

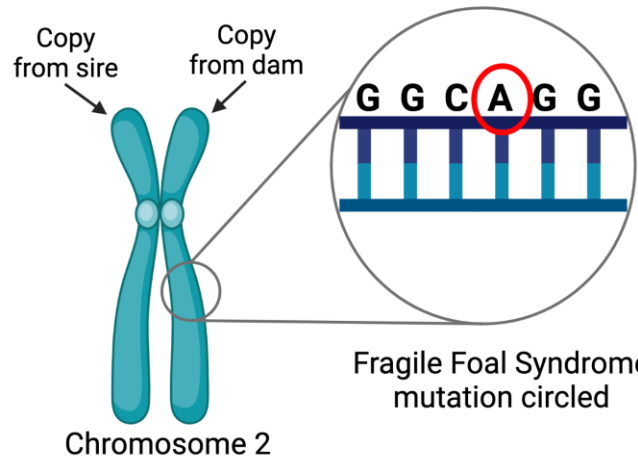


Quantifying Gait Quality Changes in Fragile Foal Syndrome Carriers Using Artificial Intelligence

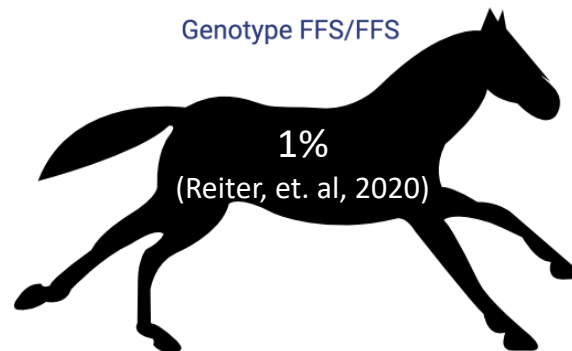
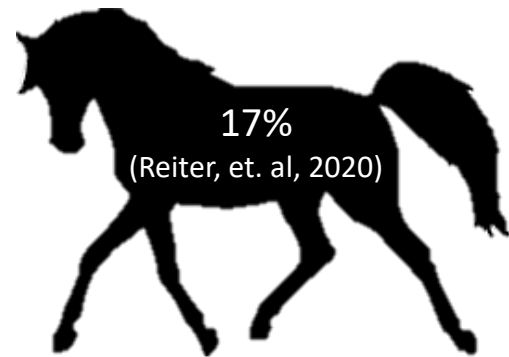
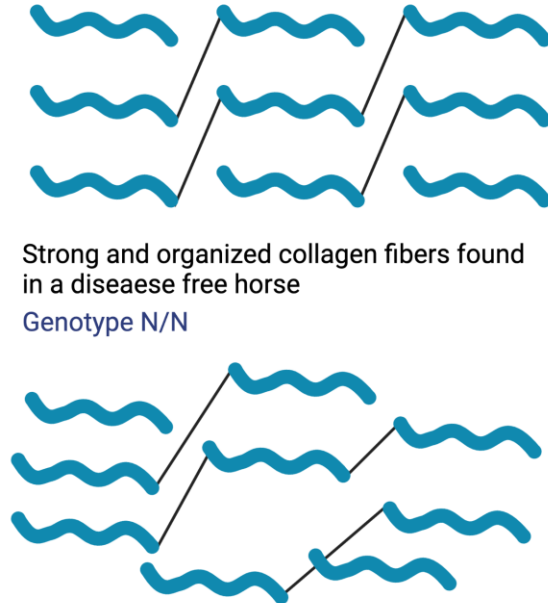
Madelyn P. Smythe, Savannah Dewberry, Elizabeth A. Staiger, Kyle Allen,
Samantha A. Brooks

Fragile Foal Syndrome

A)



B)



Gait Quality

- Important for Sport Horses
- Scores often subjective
- Pressure for horse to have superior gait

(Ablondi, et. al, 2020, Barrey, et. al, 2002, Lewczuk, et. al, 2019, Morscher, et. al, 2010, Hellsten et. al, 2006)



AF	Circle left 20 metres diameter Working trot	10	6.5	Regularity
E	Working trot Track right	10	5.5	Balance, Regularity
AK	Circle right 20 metres diameter Working trot	10	6.5	Regularity
IC	Working trot Track left	10	6.5	Regularity
Between & H	Transition to medium walk Change the rein in medium walk	10	6.0	Fluency, Regularity
B	Half circle right 20 metres diameter in free walk on a long rein	10 x 2	5.5	Balance Regularity down, g
E			6.0	Regularity
M	Change the rein in medium walk	10	5.5	Regularity
		10	6.0	Fluency

