

Genetic evaluation of dressage performances

Katrijn Peeters
Bart Ducro
Steven Janssens



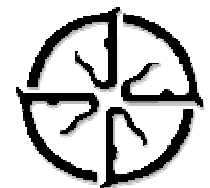
WAGENINGEN UNIVERSITY
WAGENINGEN **UR**

KATHOLIEKE UNIVERSITEIT
LEUVEN

**Animal Breeding &
Genomics Centre**

Acknowledgements

- Animal Breeding & Genomics Centre (WU)
- Bart Ducro (WU)
- Steven Janssens (KUL)
- KBRSF-FRBSE and LRV
- BWP and sBs



Aim → Problem → Solution → Consequences

Estimate genetic parameters
for dressage performance
of Belgian warmblood horses

Draw up a
Genetic Dressage Index
(GDI)

≠



WAGENINGEN UNIVERSITY
WAGENINGEN **UR**

KATHOLIEKE UNIVERSITEIT
LEUVEN

**Animal Breeding &
Genomics Centre**

Aim → Problem → Solution → Consequences

Estimate genetic parameters
for dressage performance
of Belgian warmblood horses

Draw up a
Genetic Dressage Index
(GDI)

Different competition levels

Influence of the rider



WAGENINGEN UNIVERSITY
WAGENINGEN **UR**

KATHOLIEKE UNIVERSITEIT
LEUVEN

**Animal Breeding &
Genomics Centre**

Material



■ KBRSF-FRBSE (Belgian Equestrian Federation)

- 100,303 repeated measurements
- Scoring percentage
- 7,620 different horses



■ LRV (Rural Rider Association)

- 173,917 repeated measurements
- Standardized score
- 12,248 different horses



WAGENINGEN UNIVERSITY
WAGENINGEN **UR**

KATHOLIEKE UNIVERSITEIT
LEUVEN

**Animal Breeding &
Genomics Centre**

Aim → Problem → Solution → Consequences

1. Different competition levels

→ The evaluated trait reflects

- the scoring-percentage/standardized score
- the level on which the animal competed



