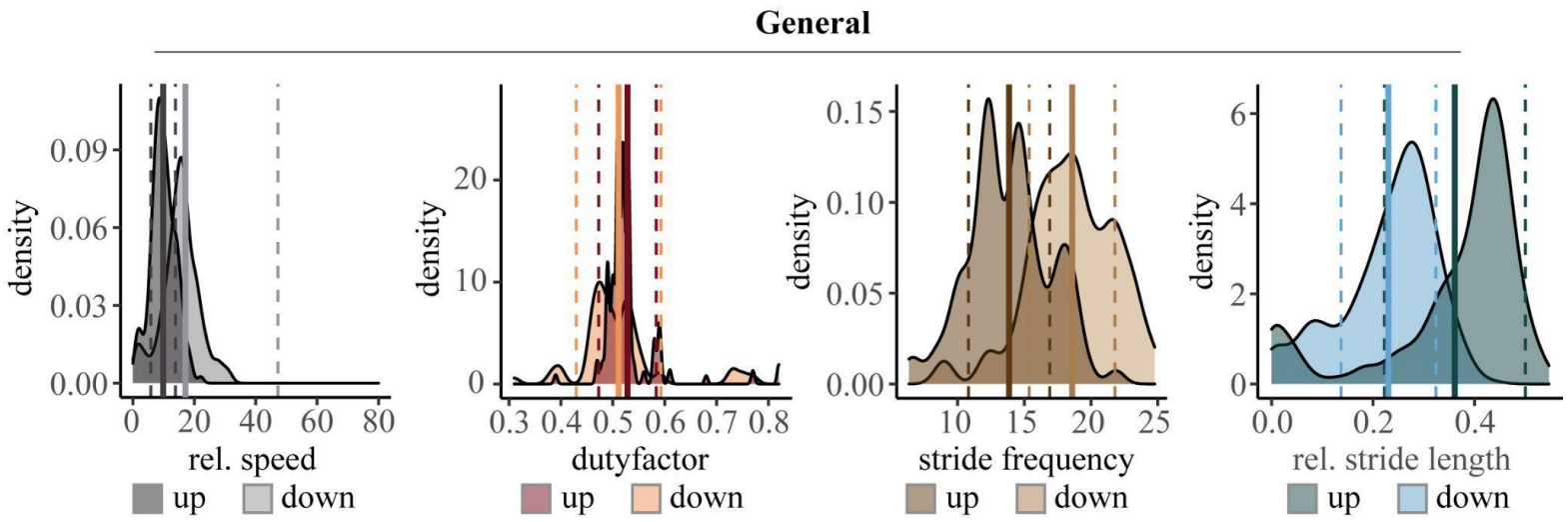
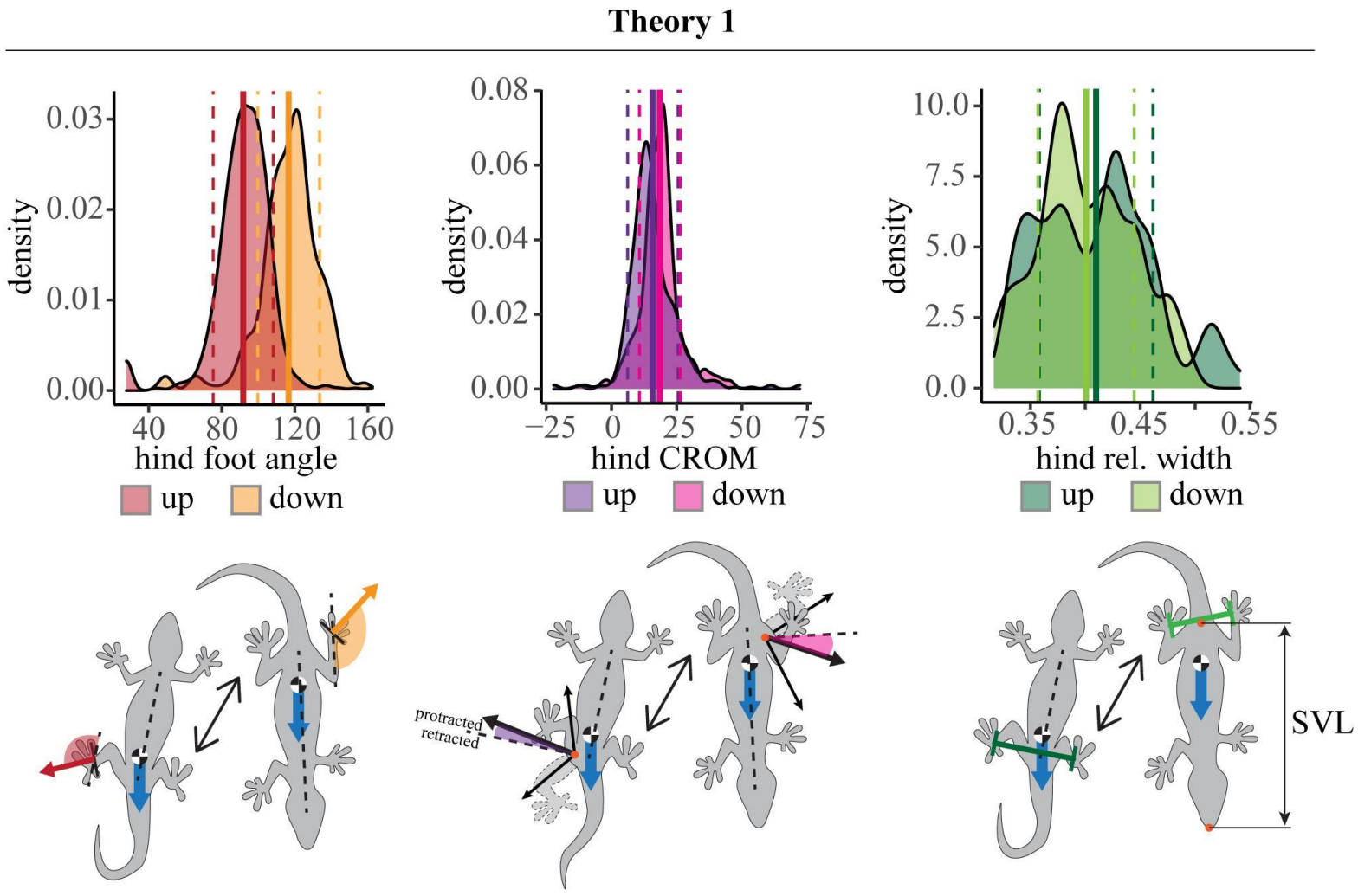
KINEMATICS

