Heritability of the ability to race barefoot in Swedish trotters

Session 48
Abstract number 2212852
EAAP 2024
Florence, Italy

Paulina Berglund[1], Sreten Andonov[1], Anna Jansson[1], Therese Lundqvist[2], Christina Olsson[2], Erling Strandberg[1], Susanne Eriksson[1]

[1] Swedish University of Agricultural Sciences, Dept. of Animal Biosciences

[2] The Swedish Trotting Association

STIFTELSEN HÄSTFORSKNING

SVENSK TRAVSPORT

Background

- Barefoot racing = pulling off front and/or back shoes at competition
- Why?
  - Improves the speed (Solé et al. 2020)
  - 0.7 s per km if fully barefoot
  - 0.3-0.4 s per km if only front or hind shoes are removed

Racing barefoot increase the risk of gallop, pace and disqualification!

Background

- Not all trotting horses have hooves that can tolerate barefoot racing
- The hind hooves are the believed to be the limiting factor
- More common to race barefoot in Standardbred trotters than in Coldblooded trotters

The genetic influence on this trait is yet unknown

Objective

To estimate the heritability for the novel trait ability to race barefoot in Swedish trotters and its genetic correlation with performance

Photo: Paulina Berglund

Material and Methods

- Barefoot status

- Binary trait (barefoot or shod hind in a race) with repeated observations
- Shoeing information from Swedish trotting races from 2005 to 2021/2022
- Horses born from 2002 to 2017/2018 and 3 to 10 years of age

	Standardbred trotter	Coldblooded trotter
Min. Number of races	10	5
N observations	875,056	93,376
N horses	25,973	3384

Material and Methods

- Barefoot status

- Repeated observations made it possible to correct for:
  - Trainer, track, track condition, season, age, race distance etc.

- Glimmix procedure in SAS to decide on fixed effects and estimate LS means
- Variance components were estimated seperate for each breed with a single trait mixed threshold model in the BLUPf90 software using Gibbsf90+
- Ten fixed effects, random effect of the horse, trainer and year-season

Material and Methods

- Performance traits

- Performance data from 1970s to 2021/2022

	Standardbred trotter	Coldblooded trotter
Best racing time per km	✓	✓
Summarised earnings	✓	✓
Earnings per start	✓	
Placings %	✓ 1-3	✓ 1-2
Number of races	✓	
Age (years)	2-5	3-6
N horses	115,185	16,402

