DEVELOPMENTS IN LINEAR SCORING

By Hermien Wierdsma

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Since 1994 a linear scoring form has been completed for all horses presented for inclusion in the studbook. After having been processed at the studbook offices, the forms are sent to the owner of the horse. The scoring form is an important tool in choosing a stallion for an individual mare, and all the scoring forms together provide a wealth of information about the genetic characteristics being passed on by the stud stallions. This information is used to assemble and adjust the stallion indices every year. In 2001, the linear scoring form was reduced by several points. Reducing the number of points on the scoring form (and, thus, in the stallion index) is intended to improve the effectiveness and efficiency of the selection process that will eventually lead to an acceleration in reaching breeding objectives.

LINEAR SCORING

Making improvements in the breed requires making observations and recording these systematically. You have to know what the breed averages are and which horses will pass on which genetic characteristics. Cattle breeding has been using the system of linear scoring and indices derived from these scores for almost 20 years; various horse studbook followed suit. In 1994, the FPS started using linear scoring with a scoring form specifically developed for the Friesian horse. In addition to general information over the horse and the judging location, the upper part of the form consists of an objective description of your horse's appearance. The points listed on the upper part of the form are thus not intended as an evaluation (the more points the better) but are to be used for the computer processing of the data. These scores indicate to what extent the characteristic being scored differs from, or is similar to, the average for the breed (between the double lines). It is also important to realize that this average for the breed is not the same as a breeding objective (the ideal). You could say that the upper part of the form is similar to a photograph of your horse; it is an objective observation. The listed elements are called "linear characteristics."

The lower part of the form contains the lines devoted to scoring the various characteristics: racial type, structure, musculature (only on the older form), legwork, walk and trot. Unlike the upper part of the form, this part indicates the jury's evaluation of the horse in terms of the listed characteristics. We call these the "evaluating characteristics." These scores indicate an assessment of the degree to which a horse meets the breeding objective. In other words, this is where the "photograph" of your horse is assessed in terms of how well it satisfies the ideal picture the FPS has in mind for the Friesian breed.

The old form gave scores for 39 linear characteristics. This is a large number when it comes to making selections for breeding, but the FPS based its decision at that time on what it saw as the need for collecting as much information as possible about the population. After having scored a significant number of horses, the data could than be analyzed for the purpose of modifying the scoring form.

ANALYSIS

After seven years of scoring, the FPS asked the Royal Dutch Cattle Syndicate (NRS) to analyze the collected data and to provide advice for a possible modification of the scoring form. The response came in the form of a report entitled "Genetic correlations between linear and evaluating exterior characteristics for the Friesian horse" (NRS, 2001). This analysis conducted by the NRS considered such matters as the genetic relationship between the linear characteristics and the evaluating characteristics, the interconnections among the linear characteristics, and the connections among the evaluating characteristics.

PREDICTIVE VALUES

In analyzing the linear characteristics, the NRS looked at which characteristics had a direct genetic relationship with the evaluating characteristics (the lines devoted to scoring the various characteristics). The result of this analysis was the "predictive value." In other words, is there a correlation between the evaluation given on the line devoted to scoring a characteristic and where the 'x' is located on the upper part? The analysis determined that only five linear characteristics that were not all the same, but which exhibited a high degree of overlap, were responsible for all of the evaluating characteristics. In other words, several linear characteristics appeared not to have that much genetic effect on the outcome of the evaluating characteristics. Some characteristics can have an effect on the evaluation of the horse but are determined less by genetics than by how the horse has been reared, accommodated, fed and trained. The difference in the degree to which characteristics are inherited is expressed as the heritability.

CORRELATION BETWEEN LINEAR CHARACTERISTICS

When looking at the results as based on the scoring forms, it appears that certain linear characteristics display a strong correlation with other linear characteristics (a high degree of genetic correlation); i.e. if for one characteristic the 'x' is located on the scoring form more to the right or left, then the 'x' for the associated characteristic is also located similarly more to the right or left. A small head, for example, is almost always a noble head. Examples of other characteristics that are highly correlated are: length of nape of neck, length of neck and head/neck connection.

INTERRELATIONSHIPS BETWEEN EVALUATING CHARACTERISTICS

The analysis also showed that there were definite interrelationships between the evaluating characteristics. The highest degree of genetic correlation was between the characteristics of racial type, structure and musculature.

Plaats:	Land:	Cat.nr:	
Datum:	Naam:		
Geslacht:	Reg.nr:	Tongnr:	
Stokmaat:	Vader:	Moeder:	
Aftekening:	Reg.nr:	Reg.nr:	

	Kenmerk	5	10	15	20	25	30	35	40	45	Kenmerk
Hoofd	onedel										edel
	lang X	X									klein
Nek	kort X	X									lang
Hoofd:hals verbinding	zwaar										licht
Hals	kort X	X									lang
	horizontaal										verticaal
	zwaar X	X									arm
Schoft	kort X	X									lang
Schouder	kort X	X									lang
	steil										schuin
Rug	lang X	X									kort
	week										strak
Lendenen	smal										breed
	week X	X									gedreven
Kruis	recht										afhellend
	kort										lang
Broekspier	kort										lang
Lengte onderarm	kort										lang
Voor be(e)n(en)	gestrekt										onderstndg
	hol X	X									bokbenig
achterbe(e)n(en)	o-benig X	X									koehakkig
	sabelbenig										recht
Ontwikkeling gewrichten	grof X	X									fijn
Koot	kort										lang
Hoeven	klein										groot
verzenen	laag X	X									hoog
Kwaliteit Benen	voos										hard
	zwaar X	X									fijn
Stap	wijd X	X									nauw
	toontredend										frans
	kort										lang
	onregelmatig X	X									regelmatig
	zwak										krachtig
Draf	kort X	X									ruim
	weinig tact										veel tact
Beweging/impuls	duwend										dragend
	vlak X	X									verheven
Kleur	vaalzwart										gitzwart
Behang	weinig										veel

