

# Primerjava ocene telesne zunanosti v različnem starostnem obdobju pri posavskem konju

## *Comparison of conformation trait scores of foals and adults in Posavje horse breed*

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**Abstract:** The objective of the study was to detect the differences of the conformation scores between foals and adult Posavje horse breed. At the Department for selection of horses in Veterinary Faculty, data of conformation scores determines criteria for quality of breeding animals in breeding objective and registering in Studbook. Evaluating data of type, head, neck, front part, middle part, hind part, conformation of front limbs and hind limbs from 1995 till 2007 were analysed. Estimated heritabilities for scored conformations trait in Posavje horse (556) were low to moderate (0.03-0.37). The data included conformation valuation of Posavje horse breed male (57) and female foals (353) and adult at admittance in studbook. An average in ten-point scale in the group of mare was  $7.25 \pm 0.50$  for type,  $7.39 \pm 0.32$  for head-neck,  $7.57 \pm 0.19$  for body and  $6.44 \pm 0.21$  points for limbs. An average of valuation points for the same animals as foal was  $7.37 \pm 0.39$  for type,  $7.18 \pm 0.37$  for head-neck,  $7.54 \pm 0.35$  for body and  $6.59 \pm 0.31$  for limbs. A significant differences between valuation of this two groups ( $p < 0.01$ ) was found for type, head-neck and limb conformation traits (paired t-test). Valuation of body was similar in foals and adult animals. The conformation scores of male Posavje horses were for the same conformations traits higher than for female animals. A significant difference ( $p < 0.01$ ) was found only for head-neck. The results show that the relationship between conformation traits of female Posavje horses was weak. In male Posavje horses, the relationship between conformation traits was more informative, most likely because of stringent criterions at evaluation of conformation in foals. Further research in genetic parameters of conformation in young horses, as well as foals, should strengthen breeding programs of Posavje horses and allow earlier selection of superior breeding animals.

**Key words:** Posavje horse breed, mares, stallions, foals, conformation traits, selection

**Povzetek:** Namen raziskave je bil ugotoviti razlike ocene telesne zunanosti žrebet in odraslih živali posavskega konja. Na oddelku za selekcijo konj na Veterinarski fakulteti podatki o oceni telesne zunanosti določajo merila za kakovost reje živali v rejskih ciljnih in registracijo v rodovniške knjige. Analizirani so bili podatki o oceni tipa, glave, vratu, prednjega, srednjega in zadnjega dela trupa, prednjih in zadnjih nog ter korektnost in izdatnost hodov od leta 1995 do 2007. Ugotovljene vrednosti dednostnih deležev za posamezne lastnosti zunanosti pri posavskem konju (556) so bile nizke do povprečne (0,03-0,37). Podatki vključujejo tudi ocene telesne zunanosti populacije posavskega konja pri moških (57) in ženskih žrebetih (353) in ob vpisu v rodovniško knjigo. Povprečje ocene na lestvici modela desetih točk v skupini kobil je bilo  $7,25 \pm 0,50$  za tip,  $7,39 \pm 0,32$  za glavo-vrat,  $7,57 \pm 0,19$  za telo in  $6,44 \pm 0,21$  točk za okončine. Povprečna ocena istih živali kot žrebe je bila  $7,37 \pm 0,39$  za tip,  $7,18 \pm 0,37$  za glavo- vrat,  $7,54 \pm 0,35$  za telo in  $6,59 \pm 0,31$  za okončine. Statistično značilne razlike med

