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INTRODUCTION

The genetic ability in jumping and dressage performances is an important factor for the horse breeder. Belgium focuses up to now mainly on jumping performances: since 1995 breeding values are estimated and published for jumping stallions, but not for dressage stallions. The Belgian Warmblood studbook (BWP) approves stallions for jumping and dressage ability separately. In order to assess the need of specialized lines within the population of Belgian Warmblood horses, an analysis of the genetic correlation between jumping and dressage performances seemed appropriate.

MATERIAL AND METHODS

Data

Competition data	Pedigree
350 566 jumping performances (1992-2009)	272 857 individuals
117 810 dressage performances (1991-2009)	

Analysis

Data analysis was performed using the SAS 9.2 module Proc Sql (Structured Query Language). Variance Component Estimation 4 (VCE4) was used to estimate the variance and covariance components for jumping and dressage performances with linear models using REML-techniques (Groeneveld, 1998).

Level transformation

Dressage performances were transformed according to the level of the combination horse-rider (Peeters, 2008). Hence, the dressage performance was expressed as 'percentage' and three transformations; 'low level', 'medium level' and 'high level' (Fig. 1).

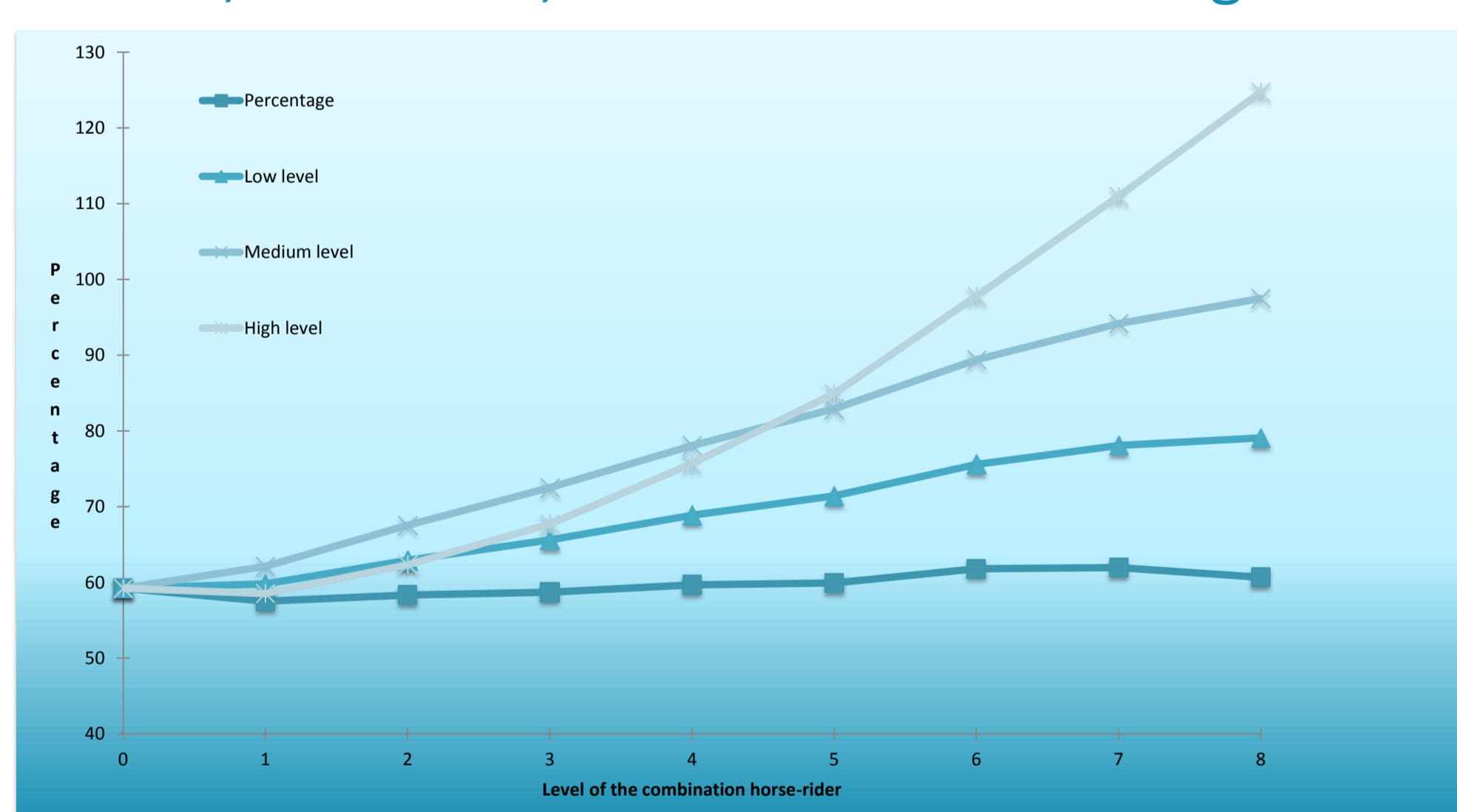


Fig. 1: Level transformations of dressage performances

RESULTS

BLUP animal models

Dressage

$$Y_{ijklmno} = \mu + sex_i + age_j + level_k + participation_l + event_m + rider_n + animal_o + e_{ijklmno}$$

Where $Y_{ijklmno}$ is the observed score for performance (percentage, low level, medium level, high level) of the o^{th} animal

Jumping

$$Y_{ijklm} = \mu + sex_i + age_j + event_k + perm-env_l + animal_m + e_{ijklm}$$

Where Y_{ijklm} is the observed score for performance (transformed ranking) of the m^{th} animal

Heritability (h^2)

For dressage, the heritability ranges from 0.223 ± 0.004 to 0.544 ± 0.004 and corresponds with results to other European countries. The heritability of jumping amounts 0.053 ± 0.003 .

