Breeding value indexes in the selection of Hungarian Sporthorses

János Posta– Sándor Mihók – István Komlósi

University of Debrecen,
Institute for Animal Husbandry
postaj@agr.unideb.hu

Introduction

Hungarian Sporthorse is a noble horse with aesthetic and functional conformation.

Breeding goal invokes first of all a horse for riding and show-jumping

Introduction

The aims of the study:

- **Estimating heritabilities of the traits**

- **Estimating genetic correlations within trait groups**

- **Breeding value estimation for each traits**

- **Construction of preliminary breeding value indexes for the traits groups and an overall index**

Dataset

- **Results of Hungarian Mare Self Performance from the interval 1993–2009 were analysed**
- **Pedigrees were known at least two generations back**

Materials and Methods

- **Animal model:**

$$Y_{ijklm} = \mu + Year_i + Age_j + Owner_k + Animal_l + e_{ijklm}$$

Genetic parameters were estimated with VCE-6

Breeding values were estimated with the use of PEST software

Traits judged at mare performance test

Traits scored various scale.

Conformation

type (0-6), head (0-8), neck (0-12), saddle region (0-10), frame (0-8), forelimbs (0-12), hind limbs (0-12), regulatory of movement (0-10), impulsion and elasticity of movement (0-12), overall impression (0-10)
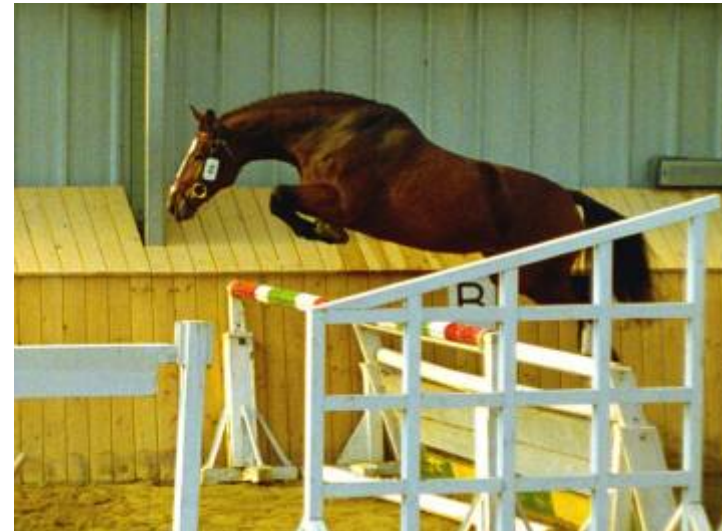
Traits judged at mare performance test

Movement analysis
walk, trot, canter,
overall impression

Free jumping
jumping style,
jumping skill,
jumping ability

Traits were scored on a 0-10 scale.

Results

Estimated heritabilities

Conformation

Trait	h²
Type	0.41
Head	0.47
Neck	0.36
Saddle region	0.50
Frame	0.32
Forelimbs	0.32
Hind limbs	0.33
Regularity of movement	0.36
Imp. and elastic. of movement	0.44
Overall impression	0.40

Movement analysis

Trait	h²
Walk	0.20
Trot	0.34
Canter	0.48
Overall impression	0.24

Free jumping

Trait	h²
Jumping style	0.39
Jumping skill	0.49
Jumping ability	0.49

Estimated genetic correlations for conformation traits

Trait		2	3	4	5	6	7	8	9	10
1	Type	0.76	0.72	0.86	0.81	0.77	0.65	0.40	0.40	0.87
2	Head		0.53	0.54	0.56	0.57	0.28	0.35	0.22	0.62
3	Neck			0.81	0.87	0.69	0.60	0.51	0.67	0.91
4	Saddle region				0.97	0.81	0.63	0.40	0.57	0.95
5	Frame					0.93	0.72	0.47	0.70	0.97
6	Forelimbs						0.52	0.54	0.46	0.84
7	Hind limbs							0.59	0.62	0.89
8	Regularity of movement								0.78	0.67
9	Imp. and elastic. of movement									0.79
10	Overall impression									