Qualitative
Score
Sheet

Objectives

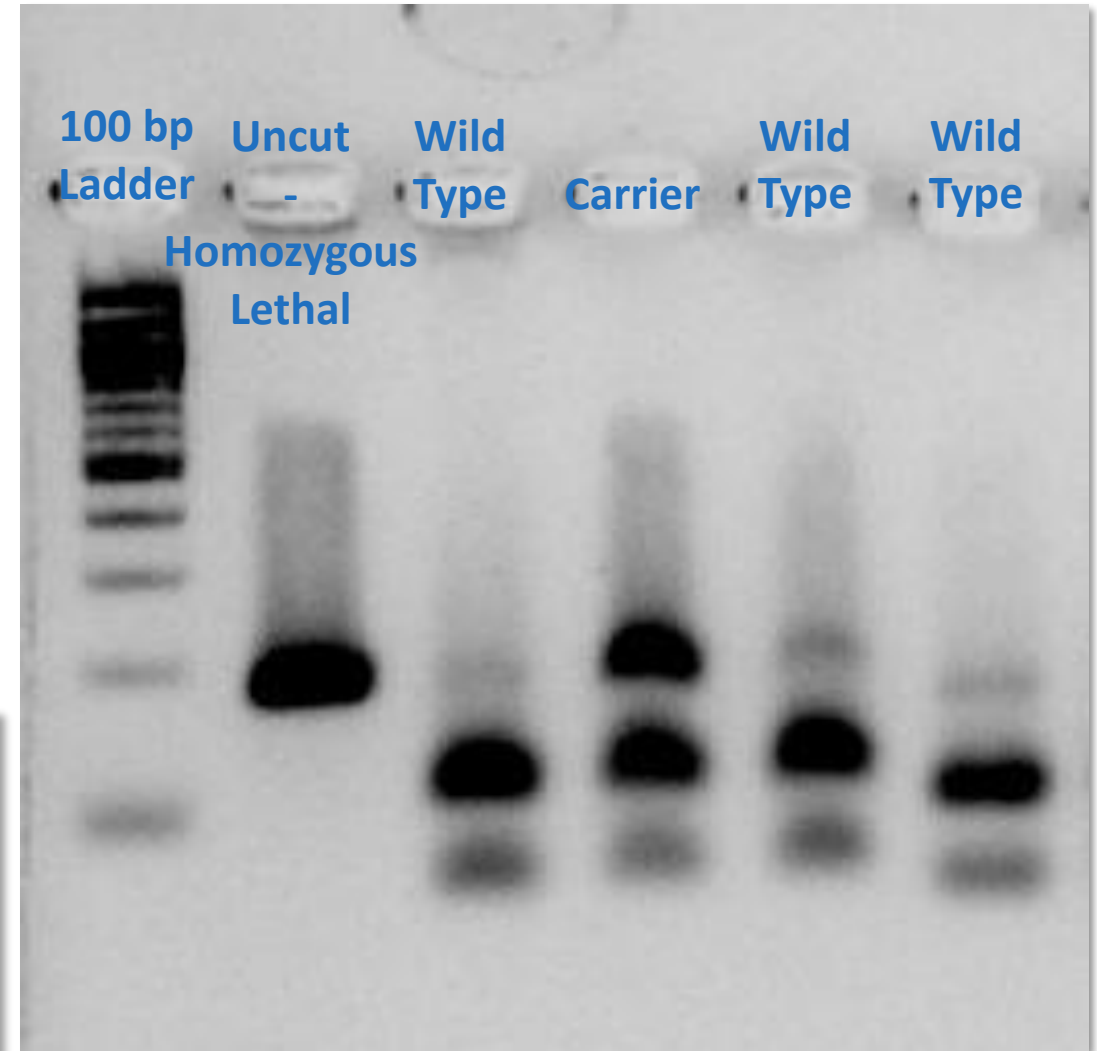
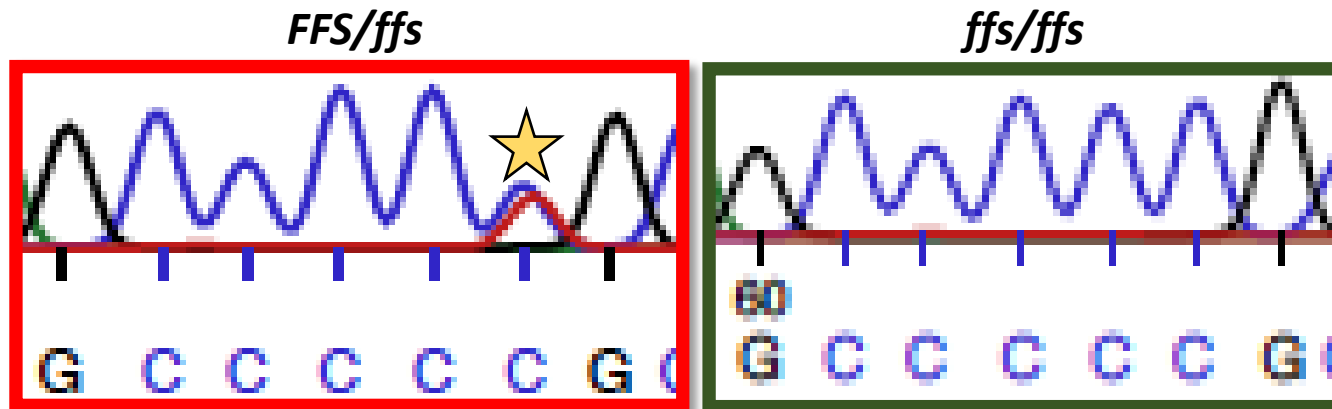
- Determine frequency of carriers in sample
- Determine effect of carrier genotype on gait parameters

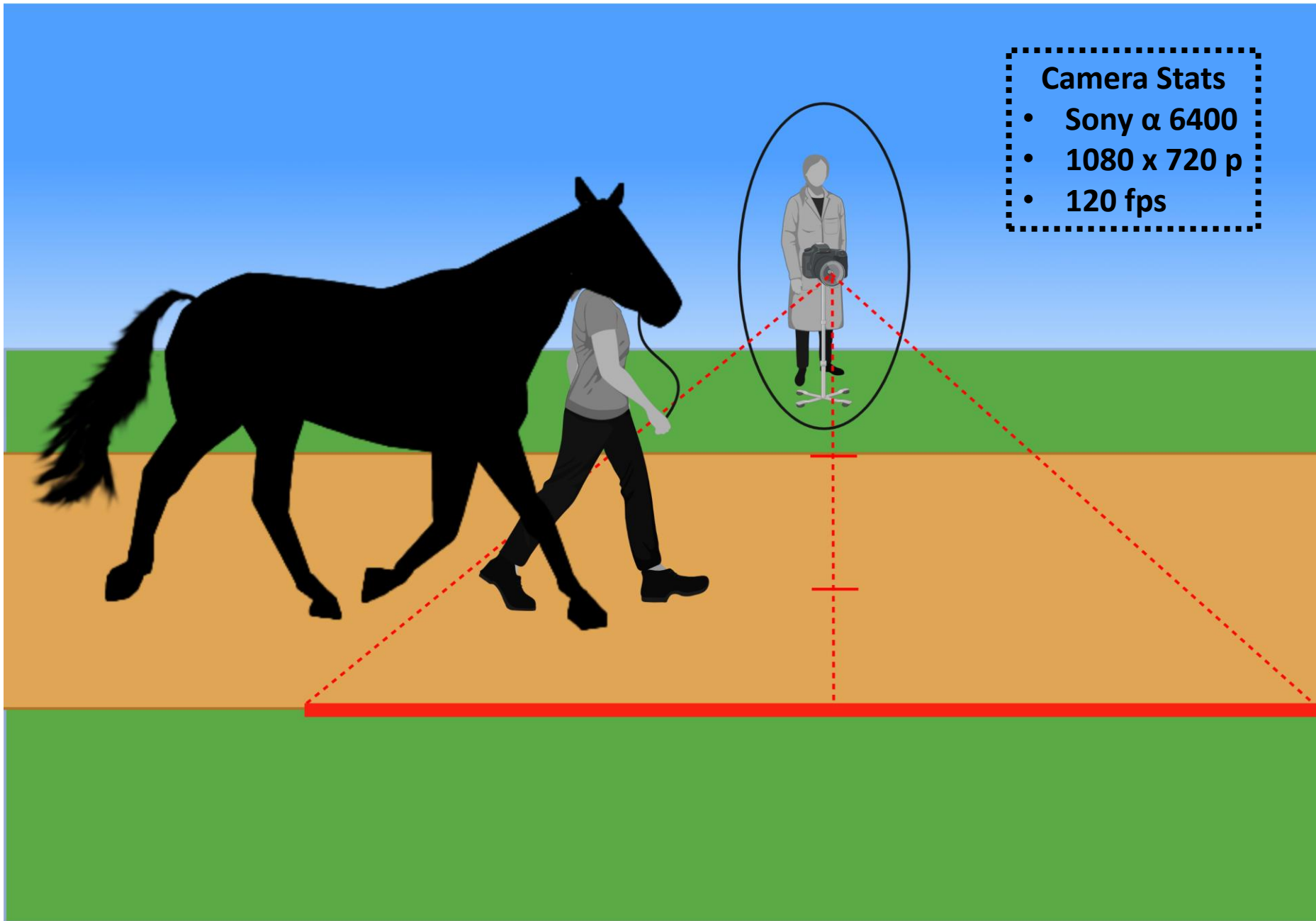
Hypothesis

- The carrier state for *FFS* allele will alter gait parameters relative to non-carriers (wild type).