Material and Methods

- Genetic correlations

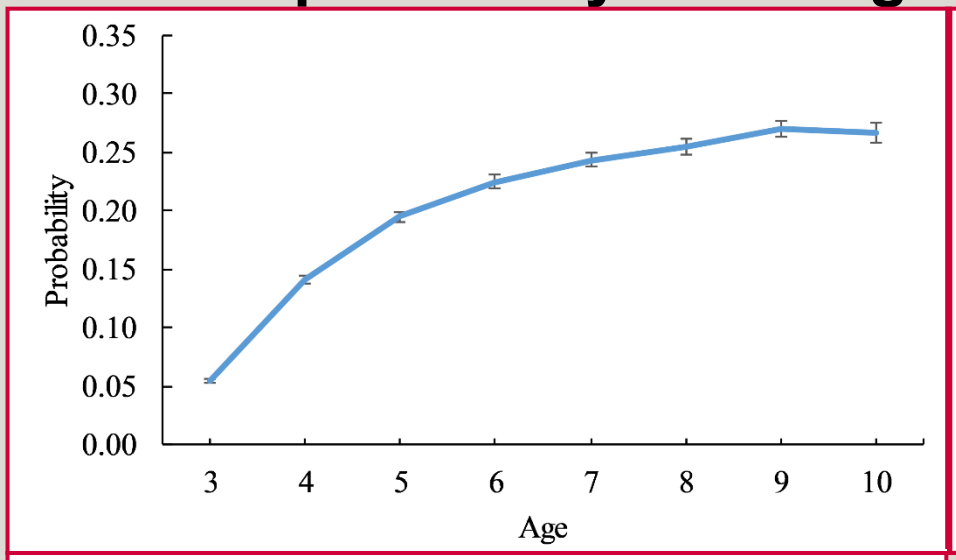
Performance traits

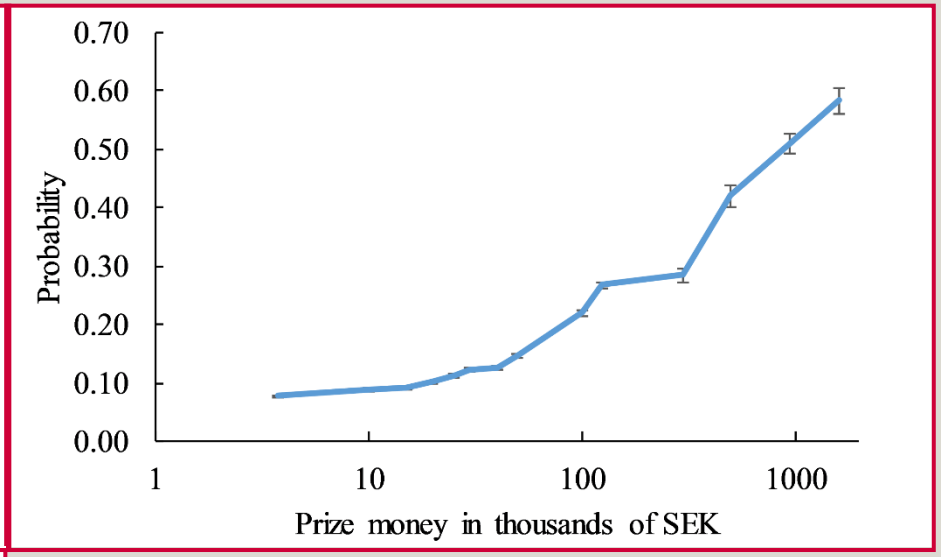
- Trait definitions and transformations according to the standard procedure in the genetic evaluation
- Model for Standardbred trotters $y_{ij} = \mu + \text{sex/birth} - \text{year}_i + animal_j + e_{ij}$
- Model for Coldblooded trotters $y_{ij} = \mu + \text{country/sex/birth} - \text{year}_i + animal_j + e_{ij}$
- Bivariate models to estimate genetic correlations between barefoot status and performance seperate for each breed in the DMU software
- Mixed linear animal model