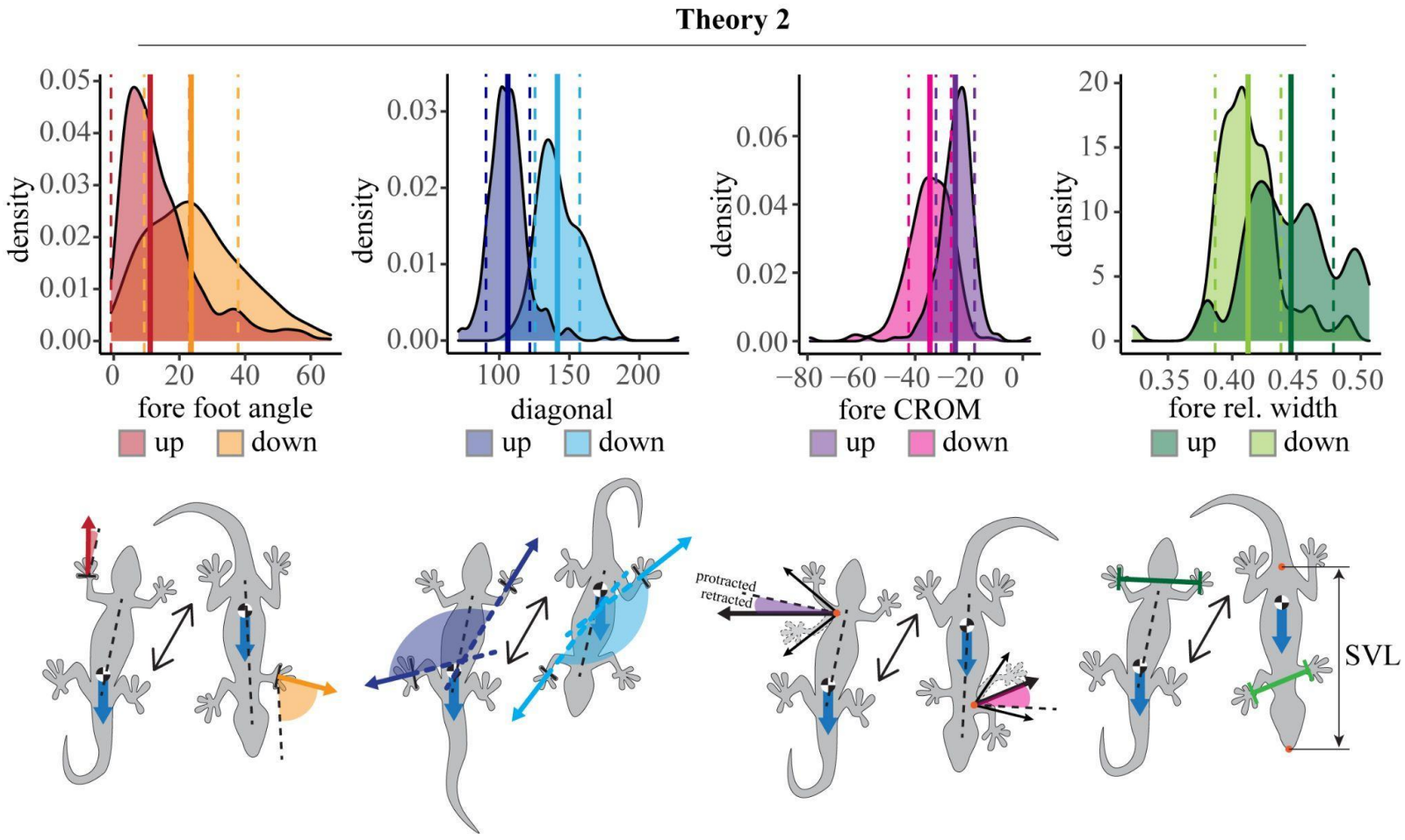
(hfren)



