Maternal transmission of behaviour

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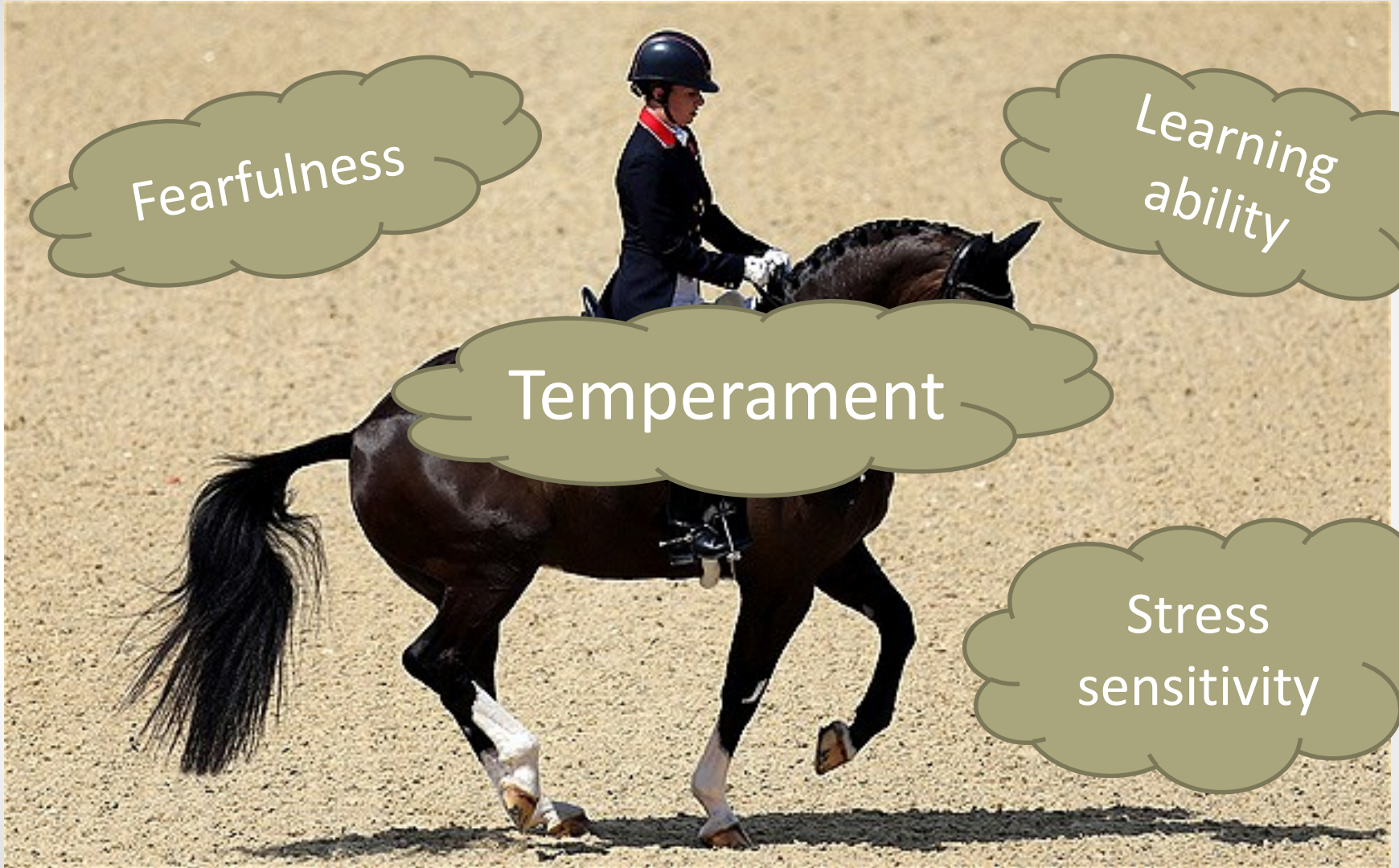

Fearfulness
Learning ability
Temperament
Stress sensitivity

What determines foal temperament?

