Swedish Warmblood

"Internationally competitive horses in dressage, show jumping or eventing"

65,000 horses
4,000 covered mares (2016)

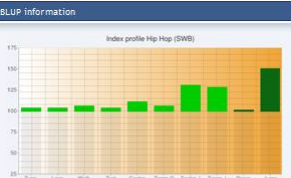---

Breeding value estimation

www.blup.se

BLUP Animal Model since 1986

Breeding values for

based on results from

Show jumping & Dressage competition

Young horse tests (3- & 4-year-old horses evaluated for conformation, jumping & dressage)

Test for 3-year-old horses

Introduced in 1999
40% of all 3-year-olds (18,000 horses)
8 *evaluating* traits: conformation, gaits, jumping – scale 1-10

Included in annual genetic evaluation since 2006

Linear profiling protocol introduced in 2013
50 *describing* traits for 3,410 horses (until today)

Linear profiling protocol

21 conformation traits

Linear profile   Height of withers _____

	CONFORMATION	Obvious	A	B C	D E F	G H I	Obvious	Comment
1	Type	refined (i.e. light)	☐	☐☐	■■■	☐☐☐	heavy	☐ good proportions
2	Body: shape a	long	☐	☐☐	■■■	☐☐☐	short	
3	Body: shape b	long legged	☐	☐☐	■■■	☐☐☐	short legged	
4	Body direction	uphill	☐	☐☐	■■■	☐☐☐	downhill	
5	Length of neck	long	☐	☐☐	■■■	☐☐☐	short	☐ wide connection
6	Position of neck	vertical	☐	☐☐	■■■	☐☐☐	horizontal	☐ low connection
7	Shape of neck	arched	☐	☐☐	■■■	☐☐☐	straight	☐ heavy head-neck connection
8	Withers	high	☐	☐☐	■■■	☐☐☐	low	
9	Position of shoulder	sloping	☐	☐☐	■■■	☐☐☐	straight	☐ deep chest
10	Line of back	straight	☐	☐☐	■■■	☐☐☐	swayback	
11	Loins	long	☐	☐☐	■■■	☐☐☐	short	☐ roached back
12	Shape of croup	sloping	☐	☐☐	■■■	☐☐☐	straight	
13	Length of croup	long	☐	☐☐	■■■	☐☐☐	short	
14	Foreleg	over at knee	☐	☐☐	■■■	☐☐☐	back at knee	☐ tied in ☐paral.displ.can ☐ misplaced cannon bone
15	Foreleg	toed in	☐	☐☐	■■■	☐☐☐	toed out	☐ thin legs in prop.to body ☐outward rotated forelimb
16	Pastern, front	upright	☐	☐☐	■■■	☐☐☐	weak	☐ long ☐ short
17	Hind leg	sickle	☐	☐☐	■■■	☐☐☐	straight	☐ tied in
18	Hind leg	cow hocked	☐	☐☐	■■■	☐☐☐	bowlegged	
19	Pastern, hind	upright	☐	☐☐	■■■	☐☐☐	weak	☐ long ☐ short
20	Correctness in movement	winging	☐	☐☐	■■■	☐☐☐	paddling	
21	Hoofs	big	☐	☐☐	■■■	☐☐☐	small	☐ uneven ☐ low heels

Linear profiling protocol

15 movement traits

	MOVEMENT	Obvious	Average			Obvious	Comment
			A B C	D E F	G H I		
22	Walk: cadence	even	☐ ☐☐	▣▣▣	☐☐ ☐	uneven	
23	Walk: stride length	long	☐ ☐☐	▣▣▣	☐☐ ☐	short	
24	Walk: suppleness	supple	☐ ☐☐	▣▣▣	☐☐ ☐	stiff	
25	Walk: elasticity	elastic	☐ ☐☐	▣▣▣	☐☐ ☐	unelastic	
26	Trot: length of stride	long	☐ ☐☐	▣▣▣	☐☐ ☐	short	☐ irregular
27	Trot: elasticity	elastic	☐ ☐☐	▣▣▣	☐☐ ☐	unelastic	☐ movement tight to the ground
28	foreleg activity	shoulder free	☐ ☐☐	▣▣▣	☐☐ ☐	Short	
29	Trot: hind leg position	under the body	☐ ☐☐	▣▣▣	☐☐ ☐	behind the body	
30	Trot: hind leg activity	active	☐ ☐☐	▣▣▣	☐☐ ☐	Inactive	
31	Canter: rhythm	even	☐ ☐☐	▣▣▣	☐☐ ☐	Uneven	
32	Canter: stride length	Long	☐ ☐☐	▣▣▣	☐☐ ☐	Short	
33	Canter: action	round	☐ ☐☐	▣▣▣	☐☐ ☐	Flat	
34	Canter: elasticity	elastic	☐ ☐☐	▣▣▣	☐☐ ☐	stiff	
35	Canter: balance	well balanced	☐ ☐☐	▣▣▣	☐☐ ☐	unbalanced	
36	Movement: direction	uphill	☐ ☐☐	▣▣▣	☐☐ ☐	downhill	

