

Genetic evaluation of UK sport horses for dressage competition

I Stewart¹, J A Woolliams², S Brotherstone¹

¹Institute of Evolutionary Biology, The University of Edinburgh, Edinburgh, United Kingdom, ²The Roslin Institute, Royal (Dick) School of Veterinary Studies, University of Edinburgh, Edinburgh, United Kingdom

Email: I.D.Stewart@sms.ed.ac.uk

Introduction Many Northern European countries – including France, Germany, Sweden, Ireland, The Netherlands, Belgium and Denmark – perform genetic evaluations of sport horses (competing in dressage, show jumping or eventing). Publication of estimated breeding values (EBVs) aids selection of animals for breeding to produce progeny with high performance ability. At least 9 of the 10 top ranked horses in the 2008 Olympics individual grand prix freestyle dressage competition were from studbooks that perform genetic evaluations (5 Hanoverian, 2 each of Dutch and Swedish Warmblood). In the UK however, little genetic evaluation of our sports horses has been performed, and EBVs are not currently predicted. The aim of this study was to perform genetic evaluations of horses competing in dressage competitions in the UK.

Materials and methods Results of national and international dressage competitions were obtained from British Dressage. Pedigree data were obtained from the National Equine Database. Data were a selection of all records since 1994, where i) the horse had scored points for performance, ii) percentage (marks awarded from total possible for the test) scoring system was used, iii) the horse had a passport (born/ resident in UK 2004 onward) and iv) it was registered to specific studbooks where pedigree data were available. In the data analysed, 6748 horses competed (376 stallions, 6252 geldings and 120 mares) giving 148997 competitive records. First generation pedigree data were available. Genetic connectedness was reasonable for the sire (mean 1.7 progeny/ sire, 197 sires with >4 progeny and 163 sires also competing). Mixed effects models, using Residual Maximum Likelihood (REML) implemented in the program ASReml (Gilmour *et al.*, 1996) were used to estimate variance components for random effects (additive genetic, horse permanent environment and competition), while simultaneously assessing the effect of fixed variables on the horse's performance. Percentage was used as the performance measure. Horse sex, age (linear, quadratic and cubic covariates), height (linear and quadratic covariates) and competition standard (10 level factor; Advanced, Novice, Freestyle etc...) were included as fixed effects. An animal model was implemented. Heritabilities and repeatabilities were calculated.

Results The variance components for the additive genetic, permanent environment and competition are shown in Table 1. The heritability (s.e.) of percentage awarded was 0.18 (0.018) and repeatability (s.e.) was 0.28 (0.0049). Horse sex, height and age all had significant effects on performance. Stallions performed better than geldings and mares. Performance improved with height from 1.47m (which coincides with the classification of a horse rather than pony) (Figure 1a). Performance improved from the youngest horses to a peak at age 10, and then declined slightly with increasing age (Figure 1b).

Table 1 Variance components for random effects

Variance Source	Component	SE
Horse –genetic	2.120	0.218
Horse – perm environment	1.237	0.194
Competition	2.006	0.036
Residual	6.751	0.036

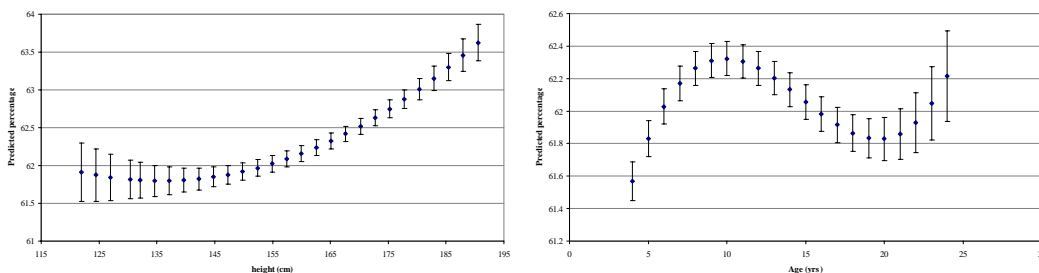


Figure 1a and b Predicted estimates of percentage at different a) heights and b) ages (+/- 1 standard error bars).

Conclusions The heritability estimate in this population is relatively high compared to other international evaluations, which range from 0.11 (e.g. Hanoverian, Oldenburg and Trakkenner) to 0.20/ 0.34 (Selle Francais) (Janssens 2008). In contrast to most international evaluations the UK data represents a wide variety of breeds. Breed may account for some genetic variance, producing an upwardly biased estimate of variation within a breed. Stallions are an elite selection of male horses, so better performance is predictable. This sex effect has been demonstrated in other populations. Genetic evaluations of sport horses are required in the UK, to give the breeding market every advantage and to keep up to date with those on the continent. The heritability estimate suggests that selection for performance is feasible in the UK population.

Acknowledgements BBSRC, British Equestrian Federation and Genesis Faraday for financial support. Industry partners and sponsors BEF and British Dressage.

References

Gilmour AR, Gogel BJ, Cullis BR & Thompson R (2006). VSN International Ltd, Hemel Hempstead, UK
 Janssens S (2008) http://www.biw.kuleuven.be/genlog/livgen/chgs_is_Breedprog.html# (Accessed 19/10/08)