1. Genetic effects
2. Pre-natal effets (during pregnancy)
3. Post-natal effects (after birth):
    i. Maternel care
    ii. Social transmission

Learning, performance and the link to stress sensitivity and fearfulness

Genetic effects

- The stallion may have some influence on learning ability in the foal

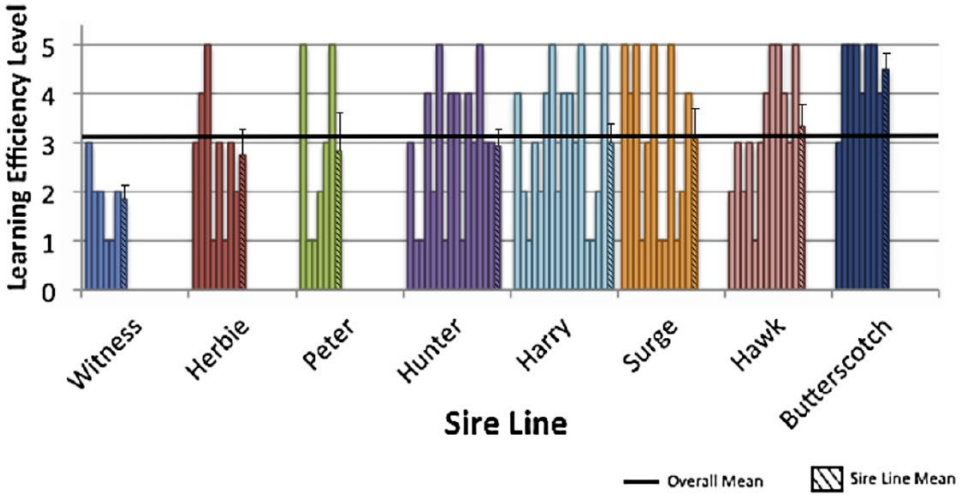
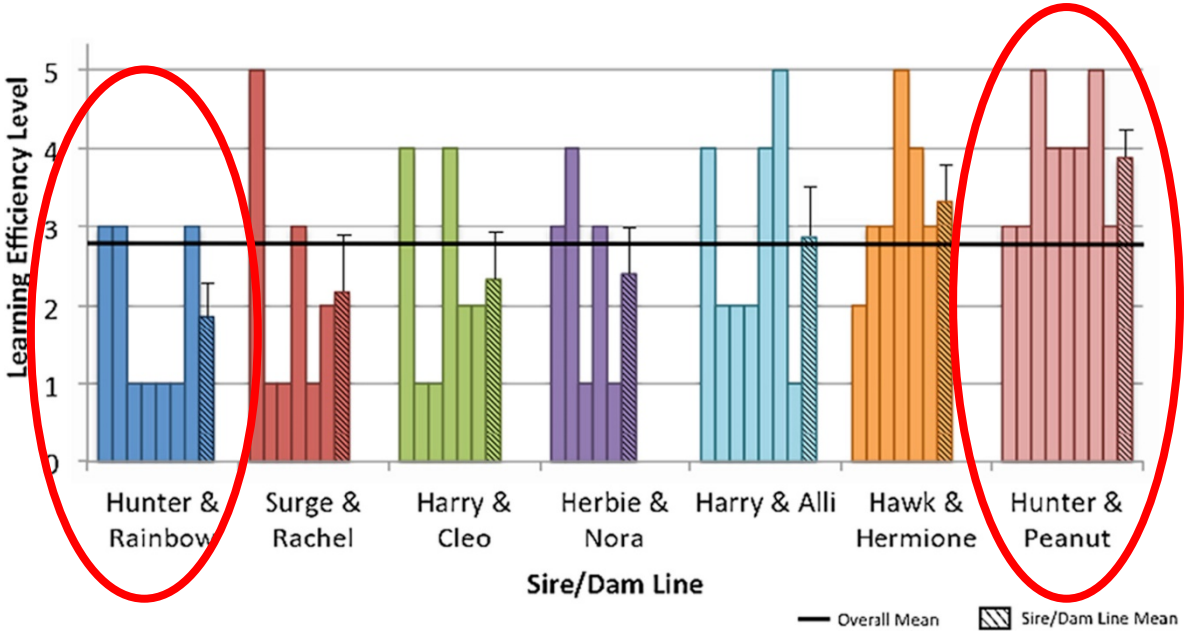


Fig. 3. Learning efficiency levels of individuals representing eight sire lines. Diagonally striped bar at right of each sire line cluster represents mean (SE) learning efficiency level of that sire line. Bold horizontal line represents overall mean for these 83 subjects. SE, standard error.

Bonnell & McDonnell, 2016: Stallion and mare
Wolff & Hausberger, 1996: Stallion
Andiano & McDonnell, 2017: (Stallion)
Hausberger et al., 2004: Stallion effect on fear but not learning

Genetic effects



- Which foster mother would you use?