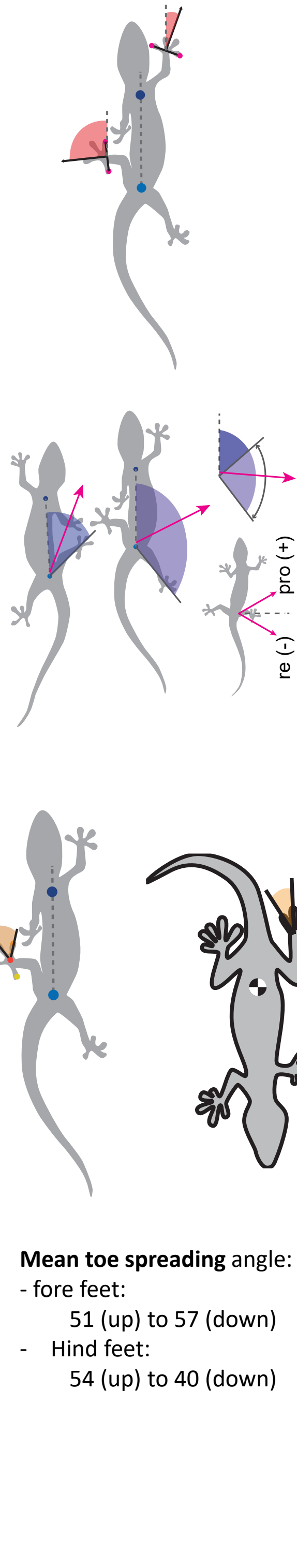
- Duty factor decreases slightly (sign.),
- rel. speed increases for down,
- with frequency increasing and stride length decreasing



- **Hind foot angle** increases for down from 90° to 115°,
- CROM hind protracts even further for down from 15° to 19°,
- Rel. width between the hind feet decreases for down



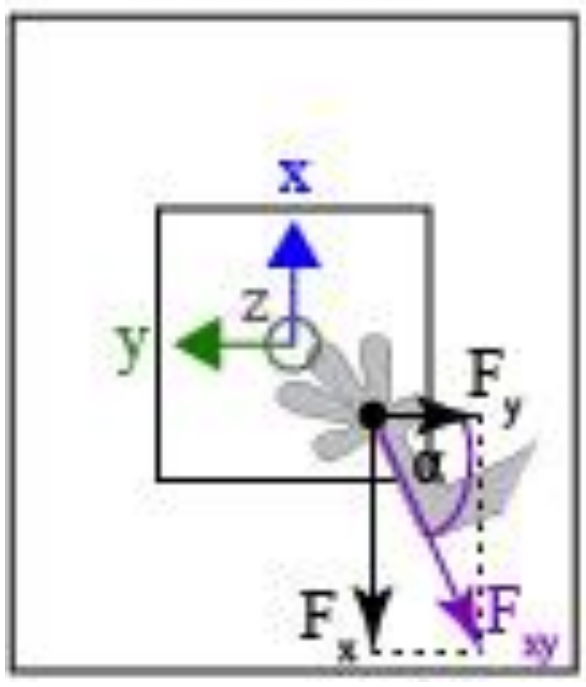
- **Fore foot angle** increases for down from 15 to 25,
- The diagonal (foot angle fore+hind) increases for down from 107 to 145
- CROM fore retracts even further for down from -25 to -35,
- Rel. width between the fore feet decreases for down

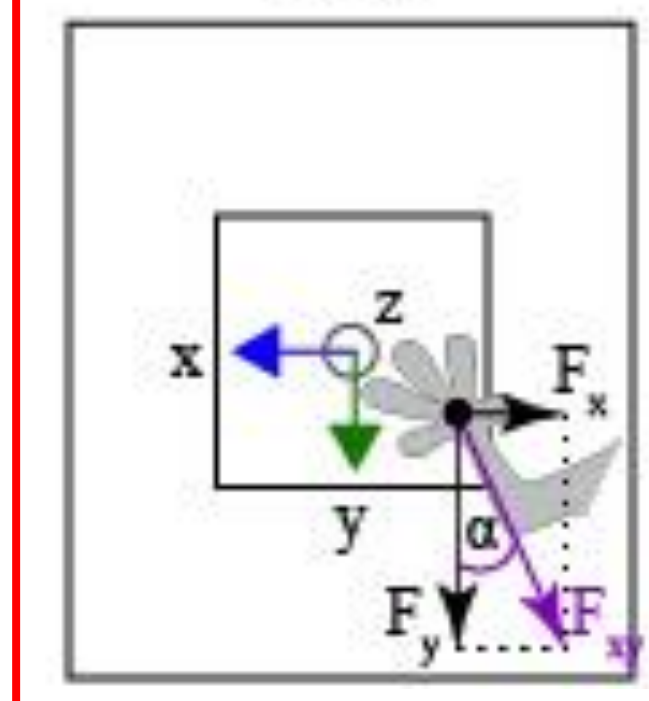


Mean toe spreading angle:
- fore feet:
  51 (up) to 57 (down)
- Hind feet:
  54 (up) to 40 (down)

