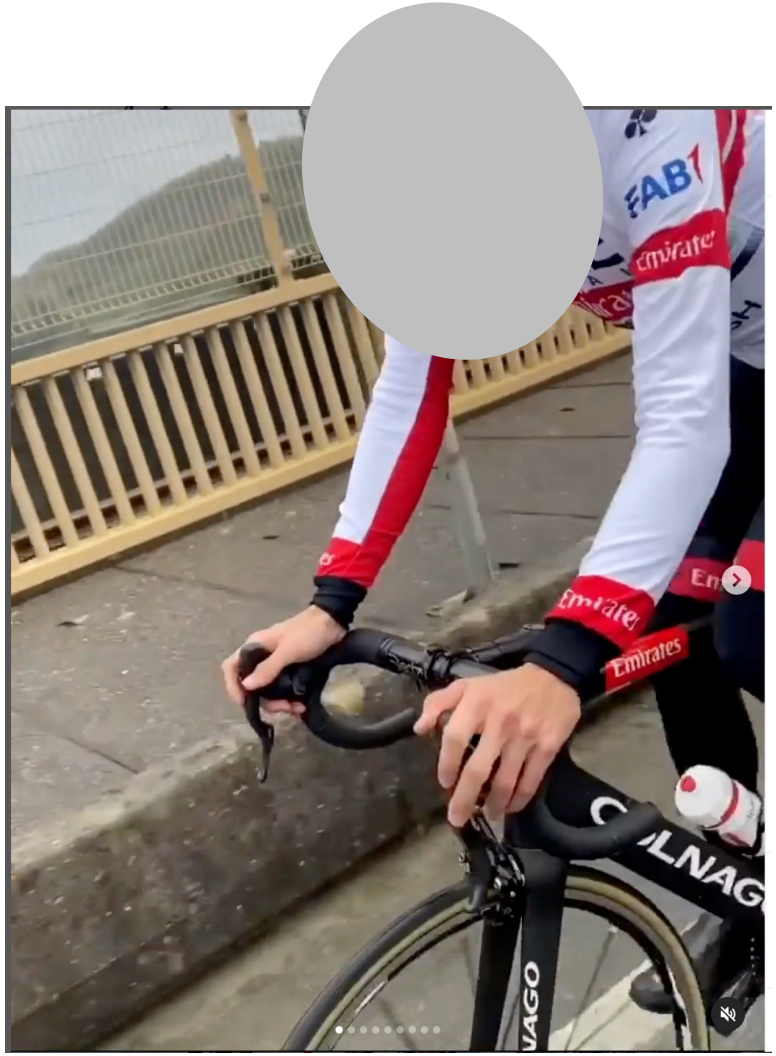
Half Ironman

- Does your rider want to

  finish comfortably?

  beat their training partner or PB?
- How aero will you put them?
- What will you take into consideration with these riders?

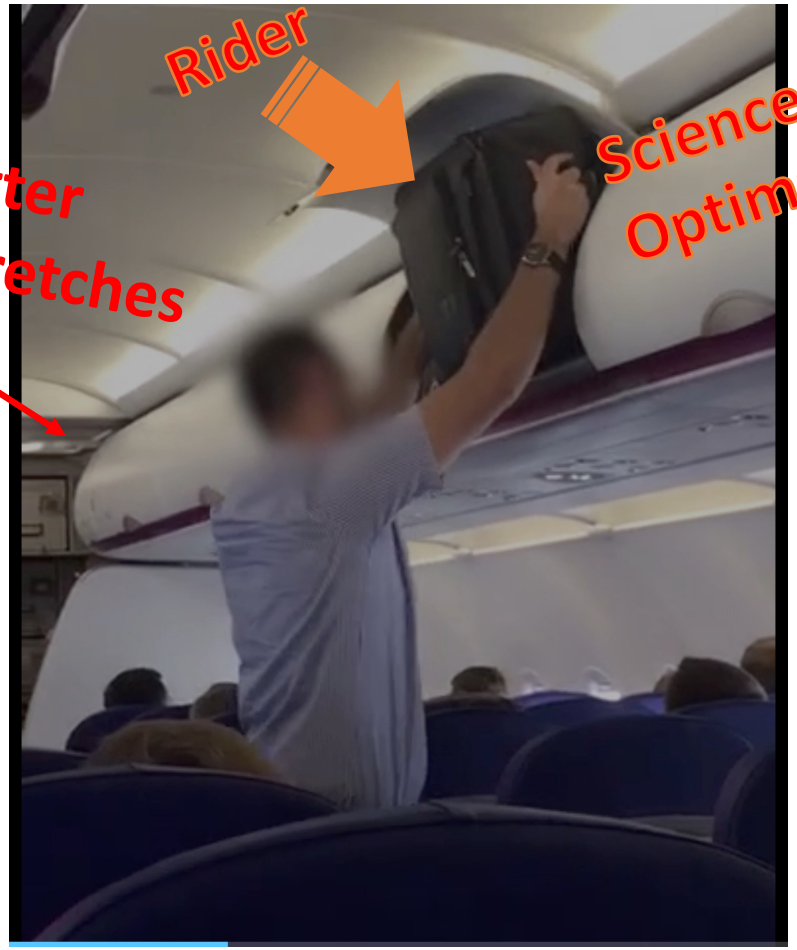
Injuries: Broken collar bone



with permission

Summary

- We need the scientific optimal ranges to guide us in terms of performance and injury prevention
- We should understand that we do not need to fit everyone into those ranges, and be able to explain why we aren't fitting them there
- Work towards getting them into those ranges with PT, exercises, stretches, postural education etc



An optimal fit is the one when the client is happy!

Thank you

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