Bonnell & McDonnell (2016)

(Monk et al., 2012; Hunter & McEwen, 2013)

Pre-natal effects

Heat/cold stress

Social instability

Transport

Aggression

STRESS

Social isolation

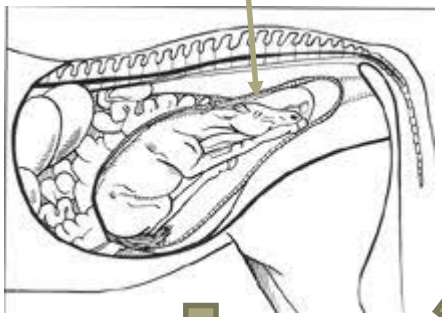
Inappropriate feeding

Environmental change

Stress hormones

Lack of free movement

Hard physical training



Reduced learning capacity

Increased stress sensitivity

Increased fearfulness

(Meaney, 2001; Gudsnuk & Champagne, 2011)

Post-natal effects

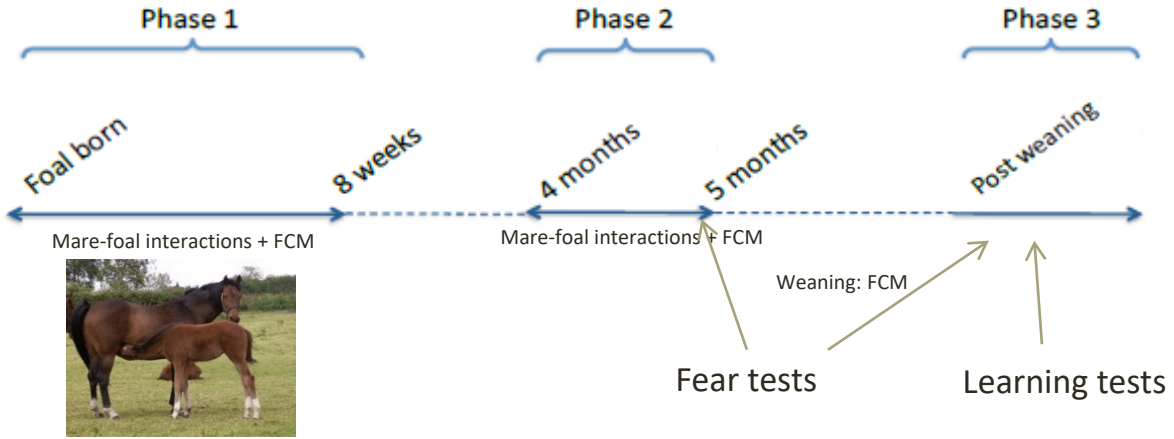
- Maternal care can change the acticity of genes

Good learning ability
Low fear
More social
Low stress sensitivity

Poor learning ability
High fear
Less social
High stress sensitivity

Research project on mares and foals

- 3-yr research project on maternal influence on development of fearfulness, stress sensitivity and learning ability in foals



- 70 mare-foal pairs (5 studs)

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Post-natal effects

- The mare does not only influence the foal through maternal care but also through her reactions in various situations (social transmission)

(Henry et al., 2005)

Handling of the mare

15 min/day for five days after foaling

vs. no handling (control)

Same experiment at 6 months: Effect of mare handling is less pronounced (Henry et al., 2006)

(Christensen, 2016)

Habituation of the mare

- 28 mare-foal pairs in three studs

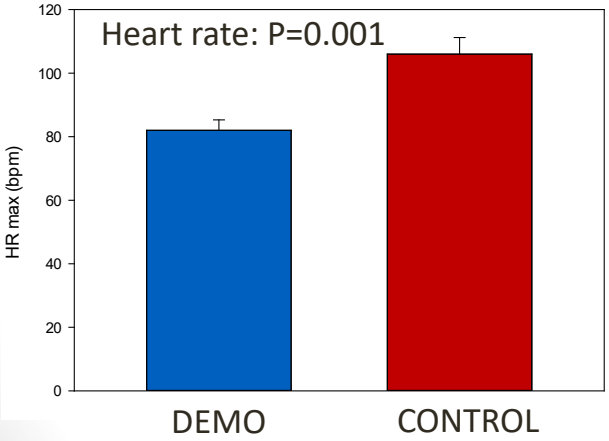
Demonstration for foals in the DEMO group (balanced for stud and foal sex)