DYNAMICS

UP DOWN


all geckos
x
z
y
F y
α
F x
F xy


hfren
z
x
F x
y
α
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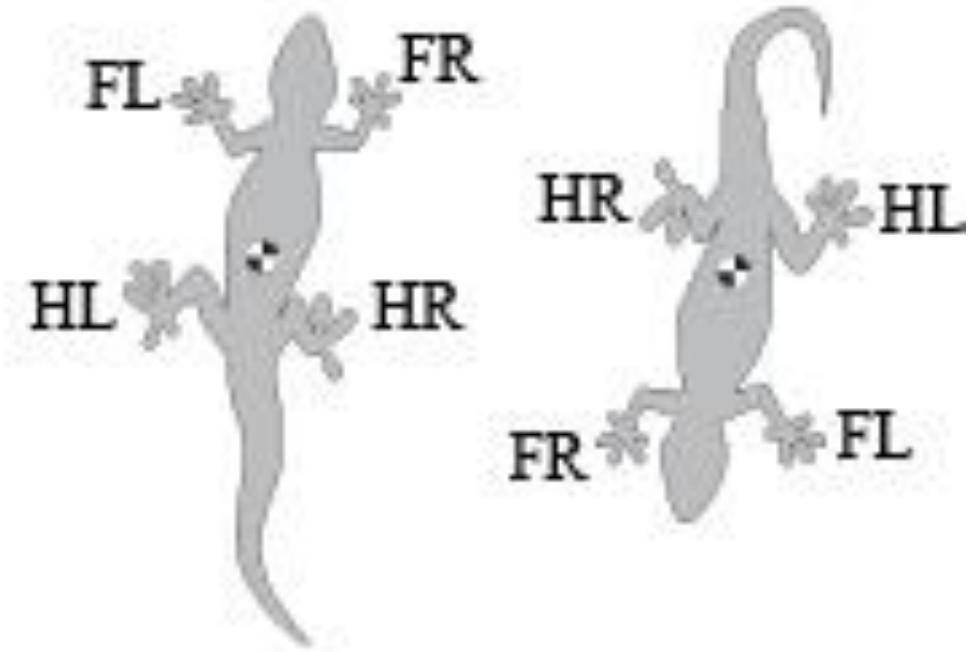
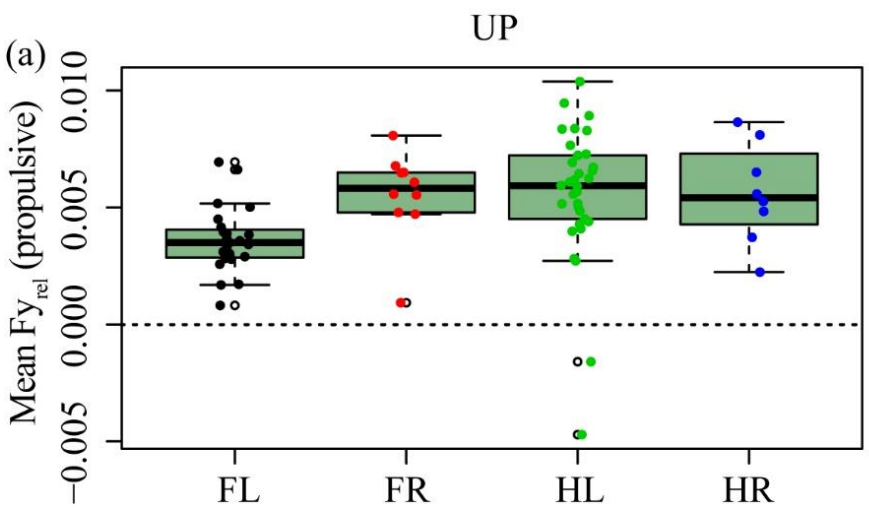
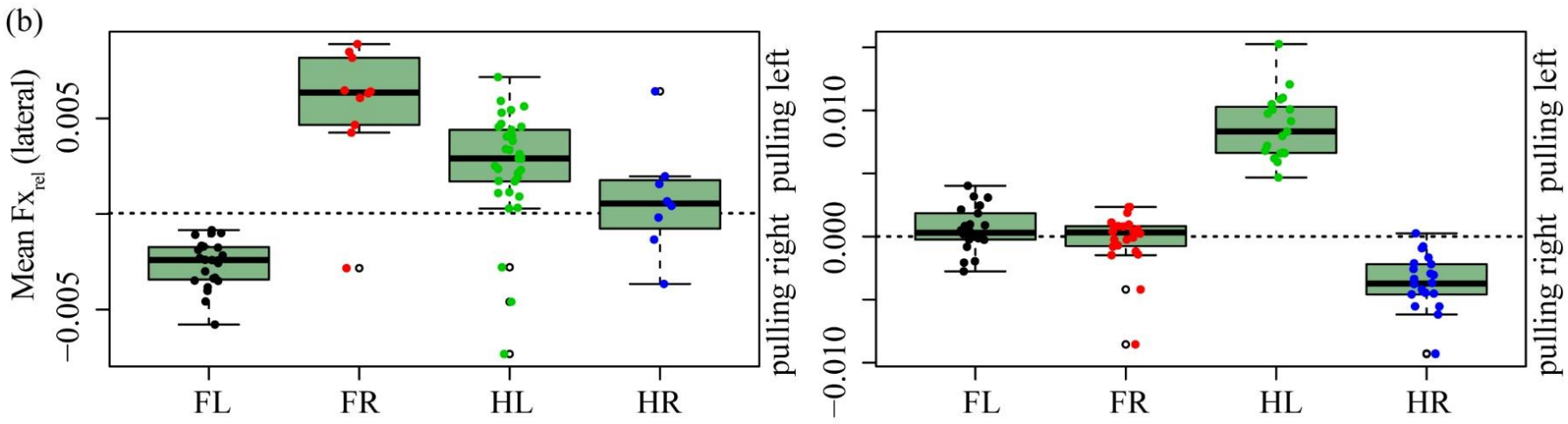
F xy


