



Linear profiling of foals in the Holstein studbook

experiences, phenotypic correlations and implications

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Linear profiling in the Holstein studbook: development

- Since 2010: linear description of foals using an assessment sheet
- Since 2014:
 - Linear profiling of mares at studbook entry and mare performance tests in Schleswig-Holstein
 - Use of the portable tablet computer for recording the data
- Since 2015: linear description of young stallions at the preselection for the licensing
- **Since 2017:** use of the extended Oldenburg linear scheme for Holsteiner mares and stallions





3

- Until 2015: only offspring of young or outcross stallions
- Since 2016: close to all presented foals, use of a tablet computer; assessment sheets only used in exceptions and for all foals assessed outside of Schleswig-Holstein
- Until 2017: Constant further development of the trait scheme (adding of new traits etc.). Same catalogue since 2017 with 34 traits
- 7-point linear scale (2010-2013: +1 to +7, since 2014: -3 to +3)
- Regular training of the judges (once a year)
- Two to three judges in total, one of the judges responsible for linear profiling, the other(s) give(s) valuating scores
- Time for assessment / linear scoring: approximately 5 minutes

25 March 2020

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Trait	2010	2011	2012	2013	2014	2015	2016	2017 - 2020
Breed type/Caliber: light - heavy		Х	Х	Х	Х			
Breed type: plain - true to type						Х	Х	Х
Caliber: light - heavy						Х	Х	Х
Growth/Size: short - tall	Х	Х	Х	Х	Х	Х	Х	Х
Size of the mare: short - tall		Х	Х	Х	Х	Х	Х	Х
Head: big, coarse - small, fine	Х	Х	Х	Х	Х	Х	Х	Х
Neck: short/low - long	Х	Х						
Neck: short - long			Х	Х	Х	Х	Х	Х
Neck: low - high			Х	Х	Х	Х	Х	Х
Shoulder: straight/short - sloping/long						Х	Х	Х
Back: short - long	Х	Х	Х	Х	Х	Х	Х	Х
Back: dipped(weak) - roached	Х	Х	Х	Х	Х	Х	Х	Х
Withers: flat - high		Х	Х	Х	Х	Х	Х	Х
Withers: short - long				Х	Х	Х	Х	Х
Croup: too flat - very sloping		Х	Х					
Croup: flat/level - sloping(weak)				Х	Х	Х	Х	Х
Croup: short - long						Х	Х	Х
Forelimb: short pastern - long pastern	Х	Х	Х	Х	Х	Х	Х	Х
Forelimb: upright pastern - weak pastern						Х	Х	Х
Toe stance: toe in - toe out	Х	Х	Х	Х	Х	Х	Х	Х
Toe stance: unilateral or bilateral						Х	Х	Х
Hindlimb: short pastern - long pastern	Х	Х	Х	Х	Х	Х	Х	Х
Hindlimb: upright pastern - weak pastern								Х
Hocks: straight - angulated	Х	Х	Х	Х	Х	Х	Х	Х
Hindlimb particularities (blank space)	Х	Х	Х					
Tarsus-Cannon art.: flat - tied-in				Х	Х	Х	Х	Х
Hoof: flat hoof, low heels - club foot, high heels				Х	Х	Х	Х	Х
Gaits: stiff/tied - elastic/rhythm	Х	Х	Х	Х	Х	Х	Х	Х
Anomalies (+ <i>blank space</i> "other")	10	11	10	9	9	9	9	9
Sum of traits	22	28	27	28	28	33	33	34
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	Breeding dis	strict:		Place:		Cat	.No.:	Sex:	
	Sire:			Mare:			birth date:		
1	BREED TYPE	plain			normal			true to type	Assessment sheet
	CALIBER	light			normal			heavy	
	GROWTH/	short			normal		U	tall	for toals since 2017
	SIZE of	short			normal			tall	
	the MARE								
	HEAD	big, coarse □			normal			small, fine	
	NECK	short □			normal			long	
		low □			normal			high 	
	SHOULDER	<u>R</u> straight/sho	ort		normal			sloping/long	
	BACK	short			normal			long	
		dipped (we	ak) □		normal			roached	7 maint scalar 2 to 12
	Withers	flat □			normal			high 	\rightarrow 7-point scale: -3 to +3
	Croup	snort ⊡ flat/ievel			normai D normai			sloping (weak)	ightarrow 24 traits + 9 defect trait
		□ short			normal			long	+ blank spaceother"
	FORELIMB	short paste	rn		normal			long pastern	
		□ upright pas	tern		normal			weak pastern	
	Toe stance	toe-in			normal			□ toe-out	
		Ц	unilate	ral 🛛		bilateral		U	
	HINDLIMB	short paster	rn D		normal			long pastern	
	Hock	upright pas	stern		normal			weak pastern	
	Tarsus-	oraignt □ flat			normal			tied-in	
	Cannon art								
	HOOF	liat noot, lo			normai			oot, nign neels	
	GAIT	stiff/tied			normal			elastic/rhythm	
	Anomalies Eves	□ painted ev	/e [artificial eve	□ fish e	eve	□ Missing	eve/s (left or right)	
	Bit	□ underbite	ernia r	 overbite scrotal bernia 				FS.	
	Hoof	□ club foot					TYP	E:	
J	Other:						GAI	r:	

Screenshot from tablet computer

LEBENSNUMMER NAME GEBURTSTAG .2014 SEX Hengst	XX 99 VATER Cayado MUTTERVATER Carolus I MMV Landgraf I	02.07.2014 Typ Gang	0 Prämie	*
NAME GEBURTSTAG .2014 SEX Hengst	VATER Cayado MUTTERVATER Carolus I MMV Landgraf I	Typ Gang	0 Prämie 0 ja	
RICHTER 1 RICHTER	1 RICHTER 2 RICHTER 2	RICHTER 3	RICHTER 3 BEWERTER	BEWERTER
Тур	Oberlinie	Fuß + Gang	Anomali	en
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	Kopf	groß, derb	0000000	klein, edel
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Publication of linear data

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HOLSTEINER.