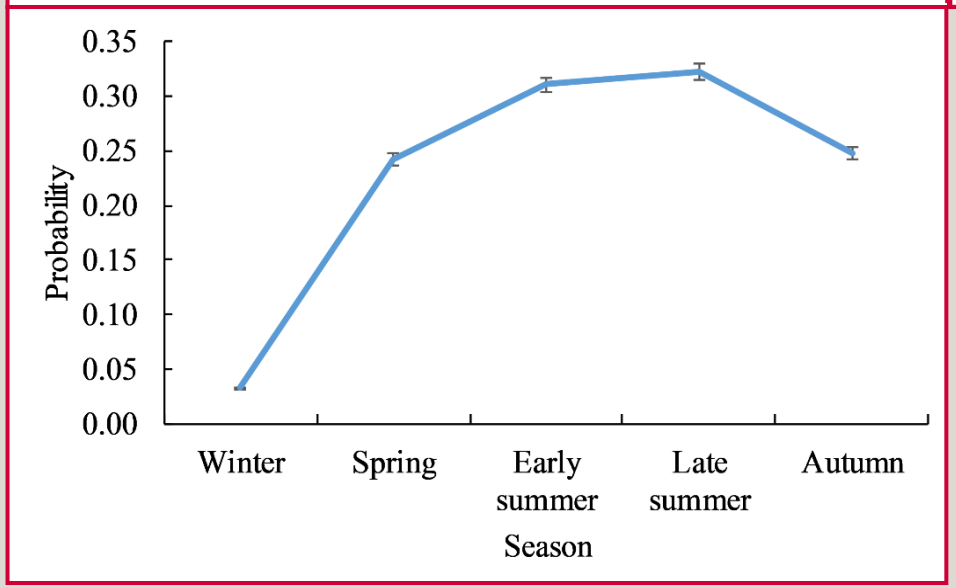
Results

- Least squares means - probability of racing barefoot

Standardbred trotter



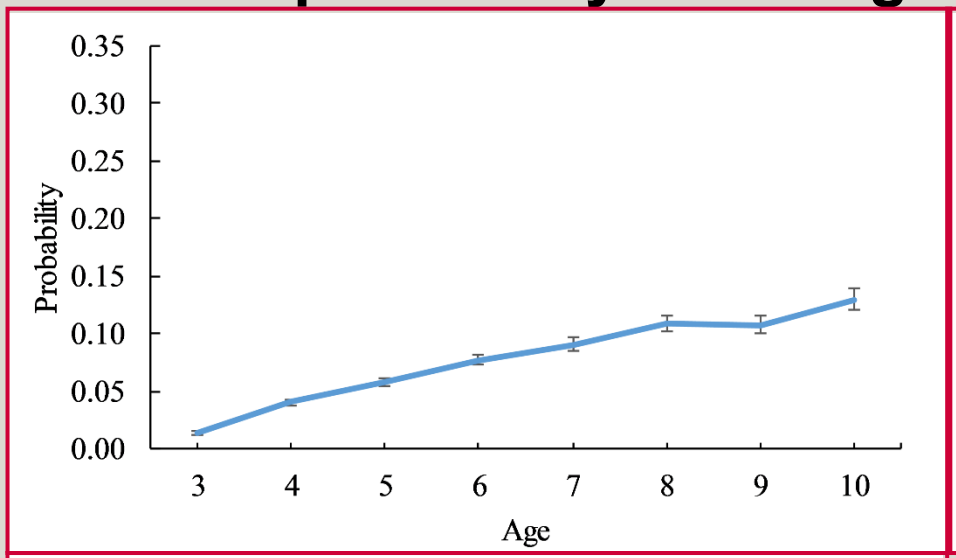


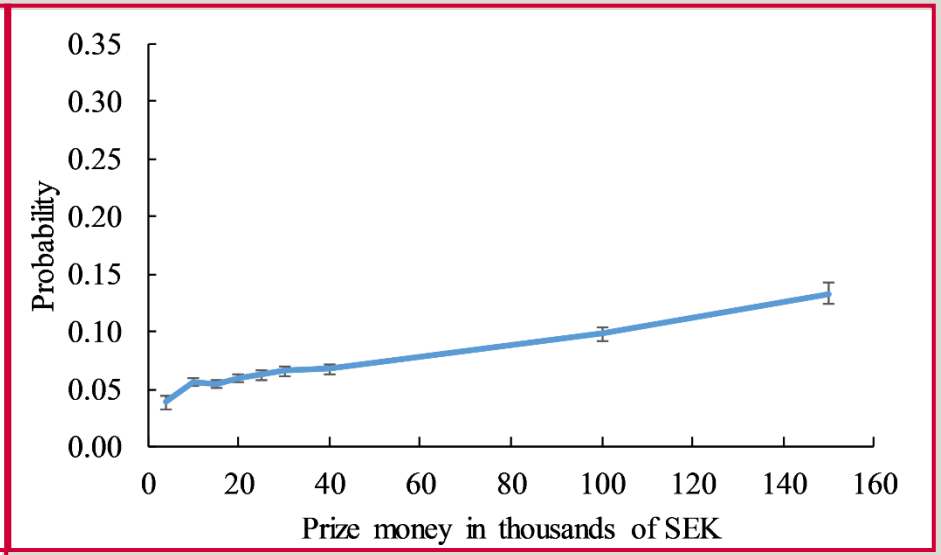


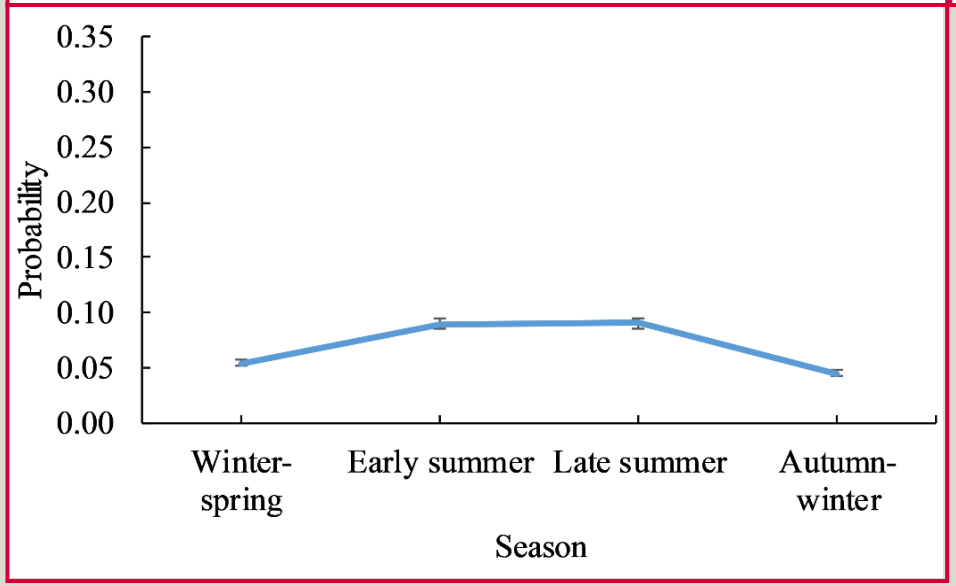
Results

- Least squares means - probability of racing barefoot

Coldblooded trotter







Results

- Barefoot status

Heritability estimates h^2 and accuracy r_{TI} for estimated breeding values

Breed	h^2 (mean)	r_{TI} (range)	r_{TI} (mean)
Standardbred trotter	0.08 $_{0.01}$	0.56-0.96	0.83
Coldblooded trotter	0.07 $_{0.03}$	0.51-0.91	0.71

- Accuracy (r_{TI}) was estimated for breeding stallions born in 1992 and later with at lest ten offspring
- There were 289 Standardbred trotter stallions and 60 Coldblooded trotter stallions that fulfilled these requirements

Results

- Genetic correlations

Breed	Trait	Heritability	Genetic correlation Barefoot status
Standardbred trotter	Best racing time per km	0.37 $_{0.01}$	-0.38 $_{0.03}$
	Summarized earnings	0.36 $_{0.01}$	0.37 $_{0.03}$
	Earnings per start	0.43 $_{0.01}$	0.11 $_{0.03}$
	Placings %	0.35 $_{0.01}$	-0.01 $_{0.03}$
	Number of starts	0.20 $_{0.01}$	0.63 $_{0.03}$
Coldblooded trotter	Best racing time per km	0.33 $_{0.02}$	-0.56 $_{0.10}$
	Summarized earnings	0.28 $_{0.02}$	0.47 $_{0.10}$
	Placings %	0.30 $_{0.02}$	0.23 $_{0.12}$

SE as subscript

Discussion

Barefoot status

- Advantages: repeated measurments, correct for trainers' perceptions of barefoot racing and race level
- Higher probability for mares to race barefoot (Standardbreds)
- Low heritability
  - Large number of repeated observations → moderate to high accuray

Genetic correlations with performance

- Preliminary results
- Favourable correlation with performance
- Indirect selection for ability to race barefoot?