FL
FR
HL
HR
HR
HL
FR
FL

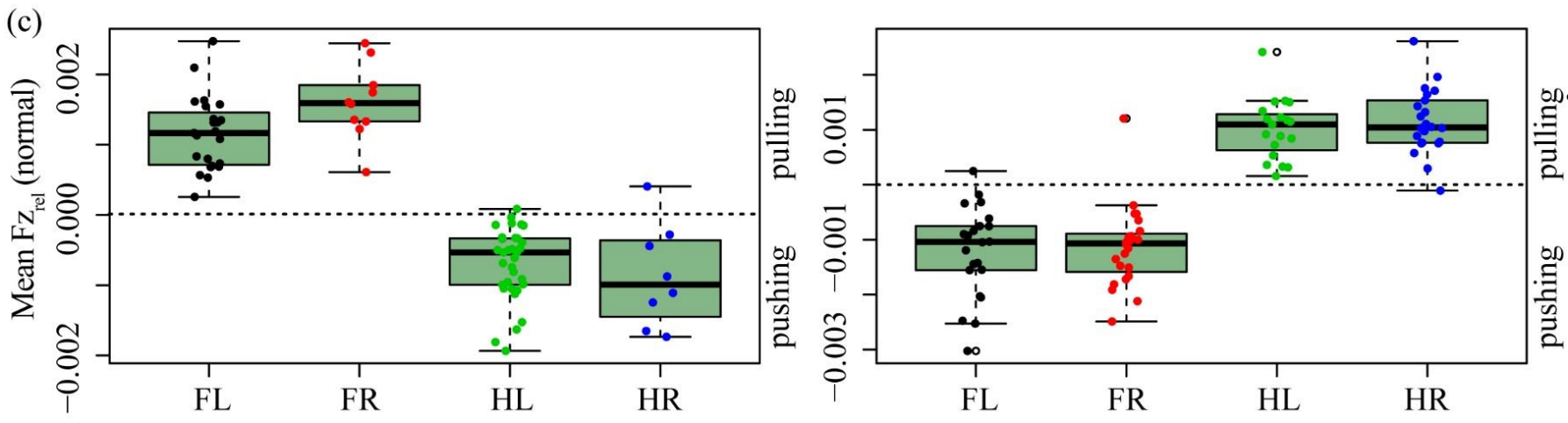


- Up: all feet generate propulsive forces
- Down: hind feet generate more, forefeet maintain magnitude