WAGENINGEN UNIVERSITY
WAGENINGEN **UR**

KATHOLIEKE UNIVERSITEIT
LEUVEN

**Animal Breeding &
Genomics Centre**

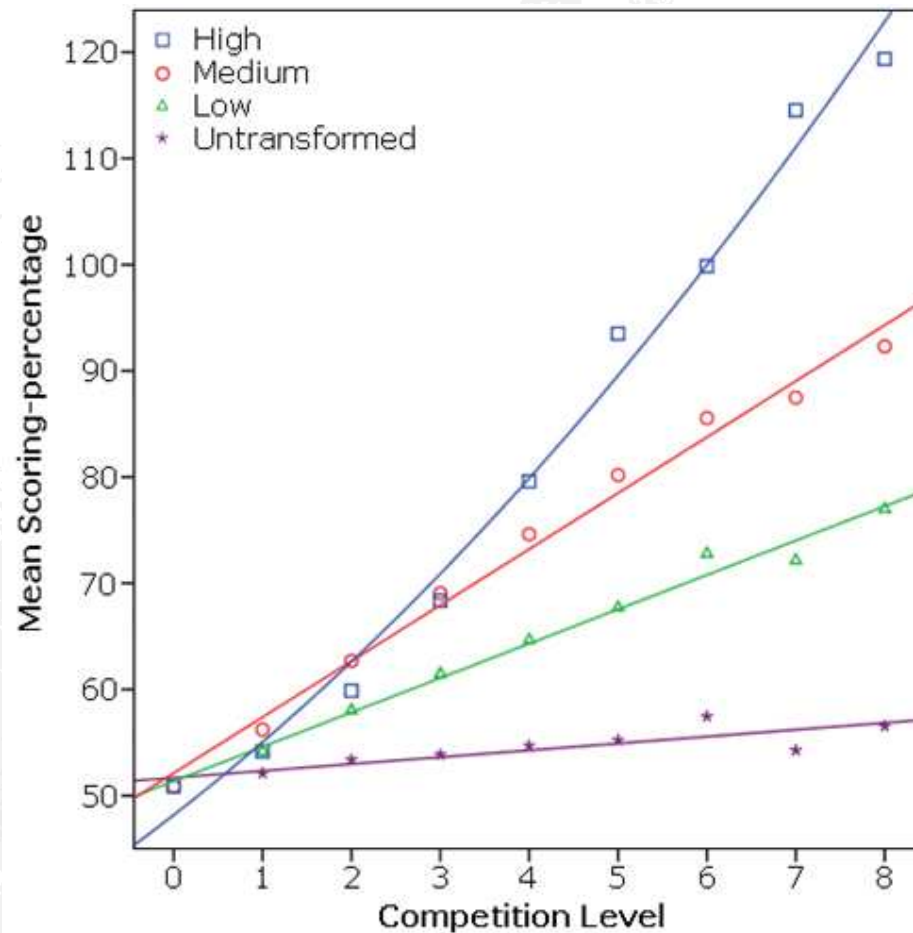
Different competition levels

■ Level-transformation example

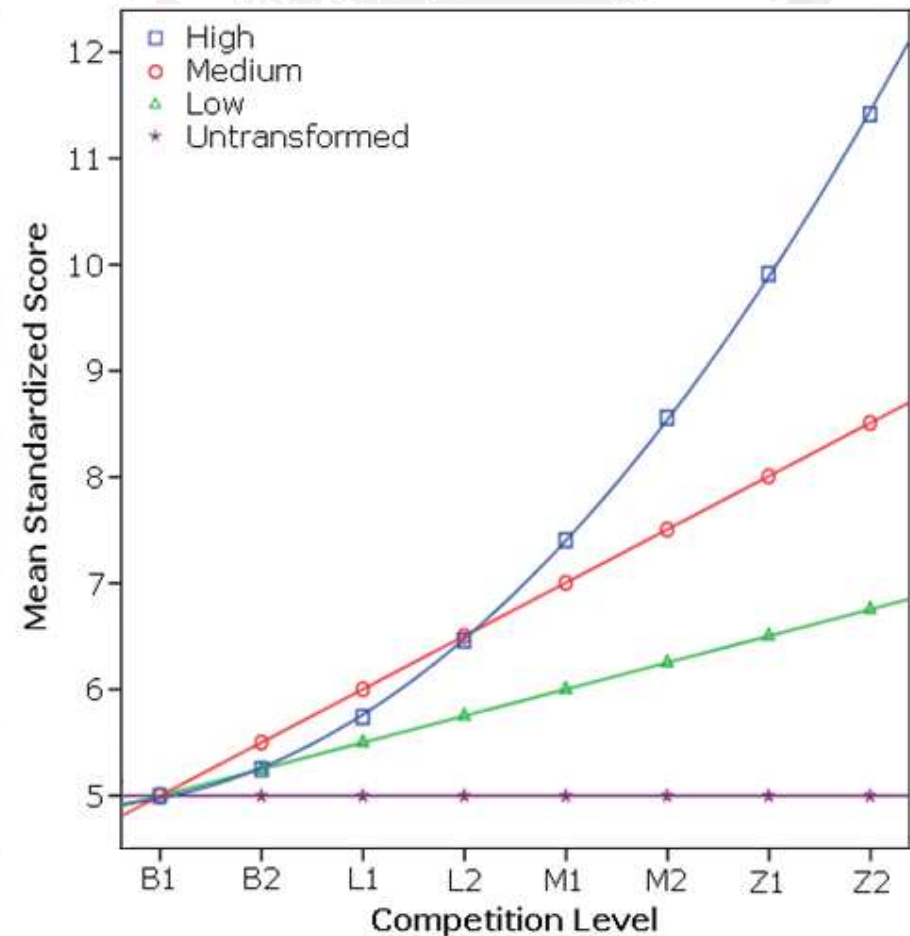


Different competition levels

■ KBRSF-FRBSE



■ LRV



Aim → Problem → Solution → Consequences

1. Different competition levels

→ The evaluated trait reflects

- the scoring-percentage/standardized score
- the level on which the animal competed

2. Influence of the rider

→ Add a random rider-effect



WAGENINGEN UNIVERSITY
WAGENINGEN **UR**

KATHOLIEKE UNIVERSITEIT
LEUVEN

**Animal Breeding &
Genomics Centre**



Influence of the rider (KBRSF-FRBSE)

■ Model 1:

$$Y_{ijklno} = \mu + \text{sexageclass}_i + \text{year}_j + \text{\#participations}_k + \text{event}_l + \text{animal}_n + \text{perenv}_o + e_{ijklno}$$

■ Model 2:

$$Y_{ijklmno} = \mu + \text{sexageclass}_i + \text{year}_j + \text{\#participations}_k + \text{event}_l + \text{rider}_m + \text{animal}_n + \text{perenv}_o + e_{ijklmno}$$





Influence of the rider (LRV)

■ Model 1:

$$Y_{ijlm} = \mu + \text{sexageclass}_j + \# \text{participations}_j + \text{animal}_i + \text{perenv}_m + e_{ijlm}$$

■ Model 2:

$$Y_{ijklm} = \mu + \text{sexageclass}_j + \# \text{participations}_j + \text{rider}_k + \text{animal}_i + \text{perenv}_m + e_{ijklm}$$



