COMPARISON OF CONFORMATION TRAIT SCORES OF DAMS AND DAUGHTERS IN LATVIAN WARMBLOOD HORSE BREED

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Abstract
The objective of the study was to detect the difference of the conformation scores between dams and daughters in Latvian Warmblood horse breed. For this purpose the correlations and regression coefficient between conformation traits of broodmares and the same traits of their daughters were estimated. Data of Latvian Warmblood horse breed broodmares were analyzed. The horse breeding organisations' evaluating data from 1995 till 2015 were analyzed. The data included conformation valuation of Latvian Warmblood horse breed dams (n = 423) and their daughters (n = 596) of different ages. An average in ten-point scale in the group of dams was 7.71 ± 0.04 for top line scoring, 7.33 ± 0.05 for forelimbs and 7.35 ± 0.05 points for hind limbs. An average of valuation points of their daughters was 7.51 ± 0.03 for top line scoring, 7.21 ± 0.04 for forelimbs and 7.21 ± 0.04 for hind limbs. A significant difference between valuations of dams and their daughters ($p<0.05$) was found for all three conformation traits. Positive and low correlation was calculated between groups of dams and daughters for all three conformation traits. The results show that the relationship between conformation traits of dams and daughters was weak. Further studies are needed in order to estimate influence of broodmare quality to daughters, analyzing the latest data of progeny.
Key words: Latvian Warmblood, broodmares, dams, daughters, conformation traits.

Introduction

The Latvian Warmblood horse breed is divided in a sport type and carriage type. The development of sport type is based on breeding of horses suitable for show jumping and dressage. A strong body conformation, suitability for tourism and driving are representative features of carriage type horses (Rozītis, Kļaviņa, & Juršāne, 2008). Breeding Programme of Latvian Warmblood Horse (2010) determines criteria for quality of broodmares of both types appropriate to breeding objective and registering in Stud Book. Mares are used for breeding purpose based on the owners' preference and knowledge without external control. Especially, selection of Latvian Warmblood sport type females is completely breeder dependant likewise in majority of warmblood breeds (Dubois, Manfredi, & Ricard, 2007). Consequently, export of the best broodmares led to production of large number of horses with a low conformation quality. The selection of stallions is important for the genetic progress in population although the mare contributes as much as the male to the individual foal (Viklund *et al*., 2011). The selection of females can contribute 1/4 of genetic response (Dubois, Manfredi, & Ricard, 2008). Currently, Latvian Horse Breeding Association with the help of a special prize and support payments promotes breeders to include the best mares in stud herd.

A methodology of horse valuation at Breeding programme of the Latvian Warmblood horses schedules seven conformation criteria. Conformation is determined as the most important, second or third major selection criteria in breeding programmes of almost all breeding organisations of warmblood horses (Koenen, Aldridge, & Philipsson, 2004). Conformation is a physical appearance of an animal due to the arrangement of muscles, bones and other tissue and quality, durability and efficiency of performance are closely related to conformation, especially to conformation of top line and limbs. The score of top line of horse combines the quality of several parts of body - head, neck, withers, shoulder, back, loins, croup. Close genetic correlations were found among separate traits of top line (Posta, Komlósi, & Mihók, 2010). Conformation influences reliability of horse limbs and quality of gaits and lameness frequently occur due to a less than ideal joint and limb angulation (Dyson, 2000; Laizans, 2012). The differences in conformation traits between younger and older groups of horses are not significant (Simcic, Mesaric, & Potocnik, 2012). Conformation valuation in Latvia included seven conformation criteria – a type, top line of horse (head, neck, withers, shoulder, back, loins, and croup), width of body, conformation of forelimbs, conformation of hind limbs, correctness of movement and temperament – evaluated in ten point scale.

The objective of the study was to detect the difference of the conformation scores between dams and daughters in Latvian Warmblood horse breed.

Materials and Methods

Data of Latvian Warmblood horse breed broodmares were analyzed. The data included conformation valuations of Latvian Warmblood horse breed dams (n = 423) and their daughters (n = 596) of different ages (several dams had more than one daughter). The horse breeding organisations' evaluating data from 1995 to 2015 were analyzed (from Latvian Horse Breeders Association, Latvian Horse Breeding Association). Such factors as

Table 1

The average scores of several conformation traits of Latvian Warmblood horse breed mares

Traits	Dams n=423		Daughters n=596		Difference
	$\bar{x} \pm s_{\bar{x}}$	V, %	$\bar{x} \pm s_{\bar{x}}$	V, %	
Top line	7.71 ± 0.041	11.8	7.51 ± 0.031	10.1	0.20*
Forelimbs	7.33 ± 0.038	13.2	7.21 ± 0.034	11.7	0.12*
Hind limbs	7.35 ± 0.042	13.3	7.20 ± 0.035	11.9	0.15*

* $p<0.05$

mares' age in evaluating time, type (sport or carriage), used sires and sires' breed, count of foals, place of evaluating and information about experts were not included in this research.