Demonstration for ‘DEMO’ foals

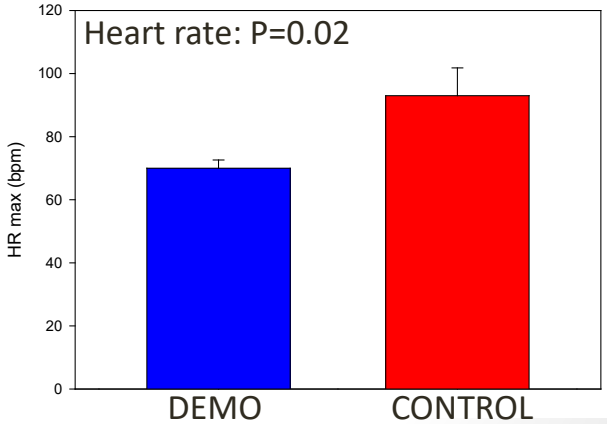
Tests

- Foals were tested in four fear tests at 8 and 20 weeks
- No training week 8-20

8 weeks: DEMO foals less fearful in all four tests

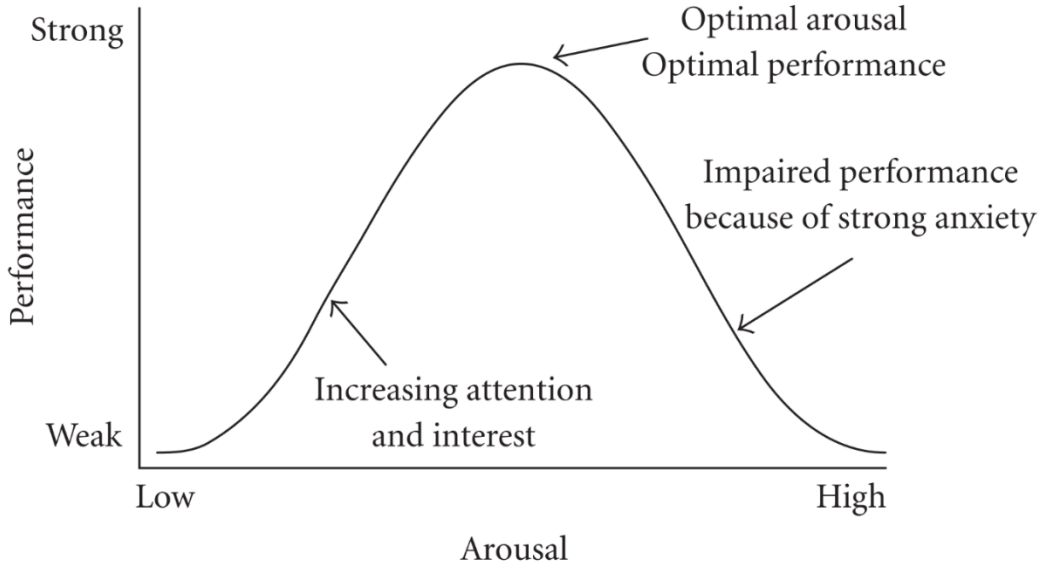


20 weeks: DEMO foals less fearful in all three tests!