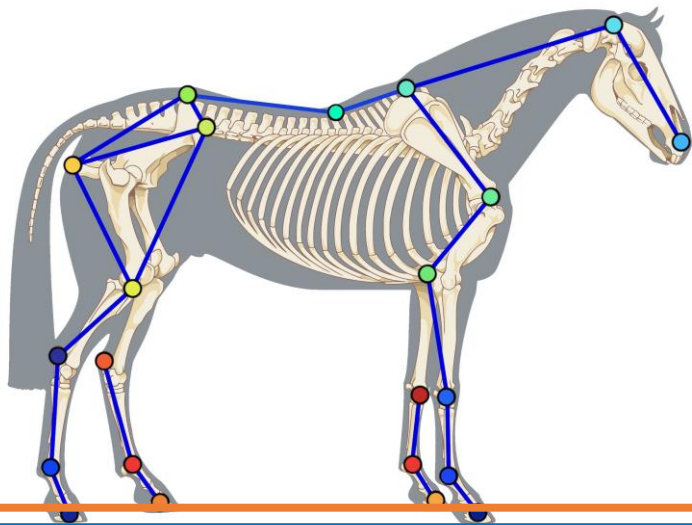
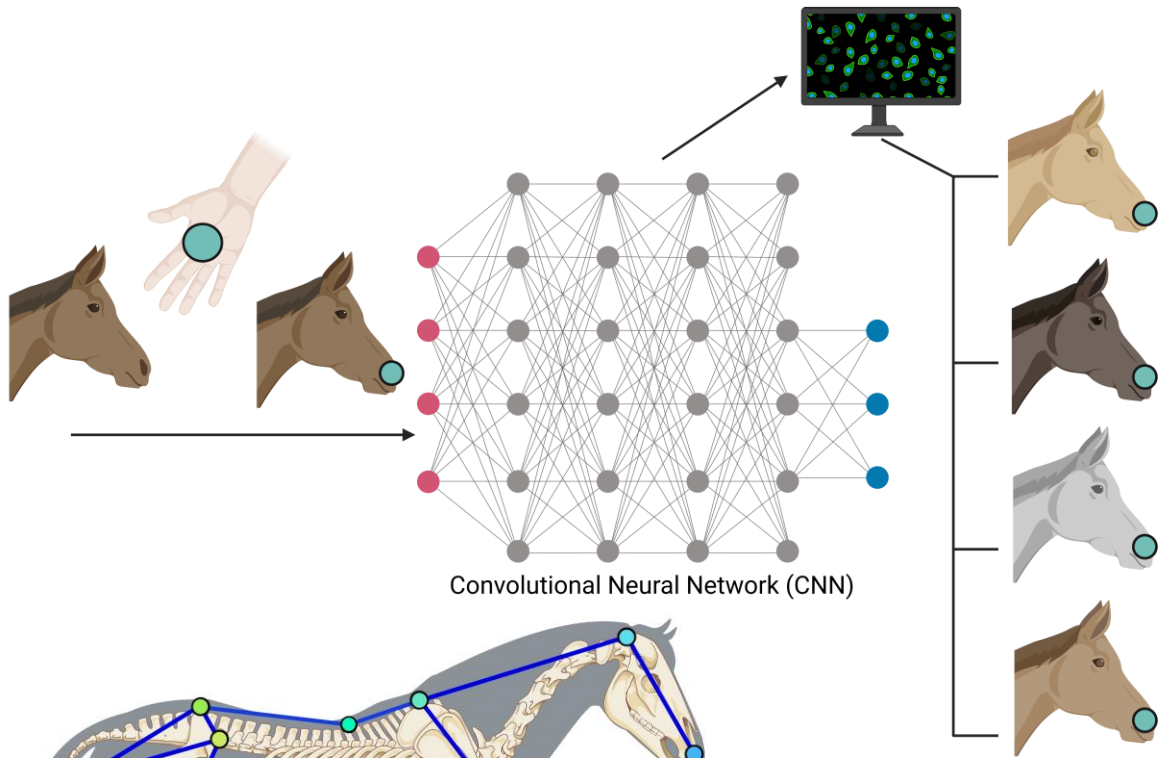
Genotyping

- Qiagen Puregene Tissue Kit
- PCR primers [Ayad et. al 2022]
- Gel Electrophoresis
- Confirmed via Sequencing