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Linear profiling in the Holstein studbook: practical experiences

Yea	r	Foals	Ma	ires	Stallions
		registration	studbook entry	performance test	preselectior
201	.0	419			
201	.1	482			
201	.2	706			
201	.3	655			
201	.4	609	310	74	
201	.5	508	383	129	213
201	.6	1.767	329	180	179
201	.7	2.293	569	146	205
201	.8	2.439	587	159	174
201	.9	2.219	439	150	219
		12.097	2.617	838	397
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Linear profiling in the Holstein studbook: practical experiences

Regular training of the judges and assistants is necessary

to improve the data quality!

- Familiarity with the linear scheme (all traits)
- Comparability of linear profiling across assessors (possible trait preferences for individual characterization of horses)
- Use of the full linear scale (-3 to +3)
- Independence of (objective) linear description and (subjective) valuating scoring → improved information basis, expected overall consistency of linear profiles with the maintained sets of scores (foals: type and gait; mares/stallions: type, topline, forelimb, hindlimb, walk, trot, canter)

		First ex	ample o	of a l	inea	ır pr	ofile	:		
Lebensnumr Stutfohlen	mer: DE 421		Тур	: 7	Gan	g: 8			Ĩ	<u>ک</u>
√ater: Mutter:	Clarcon Ascona II		DE 42100 DE 42100	01161	10				Ľ	\mathbf{O}
				-3	-2	-1	1	2	3	
(Rasse-)Typ		wenig						1		typvoll
Halslänge		kurz								lang
Schulter		steil/kurz								schräg/lang
Gang		fest/gebunde	n							elastisch/taktmäßig





Linear profiling in the Holstein studbook: practical experiences

Personal assistance for the judges

- On-site support of the judges necessary
- Use of the tablet-PC by the assistant (search for the foal dataset and entry of linear data)

Advantages:

- The judge can focus exclusively on linear profiling
- Substantial time saving (can start directly with linear profiling)

Support by the Young Breeders:

• Training for the young breeders

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Comparison between linear profile as a foal and adult horse (Bachelor thesis)

- Results from routine linear profiling: foal data from 2012 / 2013, mare data (studbook entry) 2015 / 2016
- Comparing linear profiles of **the same horse** as a foal and with 3 years of age
 - 70 profiles of mares born in 2012 and approved in 2015
 - 62 profiles of mares born in 2013 and approved in 2016
- Comparison of only those traits that are scored for both foals and mares (2012/2015: 10 traits; 2013/2016: 13 traits)
- Test for normal distribution: significant deviation → consideration (correction) in the correlation analysis: Spearman rank correlation



Results of correlation analyses (Bachelor thesis)

Traits 2012/2015	p-value	Correlation
		coefficient
Breed type/Caliber: light – heavy	0,155	-0,172
Head: big, coarse – small, fine	0,003	0,346
Neck: short – long	0,983	0,003
Neck: low – high	0,873	-0,019
Withers: flat – high	0,217	0,149
Croup: too flat – very sloping	0,532	0,076
Forelimb pastern: short – long	0,860	0,021
Forelimb Toe stance: toe in – toe out	0,333	-0,117
Hindlimb pastern: short – long	0,638	-0,057
Hocks: straight – angulated	0,342	-0,115

Traits 2013/2016	p-value	Correlation
Breed type/Caliber: light –	0,5672	-0,074
Head: big, coarse – small, fine	0,0050	0,352
Neck: short – long	0,3884	0,111
Neck: low – high	0,0300	0,276
Withers: flat – high	0,5338	0,081
Withers: short – long	0,4061	0,107
Croup: flat/level – sloping (weak)	0,9455	-0,009
Forelimb pastern: short – long	0,0434	0,257
Forelimb Toe stance: toe in – toe out	0,2230	0,157
Hindlimb pastern: short – long	0,1747	0,175
Hocks: straight – angulated	0,0863	0,220
Tarsus-Cannon art.: flat – tied-in	0,3437	0,122
Hooves: flat, low heels – club foot, high heels	0,0132	0,313

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Analysis on the utilization of the scale – foals 2012 / 2013 (Bachelor thesis)

Trait	-3	-2	-1	0	1	2	3
Breed type/Caliber: light – heavy							
Head: big, coarse – small, fine							
Neck: short – long							
Neck: low – high			J				
Withers: flat – high							
Withers: short – long (2013)]				
Croup: flat/level – sloping (weak)			-				
Forelimb pastern: short – long							
Forelimb Toe stance: toe in – toe out]				
Hindlimb pastern: short – long							
Hocks: straight – angulated							
Tarsus-Cannon art.: flat – tied-in (2013)							
Hooves: flat, low heels – club foot, high heels (2013)							

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Future aims / work steps:

- Ongoing training of the judges, expansion of the use of the tablet
- Estimation of genetic parameters (heritabilities and genetic correlations)
- Development of Estimated Breeding Values for linear traits
- Inclusion of linear mare-data in linear profiles of stallions



Thank you!