Performance is linked to fearfulness/stress

- Yerkes-Dodson Law



- Nervous horses had lower performance in a novel/stressful environment

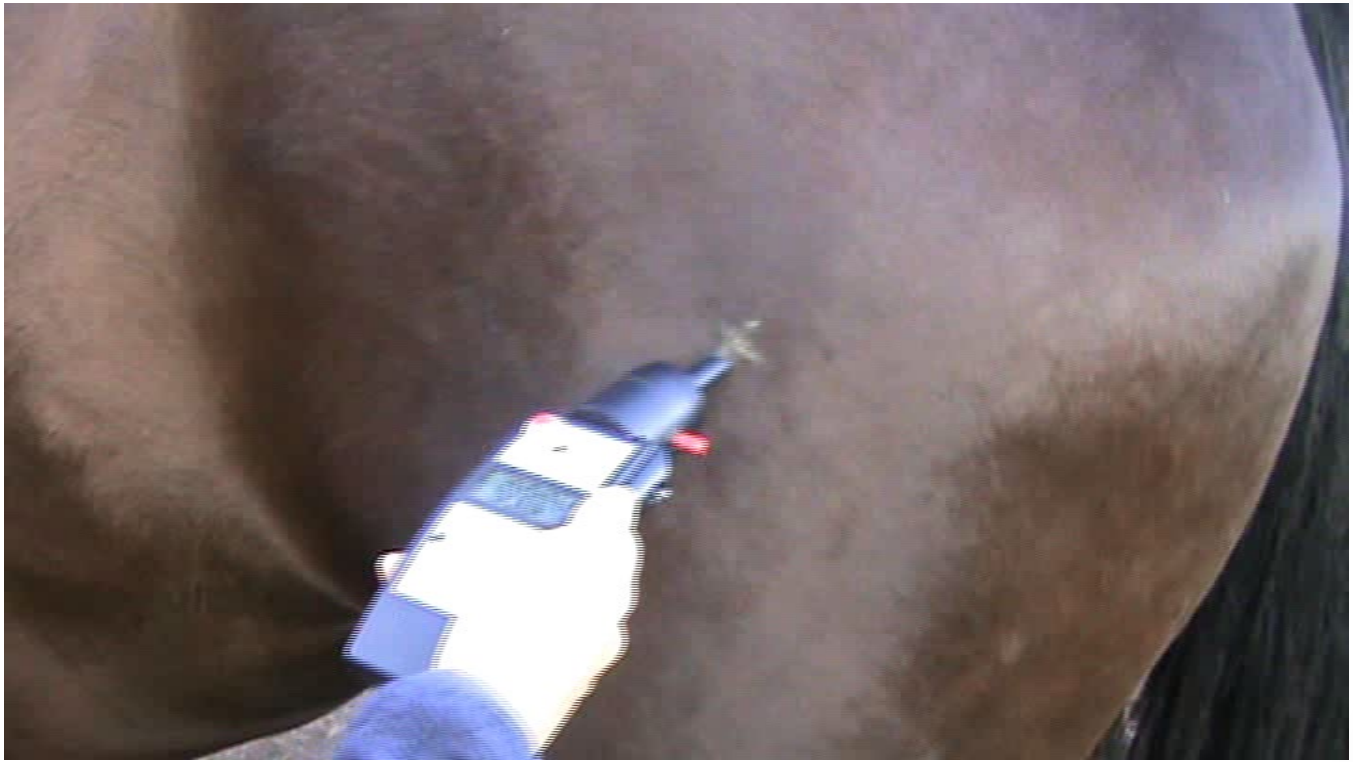
(Christensen et al., 2012; Valenchon et al., 2013)

How is learning measured?

- Correlation between assessment by professional riders and test results on fearfulness and learning abilities
- Tests typically use positive reinforcement
- Negative reinforcement is often used in horse training

Development of new learning test

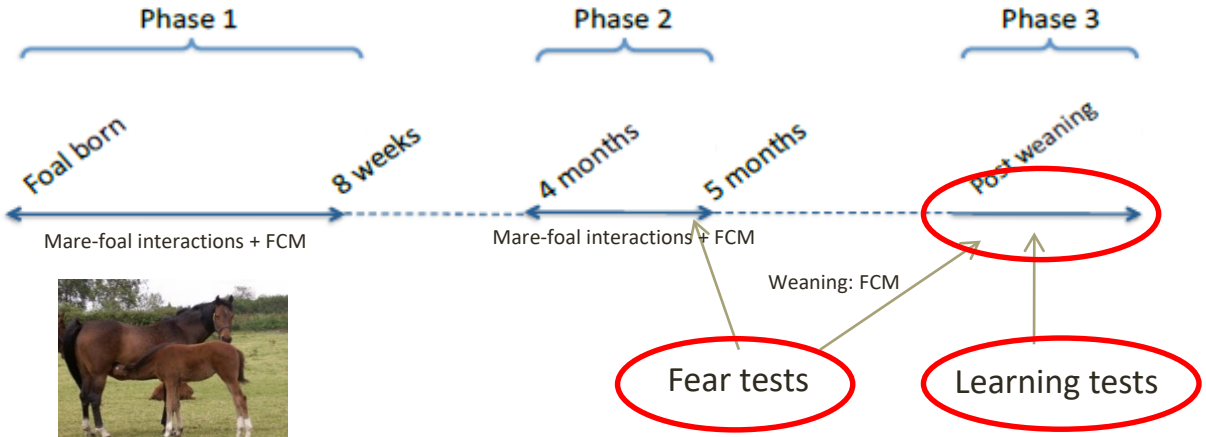
- Based on NEGATIVE REINFORCEMENT



The link between fear and learning

Materials og metods

- 3-yr research project on maternal influence on development of fearfulness, stress sensitivity and learning ability in foals



- 70 mare-foal pairs (5 studs)

Fear tests (novel object test)

NOT1

NOT2

Recordings: Heart rate (HR), latency to eat, alertness and exploratory behaviour

Same reaction in the two tests

- E.g. HR: r=0.86, P<0.001 and duration of object manipulation (sec): r=0.40, P=0.007