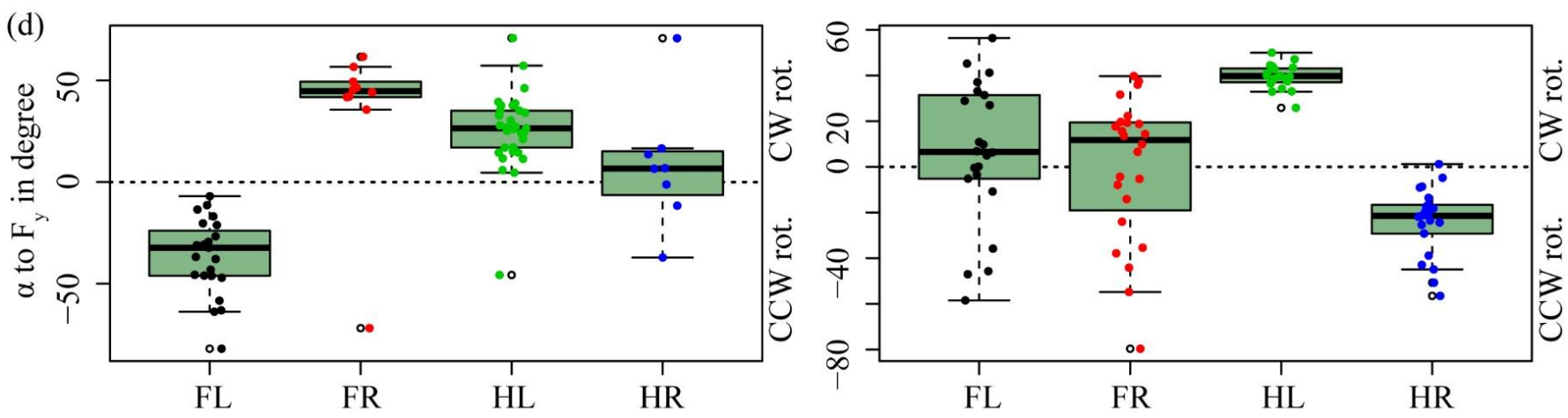
→ hind feet brake

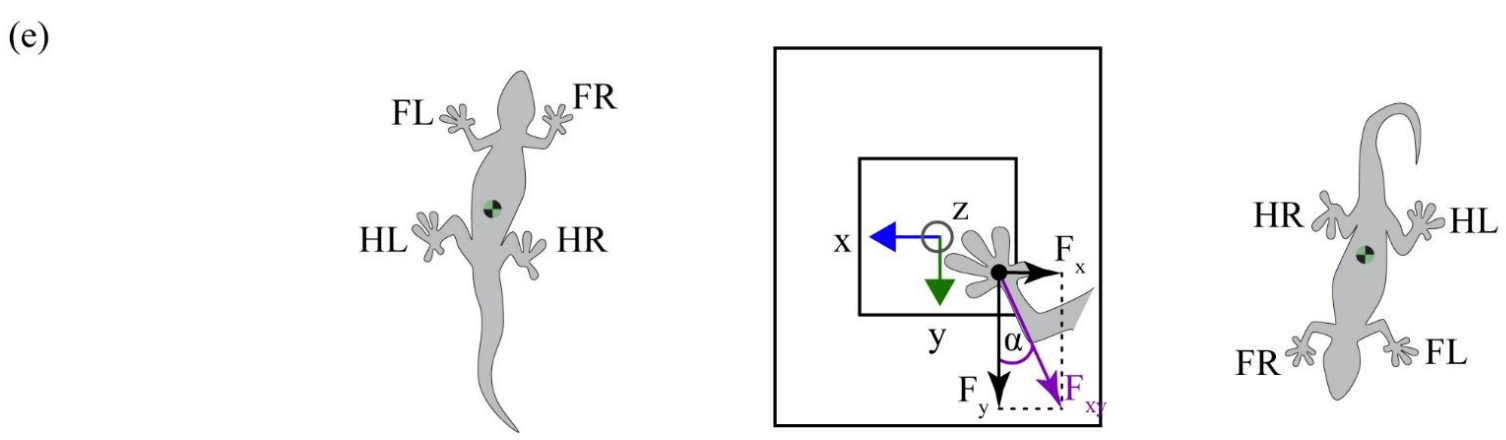


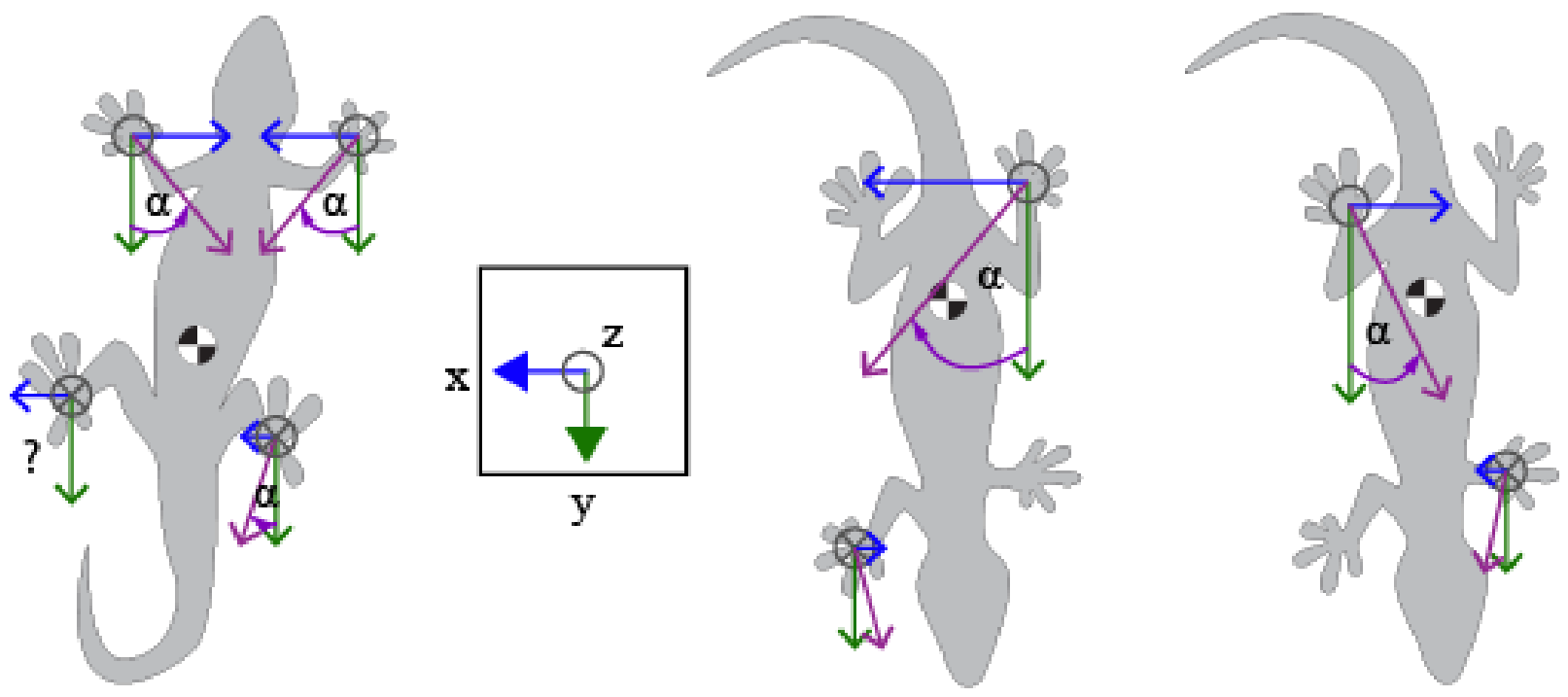
- Up: left feet pull right, right feet pull left, not sure what's wrong with HL…, fore feet pull more than hind feet
- Down: pattern inverted, hind feet now pull more than forefeet, basically no lateral forces for forefeet