The Latvian Warmblood horse breed broodmares were evaluated in accordance with Breeding Programme of Latvian Warmblood Horse. Research was carried out using horse breeding organisation's data. The valuation of three conformation traits were analyzed - top line of horse (head-neck-body), conformation of forelimbs and conformation of hind limbs due to higher objectiveness in valuation of these traits, importance in horse selection, close relationship to horse productivity and less influence of age and other factors.

The information about pedigree of mares, their conformation valuation and conformation valuation of their progeny was found in public horse database of Latvian Horse Breeding Association, available at: www.lwhorse.lv.

The statistical analysis was performed using Microsoft Excel. The difference between average values of analysed traits of dams and daughters determined by the t – test; $p \leq 0.05$ means that difference is significant. The phenotypic correlation (r_p) between scores of analysed traits was calculated by the Pearson correlation coefficient.

Results and Discussion

The data analyses showed that dams had higher average valuation than a group of daughters. An average in ten-point scale in the group of dams was 7.73 ± 0.04 for top line scoring, 7.38 ± 0.04 for forelimbs and 7.40 ± 0.04 points for hind limbs (Table 1). An average of valuation points of their daughters was 7.51 ± 0.03 for top line scoring, 7.21 ± 0.03 for forelimbs and 7.20 ± 0.04 for hind limbs. A significant difference between valuations of dams and their daughters ($p<0.001$) was found for all three conformation traits. Results can be explained with different experts and date of birth of mares that would not be included in research. These differences in scores of conformation traits would be the result of more strict breeding criteria in horse selection and higher quality of broodmares also due to larger population. It would be recommended to analyze population of young mares and their dams to detect breeding progress in the last ten years.

The scores of dams were more unequal as it was shown by higher values of coefficient of variation (11.8 to 13.3%) as in the group of daughters (10.1 to 11.9%).

Although scores of daughters were significantly lower, results also showed that scores between daughters were more adjusted. Minimal scores in the group of daughters were not lower than 5 points whereas the 2 point score was registered in dams' group for forelimbs. Previous studies with a similar horse scoring system (scale from 1 to 10) showed that scores of hind limbs were from 5 to 8, scores of forelimbs – 4 to 8, on average – 6.4 points for both traits in the group of mares (Simcic, Mesaric, & Potocnik, 2012).

The grouping of dams and daughters basis to score points of top line showed that most frequent valuation for this trait was 7.00 to 8.99 points in both groups (Fig. 1). According to the frequency of scores, dams had higher quality of top line.

The analysis of forelimbs and hind limbs scores showed that the most frequent score was 7 points (7 to 7.99) that could be described as 'good' (Fig. 2, 3). It is not possible to detect the most common conformation traits (also faults) from this valuation system.

In valuation of hind limbs both groups had scoring under 6 points more frequently than for other conformation traits.

Positive and low correlation was calculated between groups of dams and daughters in all three conformation traits. The correlation between groups was significant.

Correlation between traits into each group ranged widely and the highest correlation was between forelimbs and hind limbs in the group of dams (r_p = 0.70). Limb quality was moderately correlated with top line in the group of dams. Lower correlations were detected in the group of daughters; it could be explicable with more consolidated and more

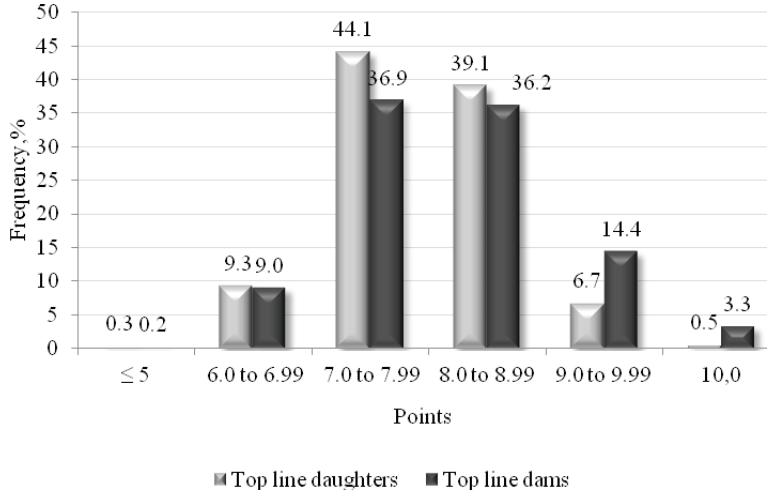

Figure 1. The grouping of Latvian Warmblood horse breed dams and daughters by top line scoring.