Linear characteristics

Average for the breed (NOT the same as breeding objective or ideal)

Rastype	Bouw	Bespiering	Beenwerk	Stap	Draf
		X			

Jurylid:

Evaluating characteristics

versie 1-1999

Illustration 1. The old version of the linear score form for Friesian horses of the FPS, edited for clarification. Courtesy FPS, Drachten.

LINEAR SCORING, Cont.

DEVELOPING A SHORTENED FORM

The selection of characteristics to be retained or omitted in the revised form was done as follows: the analysis considered the characteristics that played a major predictive role in determining the evaluating characteristics. The characteristics that played a major predictive role in determining the evaluating characteristics and which also display a high degree of inter-correlation were retained for use on the new form, the others were omitted. As an example, we can again use the head: there appeared to be a high correlation between the size of the head and the expression (noble/plain). Because the head expression had the highest predictive value for the evaluating characteristic (i.e. the correlation with the breeding objective), the element "head size" was omitted and "expression" was retained.

The evaluating characteristic "musculature" was omitted because this is highly correlated with the characteristics "structure" and "racial type."

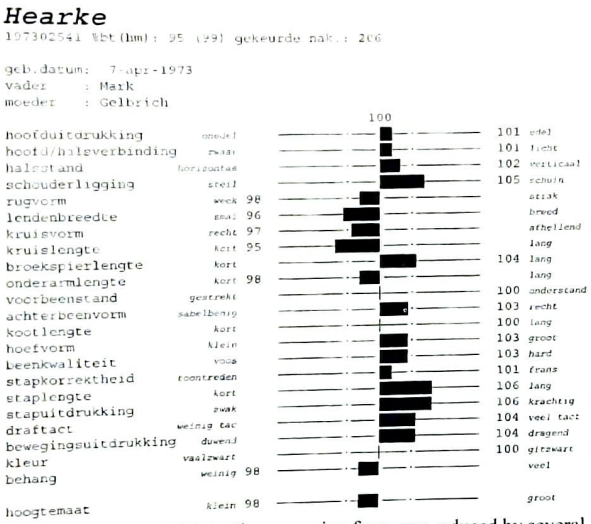

Illustration 2. In 2001 the linear scoring form was reduced by several points. (Offspring composite for the Studbook stallion, Hearke, now consists of 23 characteristics that have a direct genetic relationship to the evaluating characteristics). Courtesy FPS, Drachten.

LESS IS MORE

On the form in use until 2001, 39 points were scored. This has been reduced by 16 in the current form so that only 23 characteristics are scored. The evaluating characteristic "musculature" has also been omitted. At first, the restricting of the scoring form seemed somewhat of a loss the picture seemed a bit incomplete. But linear scoring is not just involved with the observation of your horse, it is intended primarily as a breeding tool. When attempts are made to select as based on too many factors, little progress will be seen within the near future. But by retaining the characteristics that have the highest correlation with the breeding objectives and the highest degree of heritability, the scoring forms and the stallion indices become much easier to understand and use. A better selection can be made that will lead to faster positive results. And this will mean a breeding program for the breed that will exhibit results in the shortest length of time. This, after all, is what it's all about.

Acknowledgements: Mr. H. Mulder; Mr. P. Hoekstra and Mr. J. Hendricks.

Sources:
Genetische Correlaties Tussen Lineaire en Waarderende ExterieurkenmErken bij het Friesche Paard, NRS, 2001.
Het Fokken van het Friese Paard, Dr. A. Osinga, 2000.

From Cattle to Horses - How Can They Utilize the Same System?

By Laurie M. Kasperek

The discovery that the linear score system utilized in horse breeds today, and specifically in the Friesian horses of the FPS, originated with the cattle industry elicits the full spectrum of responses from knowing nods to outright incredulity. How can two very different species utilize the same concept for breeding purposes? Those of you who have raised, bred and marketed cattle, pigs, or other livestock, or who have participated in the dairy programs of the Cooperative Extension or similar agri-oriented programs, will be well familiar with the linear score system as an important breeding tool to improve desired traits within the breeding populations of these respective species. On this continent, the Holstein Association USA is one organization that has developed extensive, association-wide use of what they call the "Linear Classification System." Mathematically, it is similar to the FPS's "Linear Score System." Characteristically (as in the characters being examined), it is very different. Both breeding organizations utilize the same concept as a management tool, to track the populations' improvement over time, and for mating comparisons.

In his book, "The Breeding of the Friesian Horse," edited by the Association "It Fryske Hoars," Dr. Ir. Anne Osinga states that he will use examples from the horse breeding industry, but also from the cattle breeding industry, "because - under pressure of the economy - the cattle breeding industry is much more up-to-date regarding the implementation of modern science than the horse breeding industry." The fact is, the cattle breeding industry did indeed have the linear score evaluation of breeding stock well in hand among members before horse registries began to view the benefits of such a program. Wide-spread use of the linear score classification within the Holstein Association USA has resulted in a