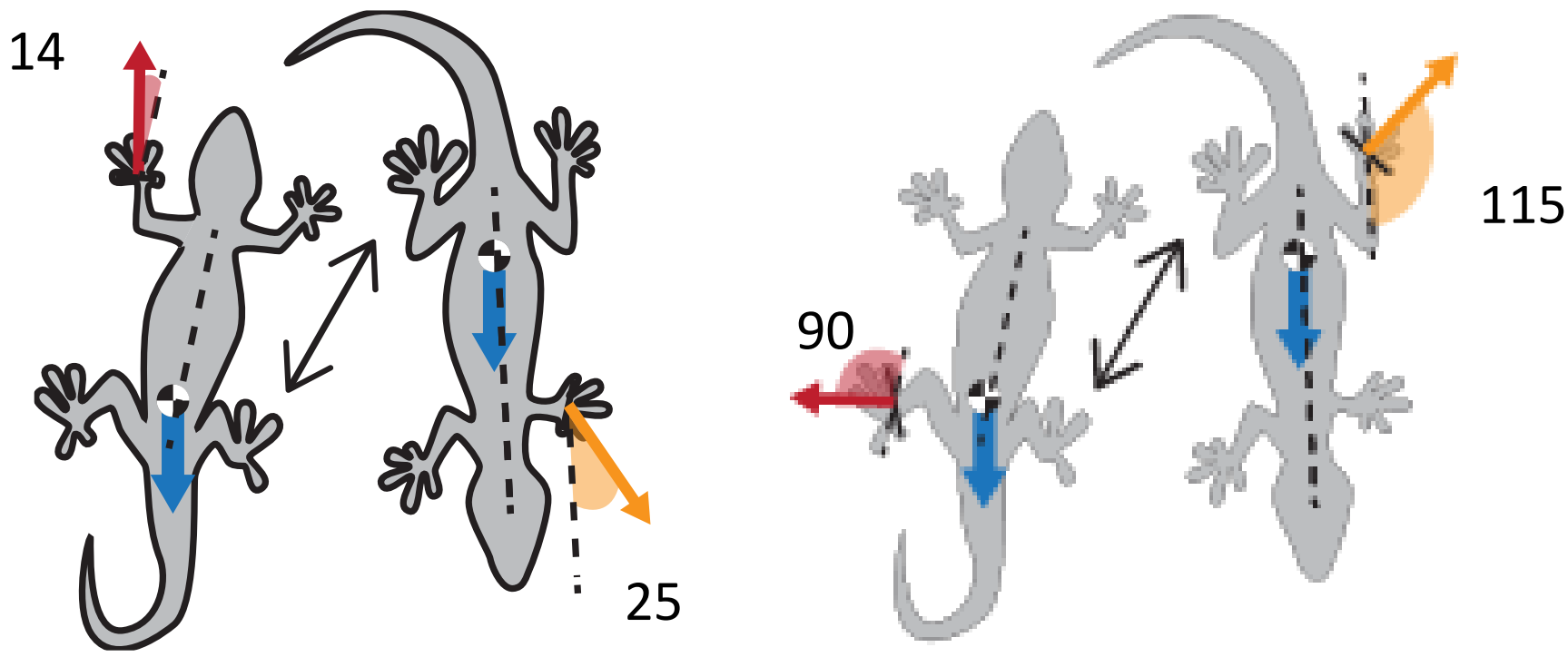
- Up: forefeet pull, hind feet push
- Down: Inverse