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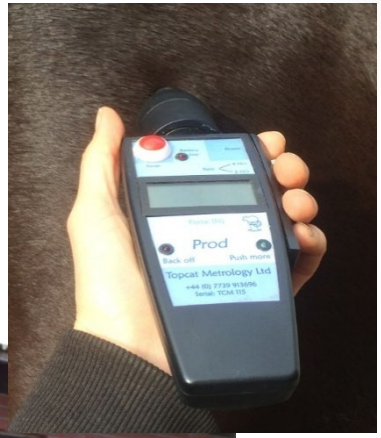
Learning tests

- Visual discrimination (10 position switches)

Recordings: Total trials, no response

Lerning tests

- Negative reinforcement (10 repetitions)

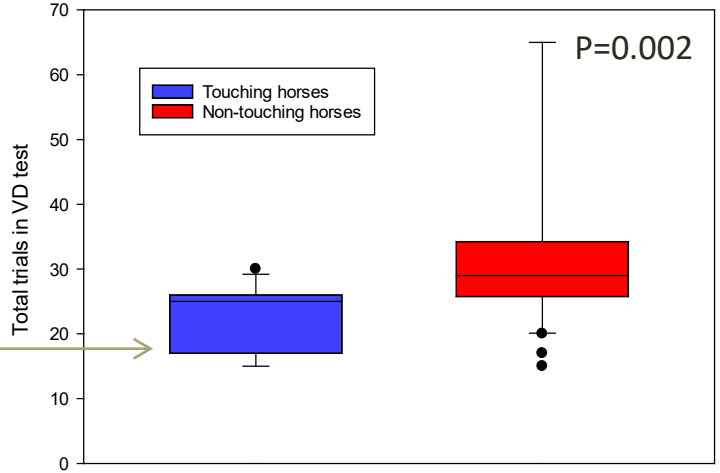


Recordings: Median force (N) and slope

(Validated in Ahrendt et al., 2015)

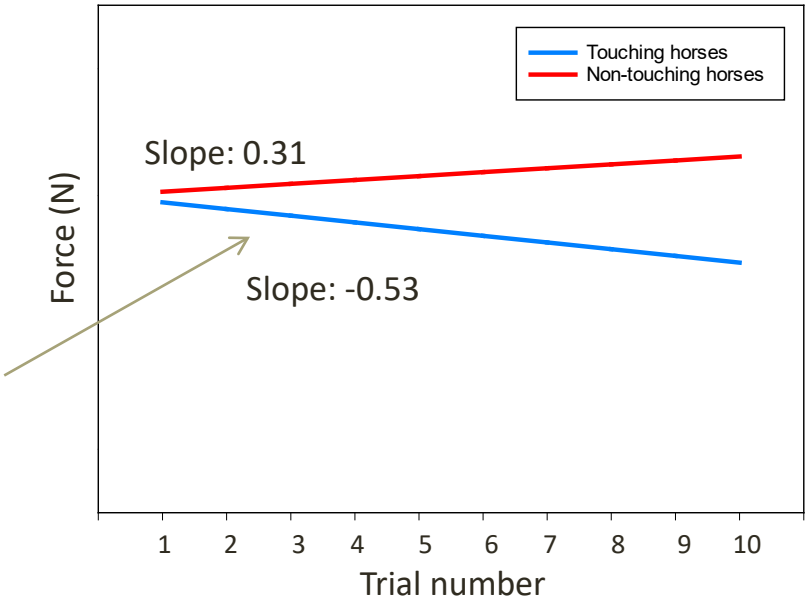
Curious horses had the best performance in both learning tests!

- Horses that touch the objects make fewer errors in the Visual Discrimination test (figure)
- The longer the duration, the better the performance (total trials, r= -0.49, P=0.001)



… also in the Negative Reinforcement test

- Horses that touch the objects perform better in the NR test (figure)
- The longer the duration of touching, the better performance (slope: r= -0.41, P=0.007)



Conclusion

- Fearfulness correlates between test situations
- Curiosity/exploratory behaviour is linked to learning
- Same reaction at 5 months and 1 year of age

Summary

- Choose foster mothers with care!
- Avoid stress for the pregnant mare
- Good maternal abilities can increase learning ability and decrease fearfulness and stress sensitivity in the foal
- Remember gentle handling of the mare in the post-natal period
- Remember to let the mare show the foal that various situations are safe
- The more curious the foal, the better its learning ability

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