Estimated genetic correlations for free jumping and movement analysis traits

Trait		2	3	4	5	6	7
1	Jumping style	0.9	0.98	0.10	0.26	0.77	0.48
2	Jumping ability–sense of distance		*	0.25	0.13	0.65	0.65
3	Jumping skill			0.62	0.59	0.70	0.89
4	Walk				*	0.32	0.46
5	Trot					0.60	0.72
6	Canter						0.75
7	Overall impression						

Breeding value index for conformation traits

$$ConfIndex = \left[\frac{\left(\begin{array}{c} 0.6 * \dfrac{type}{sd} + 0.8 * \dfrac{head}{sd} + 1.2 * \dfrac{neck}{sd} + \dfrac{saddle\_region}{sd} + \\[2ex] 0.8 * \dfrac{frame}{sd} + 1.2 * \dfrac{fore\,limbs}{sd} + 1.2 * \dfrac{hind\,limbs}{sd} + \\[2ex] \dfrac{reg\_movement}{sd} + 1.2 * \dfrac{imp\_movement}{sd} + \dfrac{overall\_impression}{sd} \end{array} \right) - \mu_{Ind}}{sd_{Ind}} \right] * 20 + 100$$

Breeding value index for movement analysis traits

$$MovementIndex = \left[\frac{\left(\dfrac{walk}{sd} + \dfrac{trot}{sd} + \dfrac{canter}{sd} + \dfrac{overall\_impression}{sd} \right) - \mu_{Ind}}{sd_{Ind}} \right] * 20 + 100$$

Breeding value index for free jumping traits

$$FreeJumpingIndex = \left[\frac{\left(\dfrac{JumpingStyle}{sd} + \dfrac{JumpingSkill}{sd} + \dfrac{JumpingAbility}{sd} \right) - \mu_{Ind}}{sd_{Ind}} \right] * 20 + 100$$

Overall breeding value index based on trait-group indexes

$$OverallIndex = \left[\frac{\left(\dfrac{ConfIndex}{sd} + 2 * \dfrac{FreeJumpingIndex}{sd} + 2 * \dfrac{MovementIndex}{sd} \right) - \mu_{Ind}}{sd_{Ind}} \right] * 20 + 100$$

Evaluated indexes, traits

I. Overall Index
II. Conformation Index
III. Free jumping Index
IV. Movement Index

1. Type
2. Head
3. Neck
4. Saddle region
5. Frame
6. Forelimbs
7. Hindlimbs
8. Regularity of movement
9. Impulsion and elasticity of movement
10. Overall impression
11. Jumping style
12. Jumping skill
13. Jumping ability
14. Walk
15. Trot
16. Canter
17. Overall impression
18. Reliability