Genetic parameters

- Untransformed data
- Excluding the random rider effect from the model

KBRSF-FRBSE

h^2 0.30

r 0.52

=

Reference

LRV

h^2 0.09

r 0.35

=

Reference



WAGENINGEN UNIVERSITY
WAGENINGEN **UR**

KATHOLIEKE UNIVERSITEIT
LEUVEN

**Animal Breeding &
Genomics Centre**

Genetic parameters

What is the effect of performing a level-transformation?

		h^2	r
KBRSF-FRBSE	Untransformed	0.30 (0.04)	0.52 (0.01)
	Low	0.39 (0.05)	0.68 (0.01)
	Medium	0.42 (0.06)	0.73 (0.01)
	High	0.39 (0.06)	0.68 (0.01)
LRV	Untransformed	0.09 (0.01)	0.35 (0.01)
	Low	0.25 (0.02)	0.49 (0.01)
	Medium	0.37 (0.02)	0.64 (0.01)
	High	0.33 (0.02)	0.70 (0.01)



h^2 0.30 $\rightarrow$ $\pm$ 0.40 r 0.52 $\rightarrow$ $\pm$ 0.70



h^2 0.09 $\rightarrow$ $\pm$ 0.32 r 0.35 $\rightarrow$ $\pm$ 0.61



WAGENINGEN UNIVERSITY
WAGENINGENUR

KATHOLIEKE UNIVERSITEIT
LEUVEN

**Animal Breeding &
Genomics Centre**

Genetic parameters

What is the effect of including a random rider effect?

		h^2	r
KBRSF-FRBSE	Excluding the rider-effect	0.30 (0.04)	0.52 (0.01)
	Including the rider-effect	0.16 (0.03)	0.25 (0.01)
LRV	Excluding the rider-effect	0.09 (0.01)	0.35 (0.01)
	Including the rider-effect	0.06 (0.01)	0.23 (0.01)



h^2 0.30 → 0.16

r 0.52 → 0.25



h^2 0.09 → 0.06

r 0.35 → 0.23



WAGENINGEN UNIVERSITY
WAGENINGEN UR

KATHOLIEKE UNIVERSITEIT
LEUVEN

**Animal Breeding &
Genomics Centre**

Genetic Dressage Index

What is the effect of performing a level-transformation?

		Untransformed	Low	Medium	High
KBRSF-FRBSE	Untransformed	1.00			
	Low	0.89	1.00		
	Medium	0.75	0.97	1.00	
	High	0.62	0.90	0.97	1.00
LRV	Untransformed	1.00			
	Low	0.82	1.00		
	Medium	0.67	0.97	1.00	
	High	0.63	0.94	0.98	1.00

- Transformations have a substantial influence on the EBV ranking
 - The EBV ranking is stable between transformations



Genetic Dressage Index

What is the effect of including a random rider effect?

Excluding the rider-effect	
Including the rider-effect	0.91

- The inclusion of a random rider effect does not affect the GDI substantially



Aim → Problem → Solution → Consequences

■ Performing a level-transformation

- h^2 and $r \uparrow$
- Substantially influences the GDI

■ Including a random rider effect

- h^2 and $r \downarrow$
- Does not substantially influence the GDI

} Confounded!



ANIMAL SCIENCES GROUP
WAGENINGEN UR

KATHOLIEKE UNIVERSITEIT
LEUVEN

**Animal Breeding &
Genomics Centre**

Aim → Problem → Solution → Consequences

Estimate genetic parameters
for dressage performance
of Belgian warmblood horses

Draw up a
Genetic Dressage Index
(GDI)

Different competition levels



Level transformations

Influence of the rider



Random rider effect



WAGENINGEN UNIVERSITY
WAGENINGEN **UR**

KATHOLIEKE UNIVERSITEIT
LEUVEN

**Animal Breeding &
Genomics Centre**

Aim → Problem → Solution → Consequences

Estimate genetic parameters
for dressage performance
of Belgian warmblood horses

Draw up a
Genetic Dressage Index
(GDI)

Different competition levels



Level transformations

Influence of the rider



Random rider effect



WAGENINGEN UNIVERSITY
WAGENINGENUR

KATHOLIEKE UNIVERSITEIT
LEUVEN

**Animal Breeding &
Genomics Centre**

Aim → Problem → Solution → Consequences

Estimate genetic parameters
for dressage performance
of Belgian warmblood horses

Draw up a
Genetic Dressage Index
(GDI)

Different competition levels



Level transformations

Influence of the rider



Random rider effect



WAGENINGEN UNIVERSITY
WAGENINGENUR

KATHOLIEKE UNIVERSITEIT
LEUVEN

**Animal Breeding &
Genomics Centre**

Genetic evaluation of dressage performances

katrijn.peeters@wur.nl



WAGENINGEN UNIVERSITY
WAGENINGEN **UR**

KATHOLIEKE UNIVERSITEIT
LEUVEN

**Animal Breeding &
Genomics Centre**