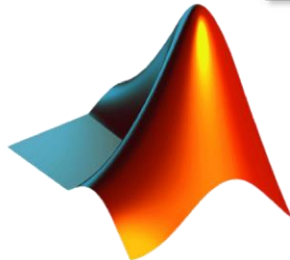




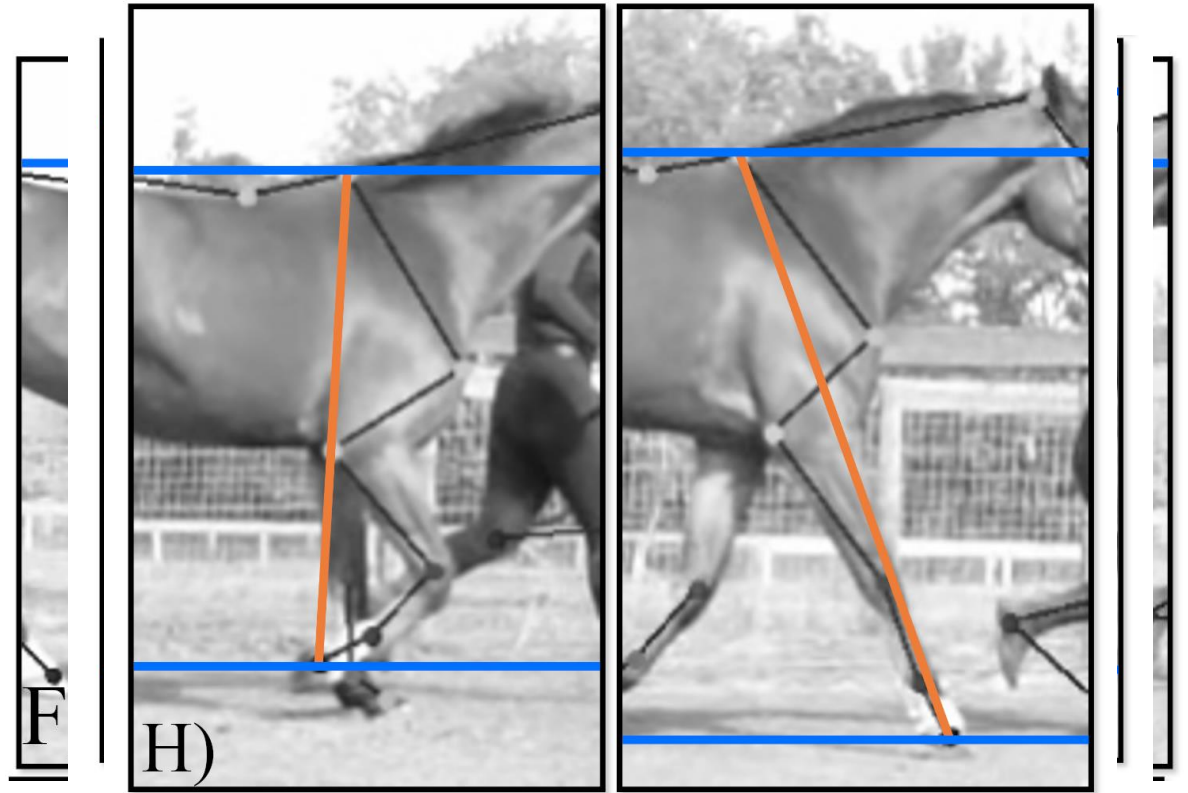
Video Processing



DeepLabCut:
a software package for
animal pose estimation

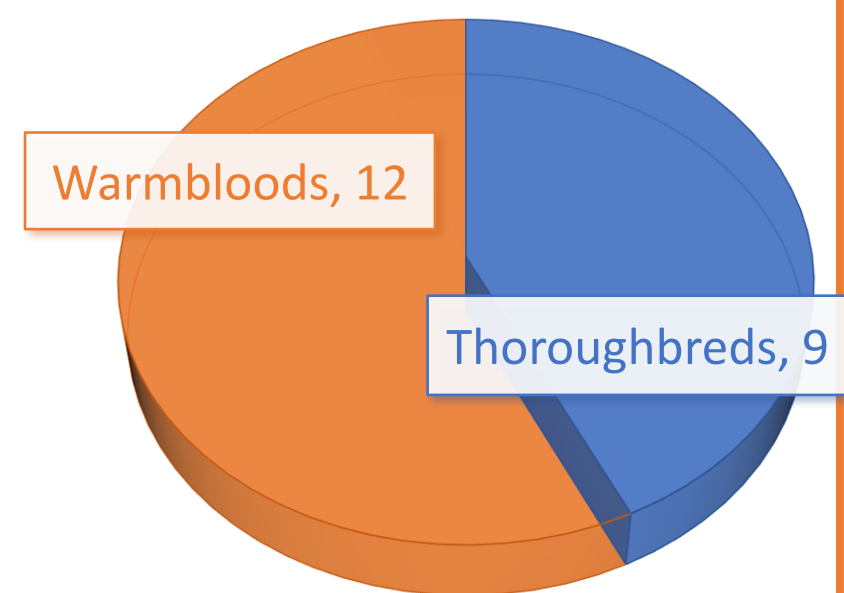
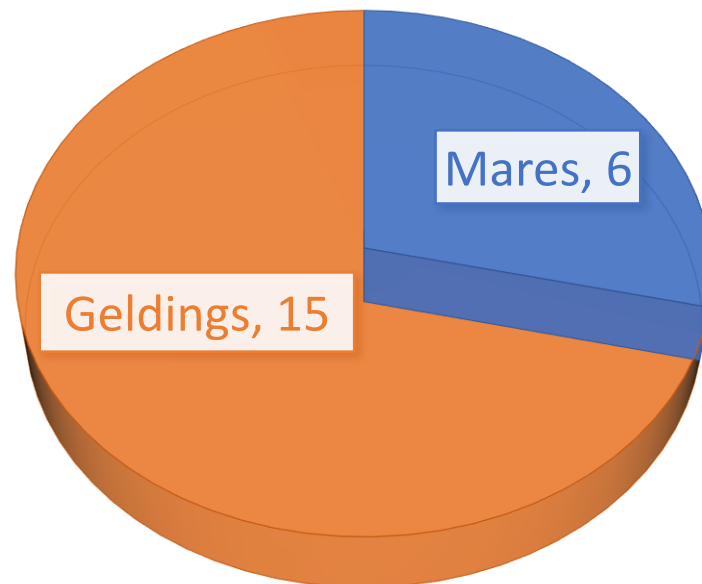
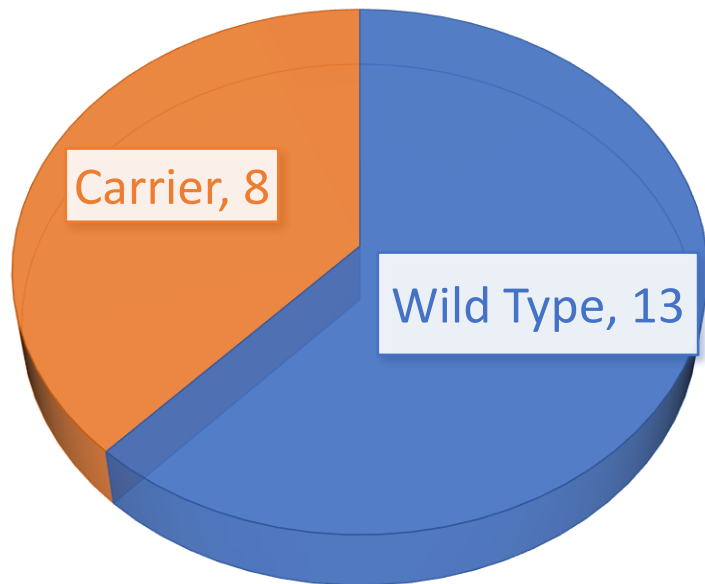