skupinama ( $p < 0,01$ ) so bile ugotovljeno s pomočjo parnega t-testa za tip, glavo-vrat in okončine. Povprečna vrednosti ocene telesa je bila podobna pri žrebetih in odraslih živali. Ocene za lastnosti zunanosti so bile pri moški populaciji posavskega konja višje od ženske populacije. Statistično značilna razlika ( $p < 0,01$ ) v oceni lastnosti zunanosti med moškimi žrebeti in žrebci je bila ugotovljena samo za glavo-vrat. Rezultati kažejo, da je bil odnos med lastnostmi ocene zunanosti pri ženski populaciji posavskih konj šibek. Pri preiskovani moški populaciji posavskih konj je bilo razmerje med lastnostmi zunanosti bolj informativno, najverjetneje zaradi strožjih meril pri ocenjevanju lastnosti zunanosti pri žrebetih. Nadaljnje raziskave genetskih parametrov ocene telesne zunanosti mladih konj in žrebet, lahko pomembneje ovrednotijo rejski program pri posavskem konju ter omogočijo zgodnejšo odbiro kvalitetnih plemenskih živali.

**Ključne besede:** Posavski konj, kobile, žrebci, žrebeta, ocena telesne zunanosti, selekcija

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## Introduction

Selection in horse breeding is based mostly on the results of the tests of the working ability and, indirectly, on assessment of the body exterior or conformation. Conformation scoring is a transformation process of visual perceptions of equine conformation into numerical scoring data (Druml et al., 2008). In horse breeding different conformation traits are routinely assessed by visual scoring procedures, which allow for the prediction of future performance at an early age. The collection of conformation details included in the evaluation is large and varies between countries and breeds or stud books (Aminder, 2002; Wallin et al., 2003; Viklund et al., 2008; Jönsson et al., 2014b). Conformation influences reliability of horse limbs and quality of gaits and lameness frequently occur due to less than ideal joint and limb angulation (Dyson, 2000; Laizans, 2012). The conformation traits are the first horse characteristics that are often evaluated early in life (Koenen et al., 2004). The differences in conformation traits between younger and older groups of Posavje horses are not significant (Simčič, Mesarič and Potočnik, 2012). Recording conformation traits in tests for young horses can be a good predictor of longevity in competition (Wallin et al. 2001; Jönsson et al., 2014a), which is a trait specified in the New Forest pony breeding objectives. Sometimes a linear scale is used for conformation in horses (Van Bergen & Arendonk, 1993; Koenen et al., 1995; Rustin et al., 2009). The conformation traits are the first horse characteristics that are often evaluated early in life

On the base of measurements and estimates that are in program at the Department for selection of horses, Veterinary Faculty in the context of the implementation of the breeding programmes, we check how they comply with the objectives of the breed and what the trends are. Evaluation of the physical structure of the horse is the result of natural selection and selection of horses for different purposes. In the case of breeding animals, we must always bear in mind that these are the parents of the new generations, so all of the errors made by the offspring should not be overlooked.

Posavje horse is autochthonous breed formed on the base of the local population of horses with cross-breeding of different horse breeds in region along the river Sava basin in Croatia and Slovenia. The breeding region includes the southern part of Slovenia (especially the districts Krško and Brežice). In 1993 a Slovenian breeding and conservation program of this breed was initiated. This was the commencement of pedigree documentation; whilst in the past only breeding stallions were registered. Breeding program in the Posavje horse population is based mostly on conformation traits. The Posavje population in Slovenia experiences a period of expansion, as the population increased from 79

breeding mares in 1993 to 627 breeding mares in 2017 (Mesarič and Rus, 2014). The dominant breed, which this horse was combined from, is Belgian cold-blooded horse (Ardennes breed). Breeding goal is harmonious cold-blooded horse of smaller size, firm constitution, well-meaning personality, good calm temperament, with correct gates. It may be used as a lighter working horse as well as a slaughter horse (Mesarič and Rus, 2011).

Very few studies have evaluated conformation in foals and its relationship to adult conformation. Therefore, it is unknown whether foal conformation can predict future performance or breeding potential in horses. In Posavje horse we have examined relationship between subjective animal conformation traits (type of breed, head-neck, body and legs) in foals and adult animals. If foal scores would be in relationship with later inspections, they can be utilized for earlier selection as well as progeny testing for approved stallions.