Genetic correlation (r)

The genetic correlation between jumping and dressage is slightly negative and varies with the applied model and trait; from -0.154 ± 0.083 to -0.044 ± 0.077 (Fig. 2). The transformation of the original dressage percentage amplifies the negative correlation.

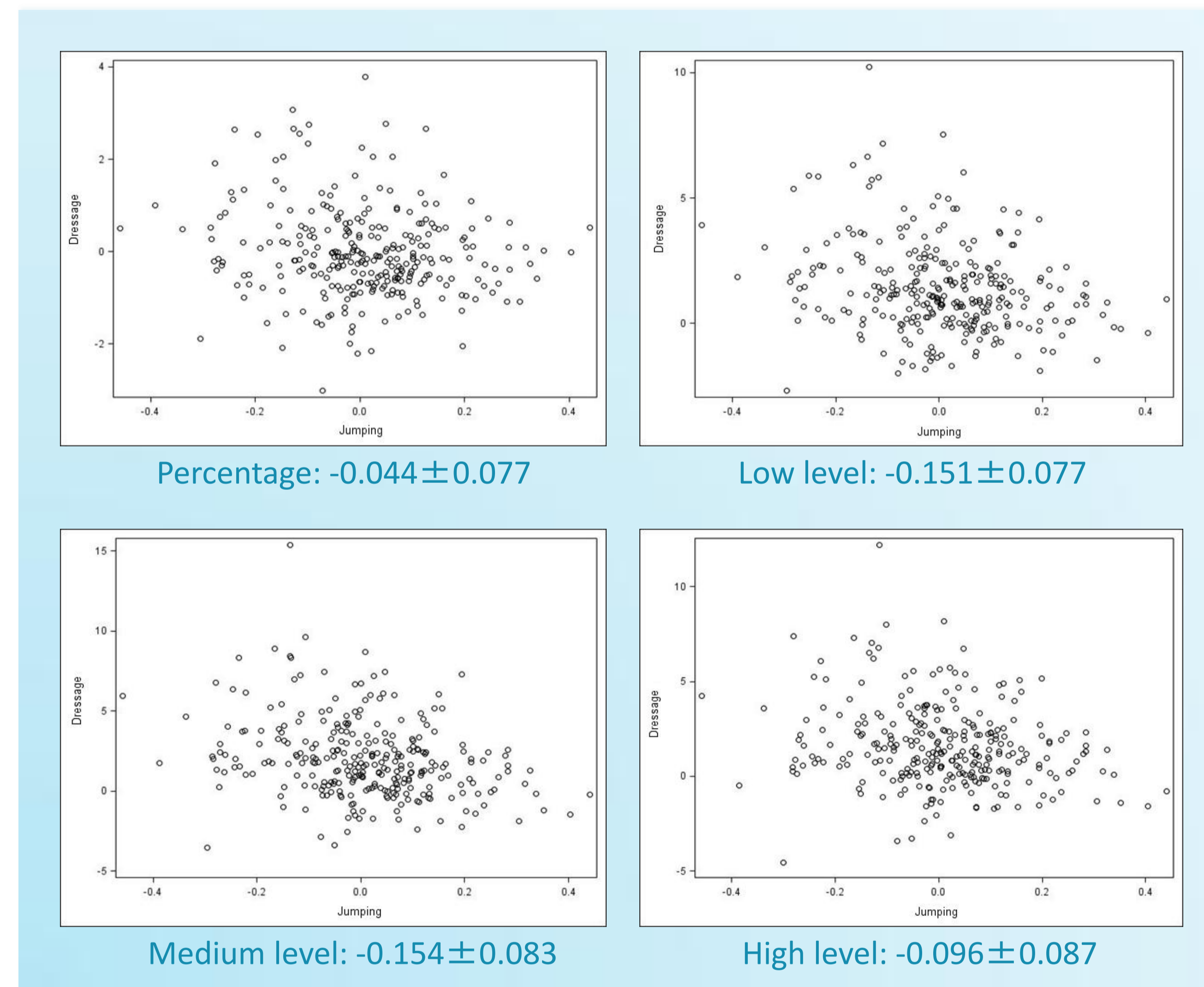


Fig. 2: Correlation diagrams and genetic correlations between jumping and dressage for percentage and the three transformations (based on jumping and dressage breeding values of 287 stallions with at least three offspring)

CONCLUSIONS

- It is necessary to involve the effects of rider and event in the model of dressage. The Belgian model ($h^2=0.223 \pm 0.004$) is most similar to the Danish model ($h^2=0.15$). It is also recommended to include the rider effect in the model of jumping.
- A slight negative correlation was found between jumping and dressage performances of Belgian Warmblood Horses. The correlation ranges from -0.154 ± 0.083 (medium level) to -0.044 ± 0.077 (percentage), which was also found in other studies. The formation of specialized lines in practice is not (yet) reflected in strongly opposed traits.
- The transformation of the levels affects the genetic correlation. The untransformed level indicates a null-correlation and a lower additive genetic effect, while the transformed levels indicate a low negative correlation and a higher additive genetic effect. This underlines the importance of the choice of the transformation (i.e. the weight given to 'high level' performance) and the distribution of the data according to the level.

REFERENCES

Groeneveld, E. (1998). VCE4 User's Guide and Reference Manual Version 1.1. Federal Agricultural Research Center, Neustadt, Germany.
Peeters, K. (2008). Estimating genetic parameters for dressage performances of Belgian Warmblood horses. Animal Breeding and Genomics Centre, MSc Thesis, Wageningen University, Wageningen.

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