MATLAB

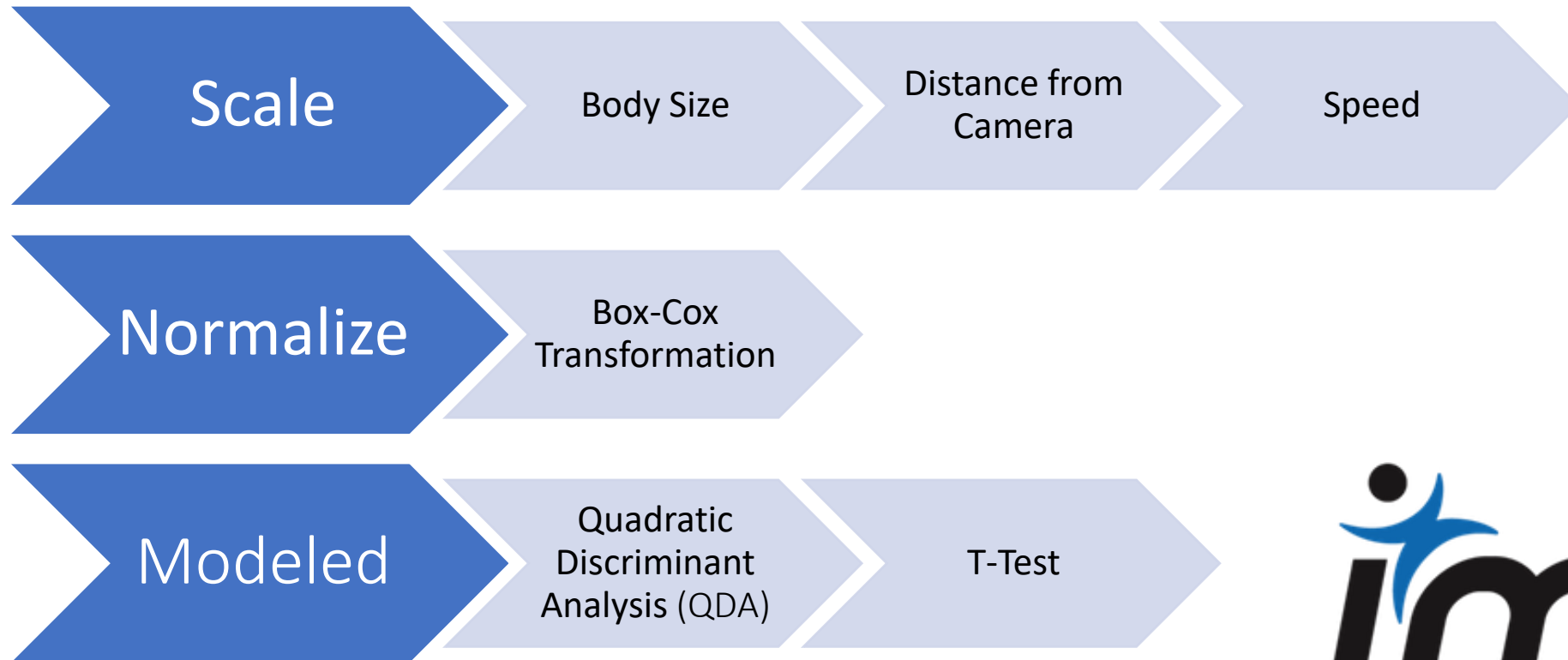


Population

- N=21
- Privately Owned Sports Horses
- 7 locations



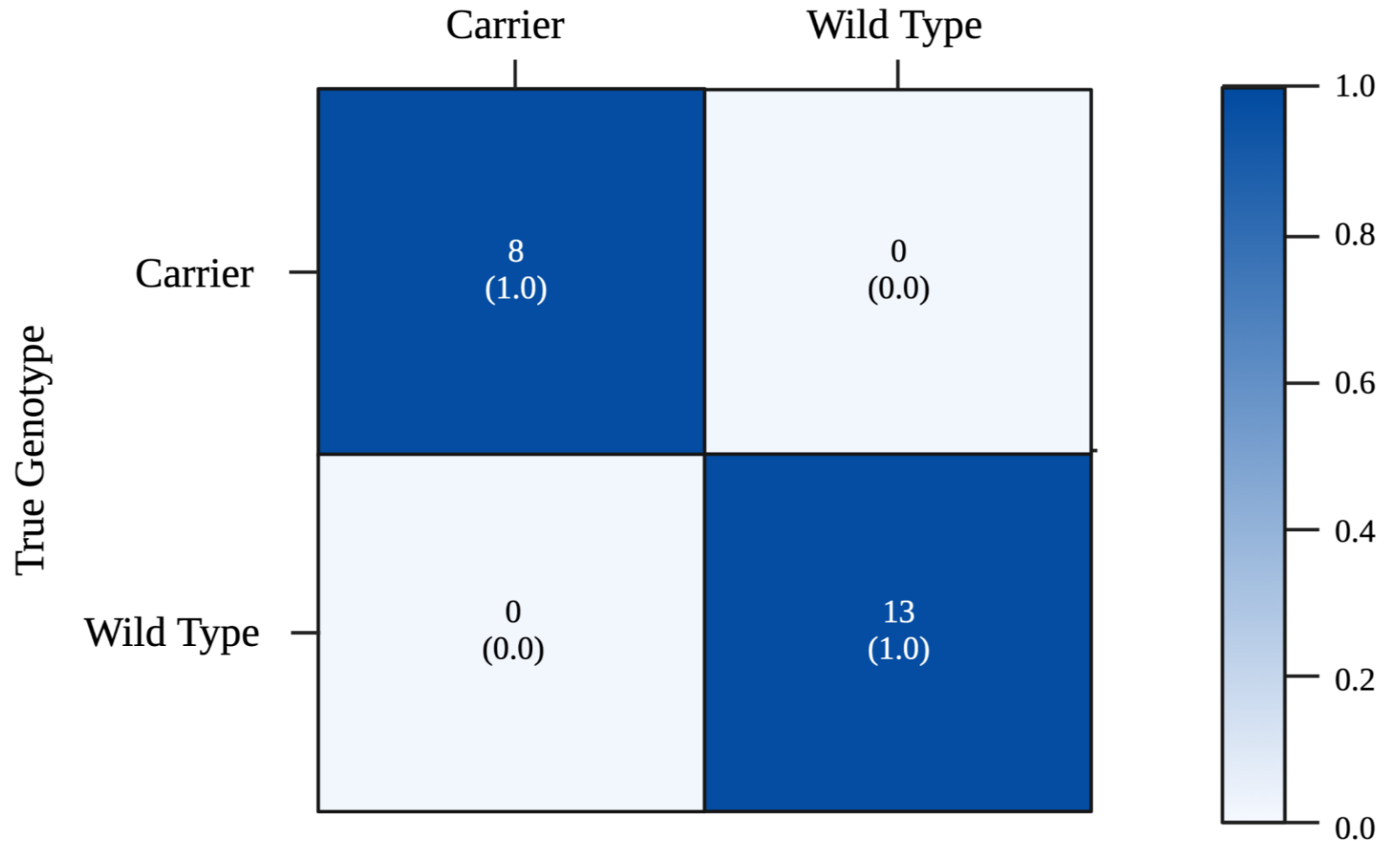
Statistical Analysis



Quadratic Discriminant Analysis

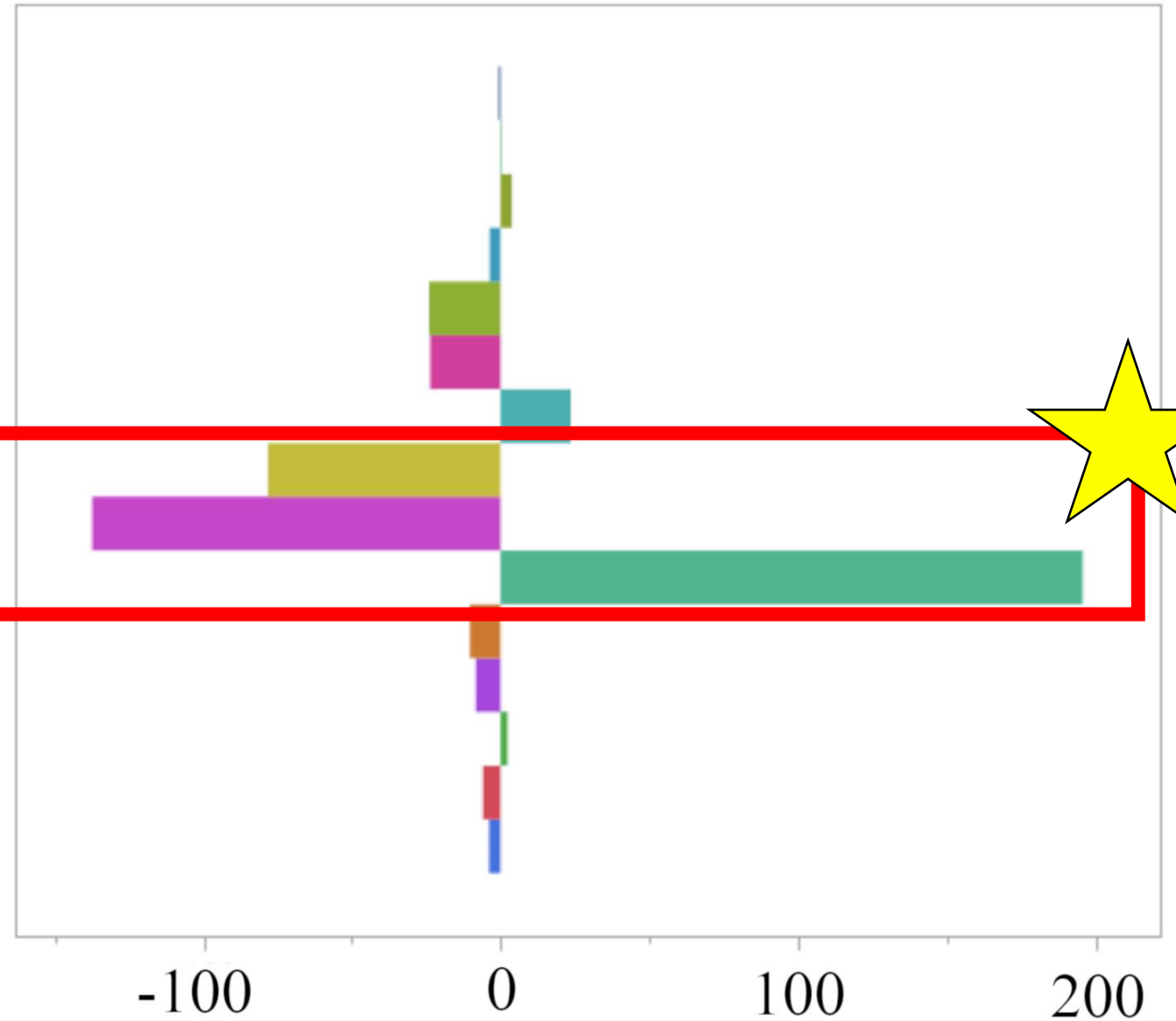
Predicted Genotype

Wilks' Lambda