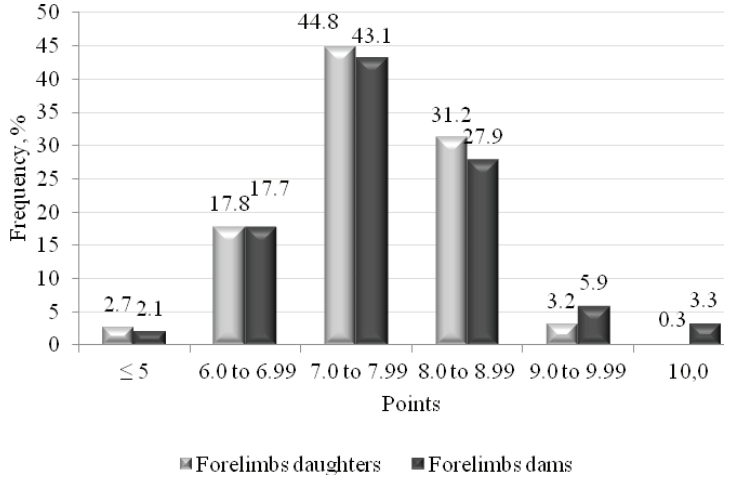

Figure 2. The grouping of Latvian Warmblood horse breeds dams and daughters by forelimbs scoring.

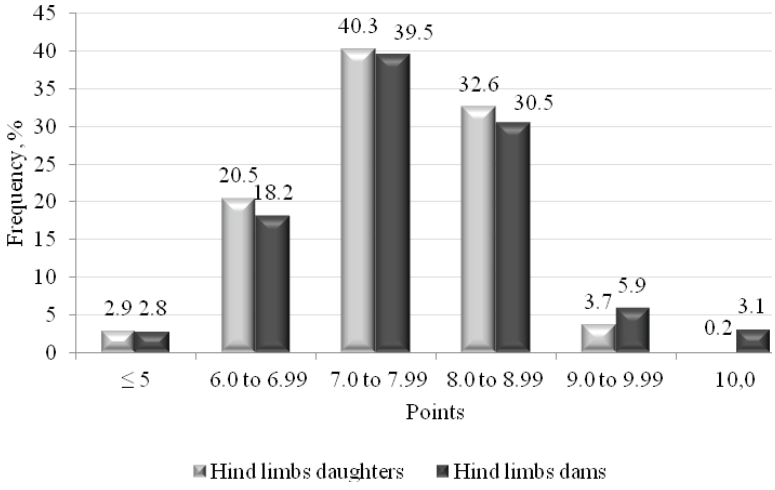

Figure 3. The grouping of Latvian Warmblood horse breeds dams and daughters by hind limbs scoring.

qualitative group of dams or specifics of horse evaluating by different experts, less from objective relation between traits.

To realise successful selection work, it is essential to find out what relationships exist between different selectional traits.

Figures 4, 5, 6 were showing scattering of valuation of conformation in groups of dams and their daughters.

Relationship between scores of dams and daughters in conformation trait 'top line' is positive however weak (r_p = 0.24). As it was shown in Figure 4, dams whose score was 10 points, no daughter has received equally high scoring. Also, the opposite situation – daughters from dams with scoring 9 and 8 points were evaluated with 10 points - was observed.

Relationship between scores of forelegs of dams and daughters was weaker than between scores of top line because r_p = 0.17. The lowest score of dams for this trait was 5 points, but for the daughter of this mare – only 2 points. As it was shown in Figure 5, dams with 10 point score have daughters whose scores were medium – from 5 to 7.

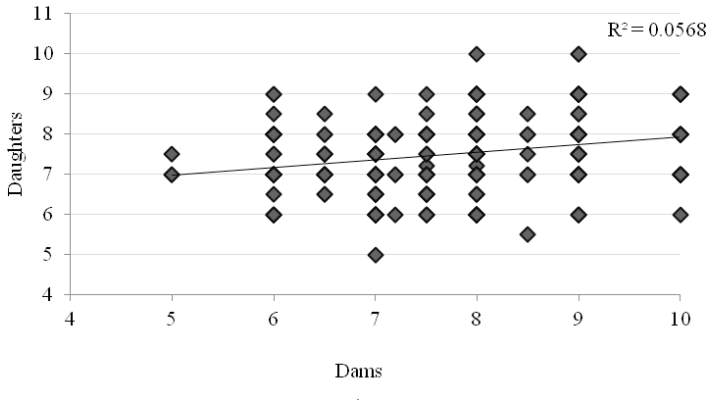

Figure 4. The relationship between dams and daughters of Latvian Warmblood horse breed in top line's valuation (in points).