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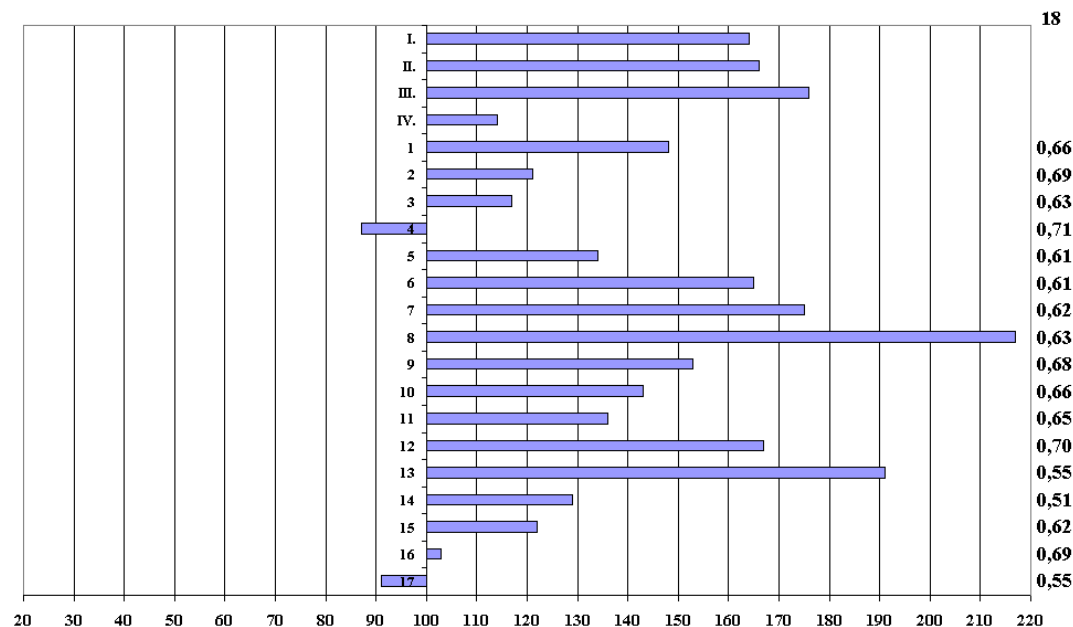
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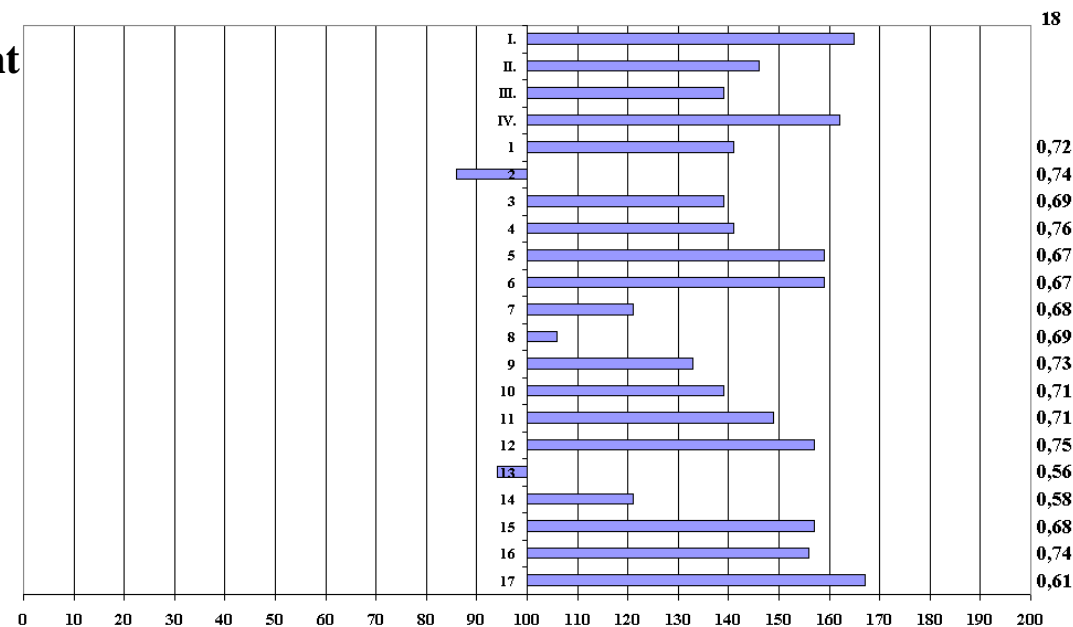
Conclusions

- **Medium to high of heritabilities were estimated**

- **Positive genetic correlations were found between gaits and jumping traits**

- **Present indexes need to be overviewed to taken into account genetic correlations among traits**

Future plans

- Continuous evaluation of mare performance tests
- Evaluation of stallion performance tests
- Analysis of show-jumping results

**Thank you
for
your attention!**