Test
P = 0.0405



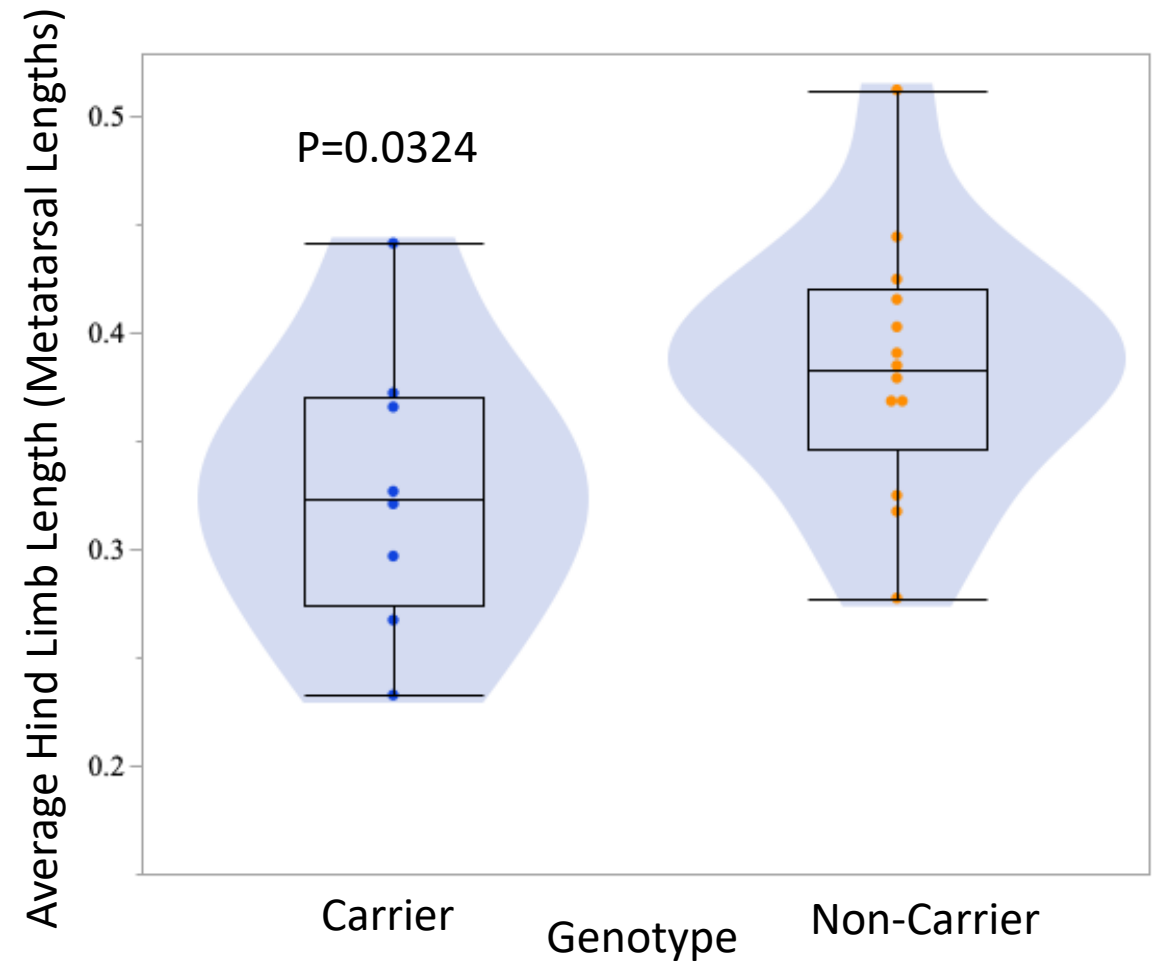
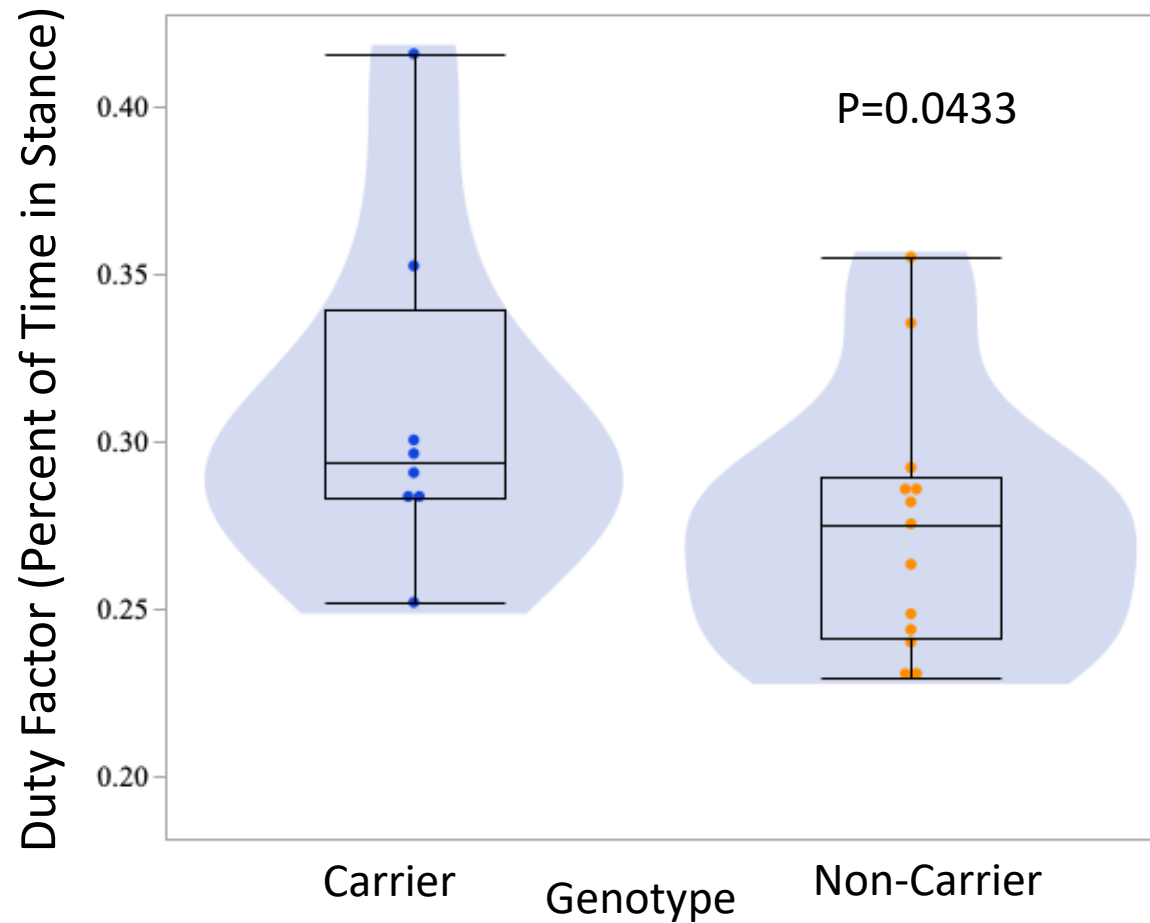
Measurements

- Maximum Fore Limb Protraction
- Forelimb Angle Range
- Maximum Hind Limb Protraction
- Average Hind Limb Swing
- Average Fore Limb Length
- Minimum Fore Limb Length
- Maximum Fore Limb Length
- Average Hind Limb Length
- Minimum Hind Limb Length
- Maximum Hind Limb Length
- Fetlock Angle Range
- Hind Hoof Speed
- Speed
- Stride Length
- Duty Factor



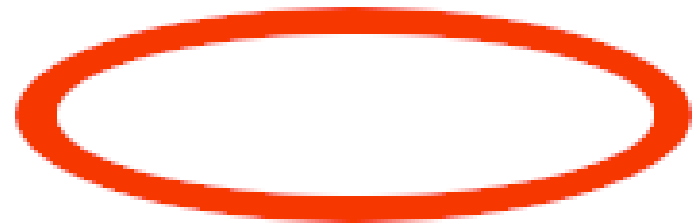
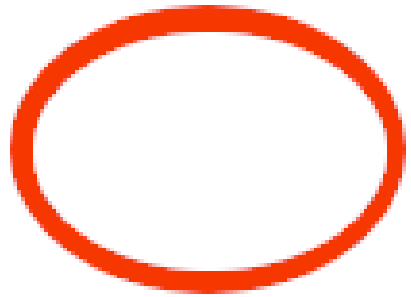
Standardized Scoring Coefficients