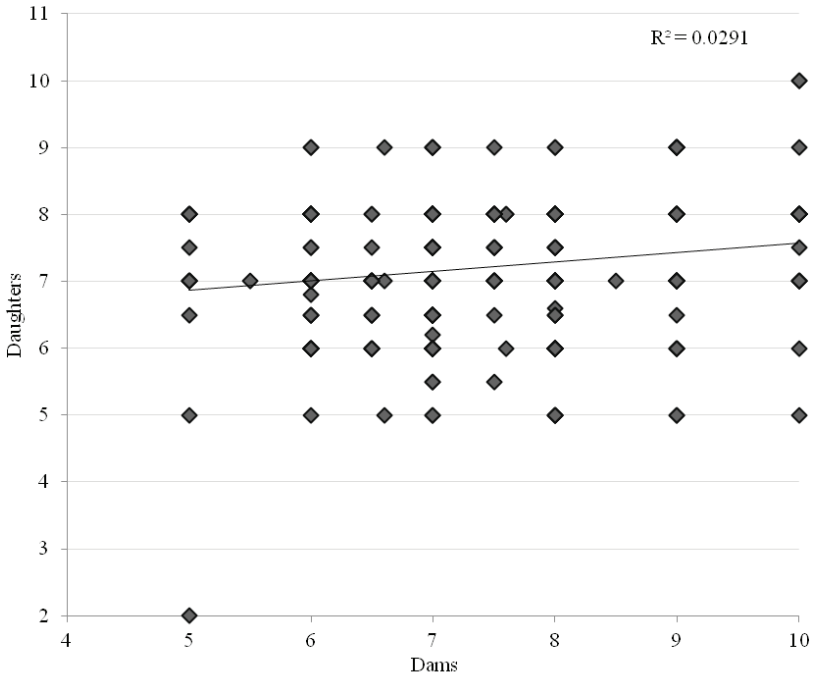

Figure 5. The relationship between dams and daughters of Latvian Warmblood horse breed in forelimbs' valuation (in points).

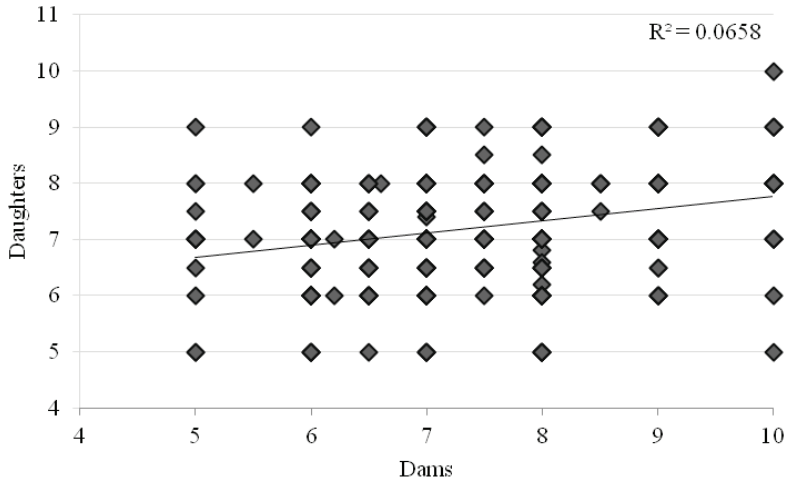

Figure 6. The relationship between dams and daughters of Latvian Warmblood horse breed in hind limbs' valuation (in points).

Closer relationships were observed between scores of hind limbs than between scores of forelimbs; however, it was also weak ($r_p = 0.26$). Also in valuation of hind limbs it is seen that dams with score 10 points have daughters whose scores were only 5 points (Fig. 6).

The results showed that the relationship between conformation traits of dams and daughters was weak, because the development of traits depends on the genetic information received from both parents. Therefore, the obtained results may indicate that successful pair selection was not carried out.

Heritabilities for analyzed conformation traits tended to be relatively low due to specifics of scoring. Previous studies verified that the lowest heritabilities were calculated directly for the limb score. It could be explicable with the large number of included limb traits (Jönsson *et al*., 2014). The evaluation of limbs in ten point scale hides many parameters as faults and advisable conformation traits, and it is also subjective due to various experts.

Conclusions

Comparison of conformation scores of dams and daughters in Latvian Warmblood horse breed showed that groups differed significantly ($p<0.05$) by analyzed traits – top of body, forelimbs and hind limbs. Dams had higher valuation than the group of daughters.

The close relation between conformation quality of dams and their daughters was not found.

The main recommendation is provident selection of high quality stallions of both types for breeding purpose to reproduce young broodmares with higher quality of conformation. It would be necessary to continue studies about broodmare quality, analyzing the latest data of progeny.

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