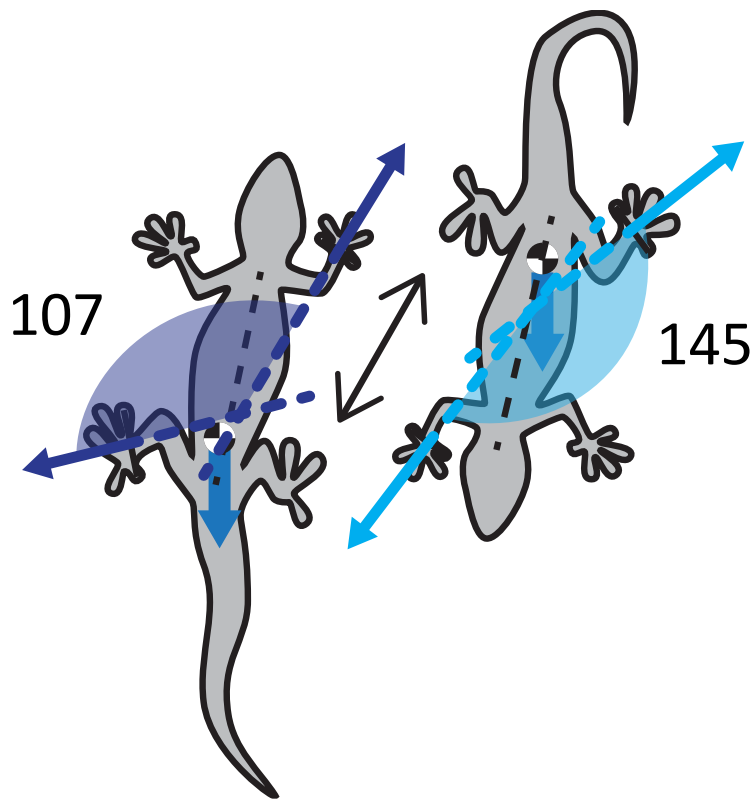




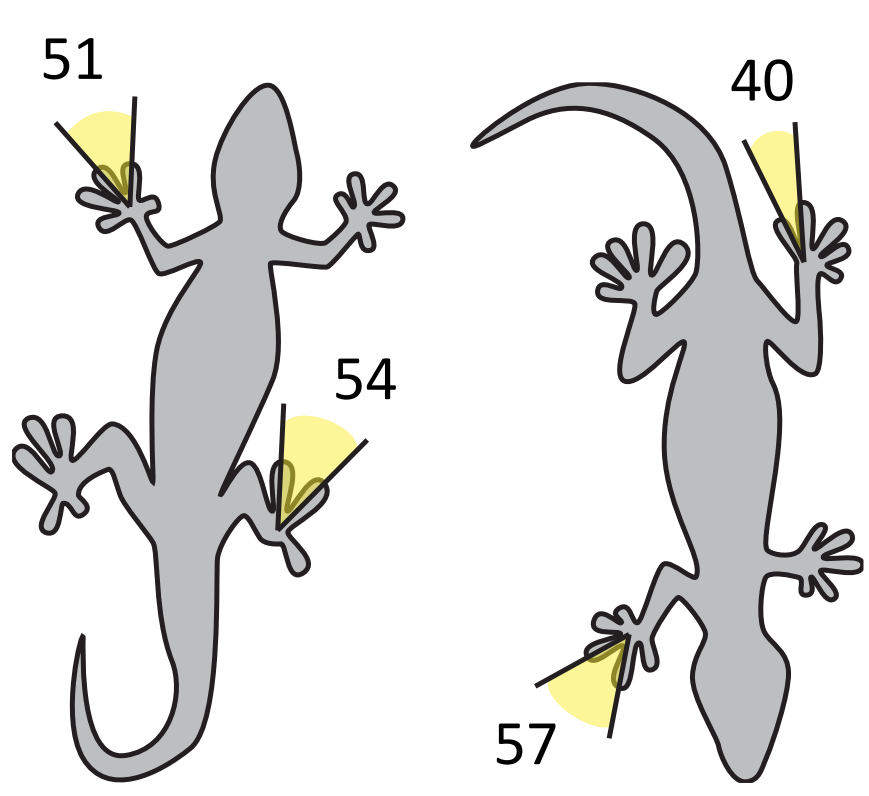
Foot angles



diagonal

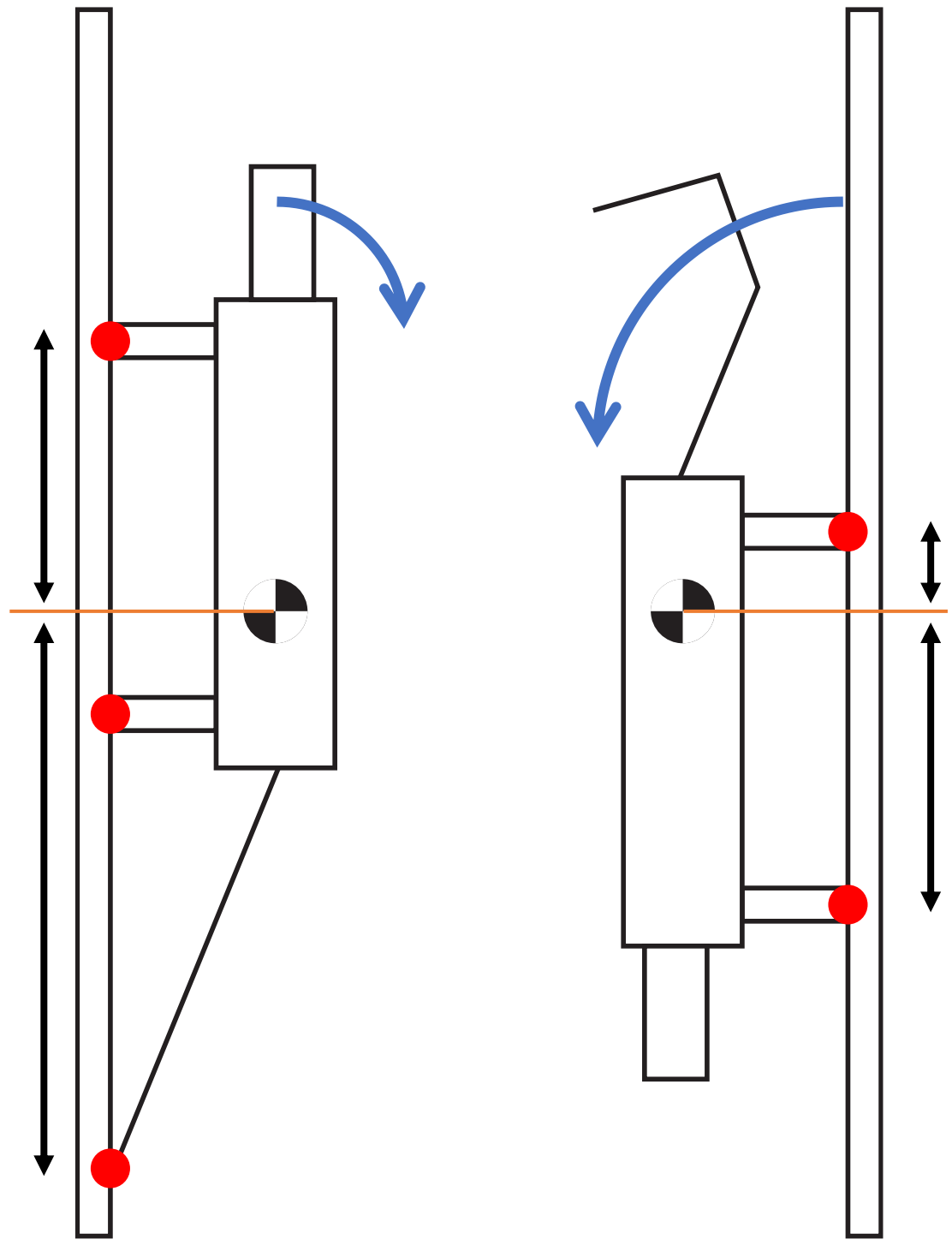


Mean toe spreading



forces

Modelling questions:



- Geckos have 3 points of contact when climbing head up, but only 2 when climbing head down. (also see Jusufi et al., 2008)
- Overturning moment larger when climbing head-down?
- Incorporate the morphology of the geckos to calculate the overturning moment.
- How to include lateral forces, how to explain the disconnect between the angle of the “wrists” and the angle of the Fxy forces?
- → Why spread the feet to the sides for head-down climbing, when no lateral forces are produced??
- 3D model possibility??