Results – T-Test



FFS Carrier

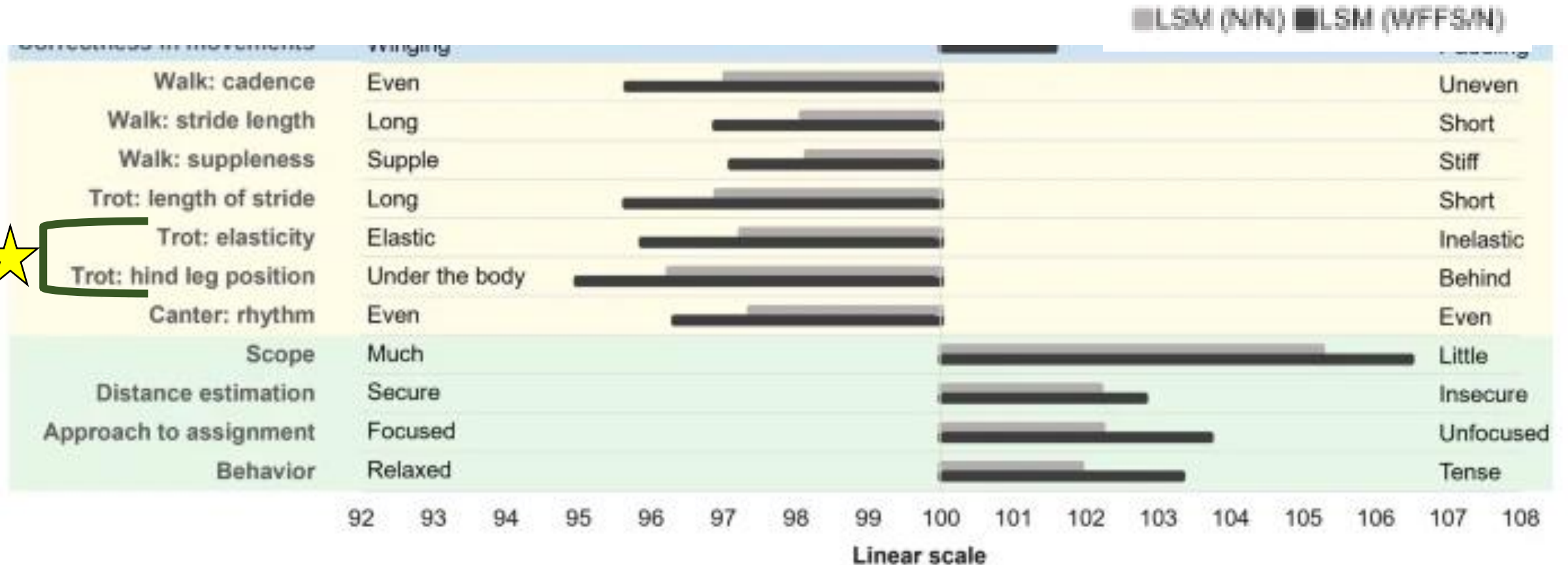
Wild Type



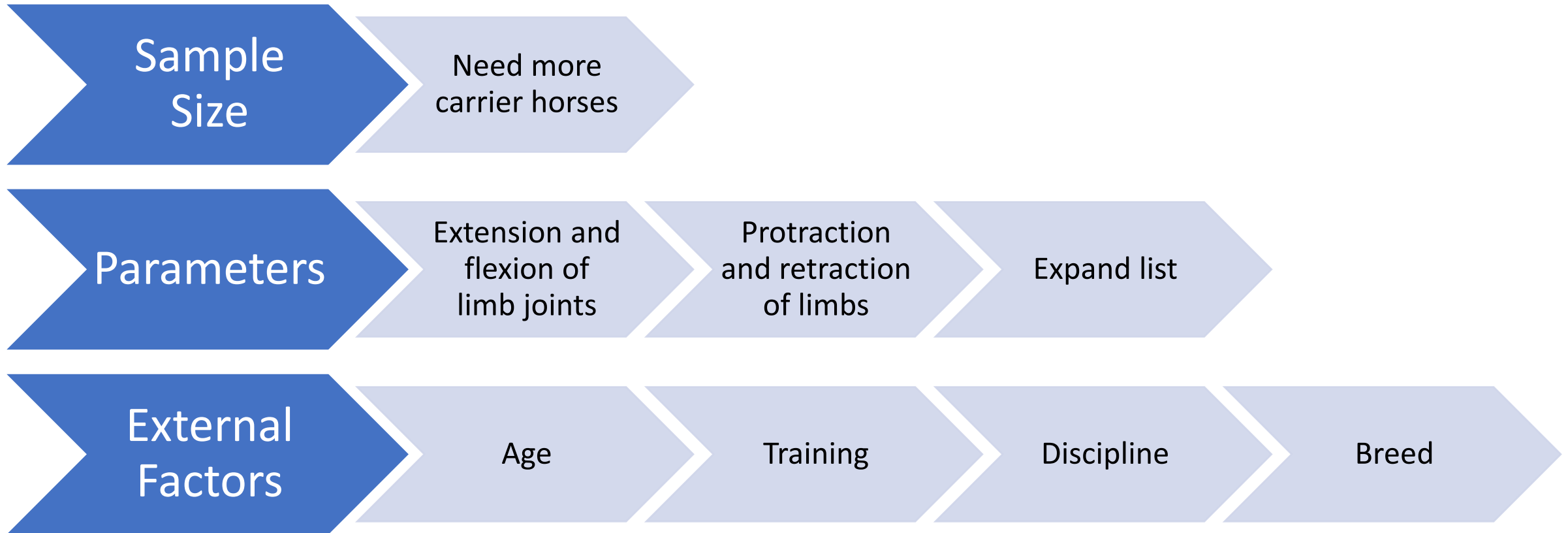
Performance of Swedish Warmblood fragile foal syndrome carriers and breeding prospects

[Michela Ablondi](#), [Martin Johnsson](#), [Susanne Eriksson](#), [Alberto Sabbioni](#), [Åsa Gelinder Viklund](#) & [Sofia Mikko](#) ✉

[Genetics Selection Evolution](#) 54, Article number: 4 (2022) | [Cite this article](#)

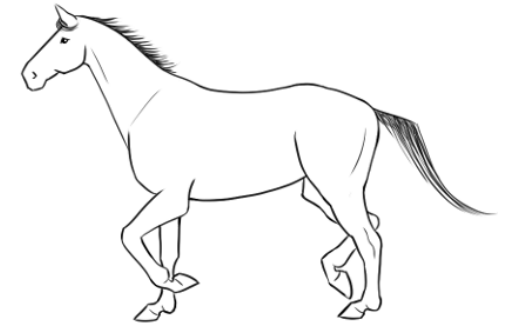


Limitations



Conclusion

- Identified promising predictive gait parameters for carrier state
 - Parameters effect flight path



Future Work

- Streamline the methods
- Investigate other collagen-related polymorphisms, including *HERDA* and *JEB*

Acknowledgments & Questions

Participants

- Thank you to all the horse owners for allowing us to collect data at your farms!

Dr. Brooks Lab & Collaborators

- Samantha Brooks, PhD
- Barclay Powell
- Julia Ciosek
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- Lauren Johns
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- Elizabeth Staiger, PhD
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- Jacob Shirey

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