## Material and methods

### *Conformation scoring*

The database included 556 Posavje horses registered from year 1999 till 2007. All data were obtained from the breeding documentation of the Slovenian Association of Posavje horse breeders. Investigated population consisted of 44 stallions and 512 mares. The animals were scored concerning conformation and basic quality of gaits. Judgment of conformation included head, neck, front part, middle part, hind part, front limbs and hind limbs. Judgment of gaits included correctness, impetus, and elasticity while trotting. The evaluation of horse conformation was conducted according to the standard scale of 100 points.

For estimation of relationship between subjective animal conformation traits (type of breed, head-neck, body and legs), male (57) and female foals (363) and adult animals were included. All 420 horses were first evaluated up to the age of 7 months and second at the age of three years and older. Scores on a scale from 0 to 10 were allocated to each of these traits, with 0 denoting not shown or not evaluable and 10 denoting excellently conformation.

### **Statistical analyses**

Statistical model for variance components estimation described fixed effects gender, age at scoring, and birth year and animal as random effect. Covariance components were estimated by Residual Maximum Likelihood (REML) method using VCE-6 program package (Groeneveld et al., 2008). Estimated genetic parameters were further used to predict BV for MS using a previously defined statistical model. The heritability index ( $h^2$ ) describes the proportion of the total variation due to the average effects of genes. The  $h^2$

ranges 0–1; a score of 0 indicates that there is no genetic basis for that particular trait, while 1 indicates that the trait is completely controlled by genes. Means scores of conformation traits between foals and adult Posavje horse breed were compared by the paired t-test and performed with SPSS software package.

## Results and discussion

The explanation what exactly each point meant is very subjective, while 1 means that the trait was the worst expressed, and 10 that the trait was the most expressed in agreement with breeding goals. The range of received notes is 5-9 points for the type, head, front and middle part, 6-9 points for neck and hind part, 4-8 points for front limbs, 5-8 points for hind limbs and correctness of gaits and 6-10 points for elasticity of gaits. Mean values and standard deviations from the 556 Posavje horses scored are presented in Table 1. The obtained results showed the mean scores from 6.38 (front limbs) to 7.56 (front part) with standard deviations from 0.61 to 0.77. Wejer and Lewczuk (2015) reported mean scores from 6.73 to 7.24 for similar conformation traits.

Variable	N	Mean	SD	Min.	Max.	Range	h <sup>2</sup>
Type	556	7.13	0.73	5	9	4	0.37
Head	552	6.92	0.77	5	9	4	0.30
Neck	552	7.30	0.74	6	9	3	0.10
Front part	552	7.56	0.70	5	9	4	0.18
Middle part	552	7.11	0.74	5	9	4	0.26
Hind part	552	7.51	0.61	6	9	3	0.36
Front limbs	552	6.38	0.73	4	8	4	0.03
Hind limbs	552	6.51	0.64	5	8	3	0.07
Correctness, gaits	548	6.51	0.61	5	8	3	0.09
Elasticity, gaits	545	7.17	0.65	6	10	4	0.10

Table 1. Mean values, minimum and maximum values, standard deviations (SD), range and heritabilities (h<sup>2</sup>) of 10 traits for Posavje horses

Heritability estimated for the 10 traits scored during this study vary from 0.03 for front limbs to 0.37 for breeding type. The lowest estimates of heritability were found for traits of the limbs and gaits in comparison to the other traits. A similar low result was observed by Arnason (1979) and Grosshauser and von Butler-Wemken (1991), finding heritability of 0.16 for Icelandic horse and Bavarian coldblood. The low estimates for the heritabilities of the traits front/hind limbs, correctness and elasticity of gaits could be caused by the influence of factors other than additive genetics effects or by small variances of these traits. Heritabilities for analysed conformation traits tended to be relatively lower due to specifics of scoring (Table 1). The evaluation of limbs in ten-point scale hide many parameters as faults and advisable conformation traits, and it is subjective due to various experts. This can be explained by the fact that there are many individual properties that affect these traits to each other negatively related. In addition to these traits, it is

considered that they can objectively assess the weight, or to the influence of subjectivity. Subjective scoring of conformation traits had lower heritability than measured traits in Posavje horse breed (Simčič, Mesarič and Potočnik, 2012).

