Genetic parameters of clinical and radiological findings of candidate stallions presented for licensing for German Warmblood breeding

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Sustainability and long-term success of sport horse breeding requires proper consideration of health aspects. In Germany, the central equine health database is the core infrastructure supposed to foster development of new, health-targeted breeding tools. Harmonized screening protocols including standardized clinical and radiological examinations could deliver valuable information for genetic and genomic analyses if used for collection of data on a large enough and representative sample of the whole population. However, such screening is hard to establish and does not yet exist for riding horses. Therefore, the aim of this study was to evaluate the usability of health data on a preselected horse sample for breeding purposes. Examination results of 1,692 stallions presented for licensing at German Warmblood studbooks in 2018 to 2020 had been entered into the health database and made available for genetic analyses. The most commonly recorded clinical findings and radiological findings in the limbs were selected for further analyses, considering different levels of grouping vs. refined trait definitions. Variance components were estimated in single- and multiple-trait linear animal models using pedigree information on 4 ancestral generations (17,406 horses in the relationship matrix) and VCE6 software. Most of the findings were minor, and only two clinical and four radiological findings had prevalences of > 10% including, e.g., swellings / exostoses in Mc/Mt and changes of bone contours at P2. Heritability estimates were low for all traits, ranging from < 0.001 to 0.089 (clinical) and 0.118 (radiological), and had high standard errors (SE ≤ 0.059). Plausible patterns of h^2 and rg were found for radiodense bodies in different limb joint locations, consistent with previously described advantages of considering joint (fetlock, tarsus), limb (front, hind) and location within joint (dorsal, palmar/plantar). Preselection had likely impacted the results implying slower, but possible breeding progress through systematic use of health data on selection candidates rather than population-wide data.

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The spectrum of traits and effectiveness of breeding measures will benefit from continued engagement for extending the standardized collection and use of equine health data beyond screenings of predominantly clinically sound horses.