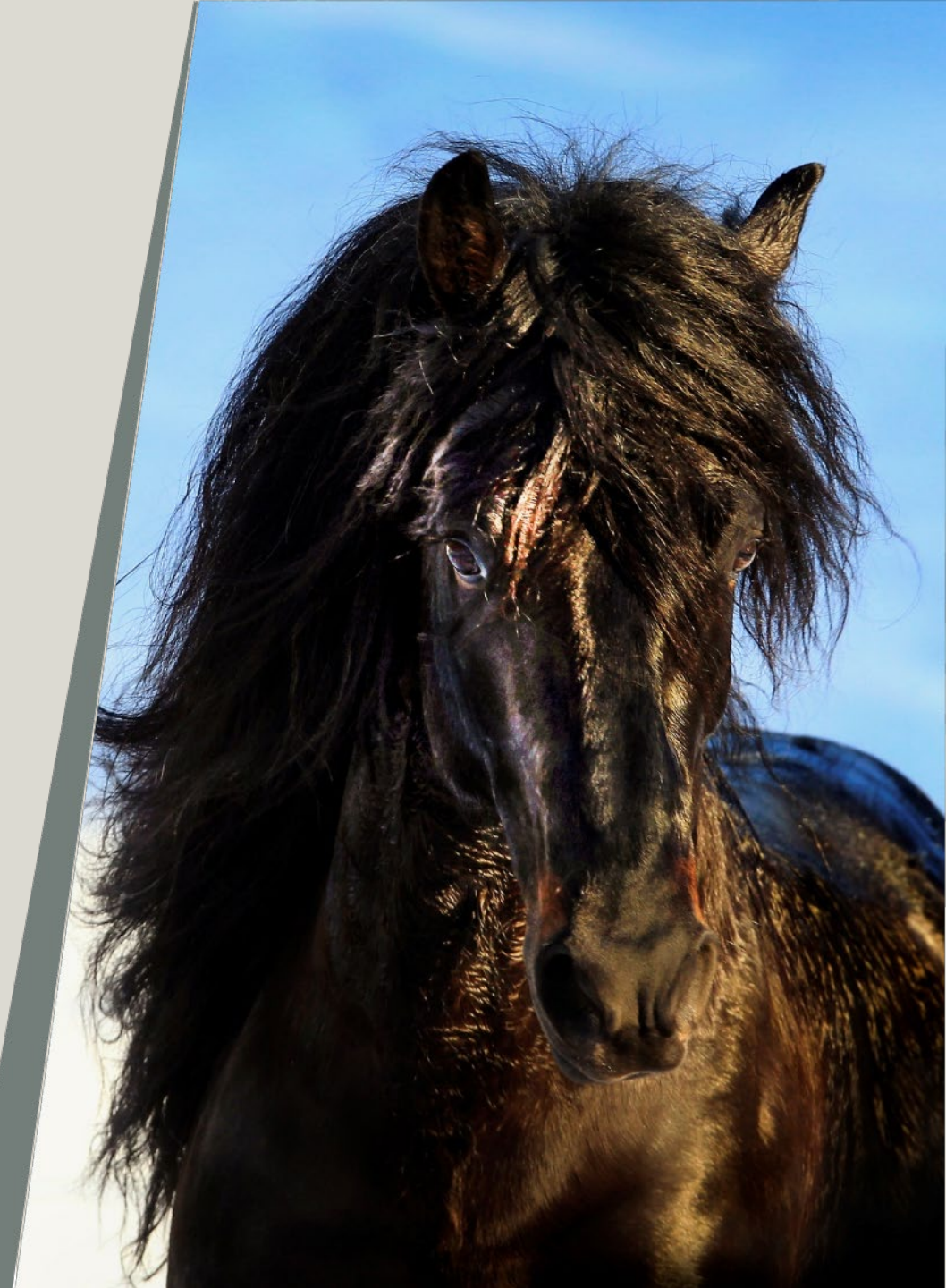
Conclusions

- Ability to race barefoot is a complex trait
- The results indicate that it would be possible to select for ability to race barefoot in Swedish trotters
- How does barefoot racing in young horses impact the career length?

Photo: Kanal 75

Thank you for your attention!

Special thanks to The Swedish-Norwegian Foundation for Equine Research and The Swedish Trotting Association for financing the project




SLU
SCIENCE AND EDUCATION FOR SUSTAINABLE LIFE