Traits	Type		Head-Neck		Body		Limbs	
	Stallion	Foal	Stallion	Foal	Stallion	Foal	Stallion	Foal
Mean	7.68	7.81	7.79	7.54	7.82	7.93	6.62	6.84
Variance	0.33	0.37	0.30	0.39	0.25	0.42	0.23	0.42
P - value	0.24 (NS)		0.01*		0.273 (NS)		0.03	

Table 2. Means, variances and P-values of conformation of Posavje horse, compared female animals as foals and adult animal (paired t-test, n = 363)

The data analyses showed that female Posavje horses had as foals higher average evaluation for type (7.37±0.39) and limbs (6.59±0.31) than as mares (7.25±0.50; 6.44±0.21) at admittance in studbook. Exterior assessment of female foals and mares was significantly different at assessing type, head-neck and limbs, and nonsignificant assessing body (Table 2). The highest difference in mean values was established in head-neck (p<0.00001) and limbs (p<0.0001), probably because of less strict selections in female foals. Mean values of conformation scoring was in male populations of Posavje horse higher in comparison to the female populations (Table 3). Only assessment of head-neck was significantly different (P<0.01) comparing male foals and stallions, most likely due to stringent criteria at evaluation of conformation. Assessment of breed type, body and legs were between male animals (foal-stallion) similar. The scores of male foals were more unequal as it was shown by higher values of variance (0.37 to 0.42) as in the group of stallions (0.23 to 0.33). Overall the mean scores of evaluated Posavje horses were higher for type, head-neck and body than for limbs. This can be explained by low heritability of this trait and previously low selection pressure for legs correctness in cold-blooded breeds like Posavje horse.

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P - value	0.24 (NS)		0.01*		0.273 (NS)		0.03	

Table 3. Means, variances and P-values of conformation of Posavje horse, compared male animals as foals and adult animal (paired t-test, n = 57)

Previous studies with a similar horse scoring system showed that score of fore and hind limbs were 4 to 8 and 5 to 8 in the group of mares (Orbidane and Jonkus, 2016). Exterior assessment of female foals and mares at admittance in studbook was significantly different at assessing head-neck, body and legs, and similar assessing type of breed. Only assessment of head-neck was significantly different comparing male animals, most likely because of stringent criteria at evaluation of conformation. Significant differenc-

es in conformation traits between foals and later as adult horses were in relationship with established low heritabilities in Posavje horse. The observed overestimation in the foals is not very surprising, as it can be expected that young foals give a positive impression. The other reason for such high evaluation may be connected with the belief that every mistake by young foals is thought to be correctable through the development, with could be case in the female population. The evaluation of very young foals should be more informative for the breeders, as they should receive a more reliable assessment. The accurate evaluation of foals is of great importance for future breeding decision, especially if the heritabilities of conformational traits seem to be higher for younger than for older animals (Schöpke et al., 2013). Several trends in conformational change from foal age to adult exist and should be examined further to determine if conformation at foal age is relevant to adult conformation. Finding a more appropriate system for horse evaluation is crucial, especially in the age of the new genetic or genomic selection.

### Conclusions

In the conclusion from our study, the current system of assessment overestimate the evaluation of some conformation traits by foals. Their evaluations seem to be overestimated mainly for type and limbs and more obviously in male population. Heritabilities for analysed conformation traits tended to be relatively low due to specifics of scoring. This could be the result of specific breeding strategy in Posavje horse breeding program. Body structure of the horse is a result of the natural selection and planning for different purposes. In general breeder's decision for selection of horse is based on personal preferences and possibilities and less on selection measure results, evaluations and testing of working abilities. The evaluation of very young horses should be more informative as it is essential for the breeders. Overall, inspection scores in young horses can be used to select potential breeding horses at an earlier age. Further research in genetic parameters of conformation in young horses, as well as foals, should strengthen breeding programs of Posavje horses and allow for earlier selection of superior breeding animals.

### Literature

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