Linear profiling protocol

14 jumping traits

	JUMPING	Obvious	Average			Obvious	Comment
			A B C	D E F	G H I		
37	Take off	powerful	☐ ☐☐	▣▣▣	☐☐ ☐	weak	
38	Take off: quickness	quick	☐ ☐☐	▣▣▣	☐☐ ☐	slow	
39	Take off: direction	upwards	☐ ☐☐	▣▣▣	☐☐ ☐	forwards	
40	Technique: foreleg	bent	☐ ☐☐	▣▣▣	☐☐ ☐	hanging	☐ under the body ☐ stretched out
41	Technique: back	rounded	☐ ☐☐	▣▣▣	☐☐ ☐	hollow	
42	Technique: haunches	open	☐ ☐☐	▣▣▣	☐☐ ☐	tight	
43	Scope	much	☐ ☐☐	▣▣▣	☐☐ ☐	little	
44	Elasticity	elastic	☐ ☐☐	▣▣▣	☐☐ ☐	stiff	
45	Care	too careful	☐ ☐☐	▣▣▣	☐☐ ☐	not careful	
46	Distance estimation	secure	☐ ☐☐	▣▣▣	☐☐ ☐	insecure	
47	Balance	balanced	☐ ☐☐	▣▣▣	☐☐ ☐	unbalanced	
48	Reaction	quick	☐ ☐☐	▣▣▣	☐☐ ☐	slow	
49	Approach to assign.	focused	☐ ☐☐	▣▣▣	☐☐ ☐	unfocused	
50	Behaviour	relaxed	☐ ☐☐	▣▣▣	☐☐ ☐	tense	

Distribution of linear traits

Scope
much - little

No of horses

A B C D E F G H I

Distribution of linear traits

Hoofs
big - small

No of horses

A B C D E F G H I

Distribution of linear traits

Jumping technique - foreleg
bent - hanging

No of horses

(bar chart with categories A, B, C, D, E, F, G, H, I on the x-axis and values from 0 to 1600 on the y-axis; tallest bars at D (~1380) and E (~1220), with smaller bars at C (~175), F (~475), G (~120))
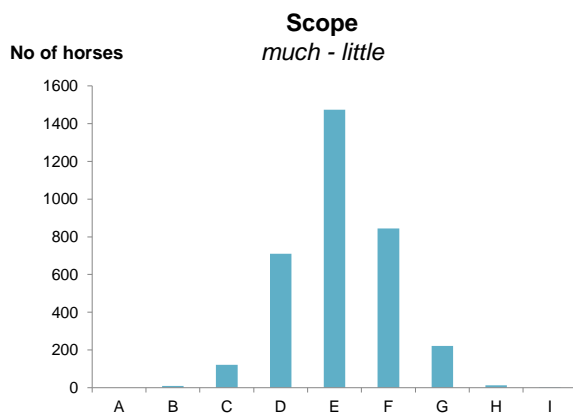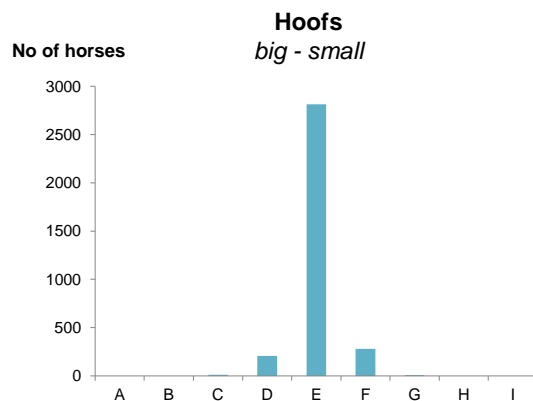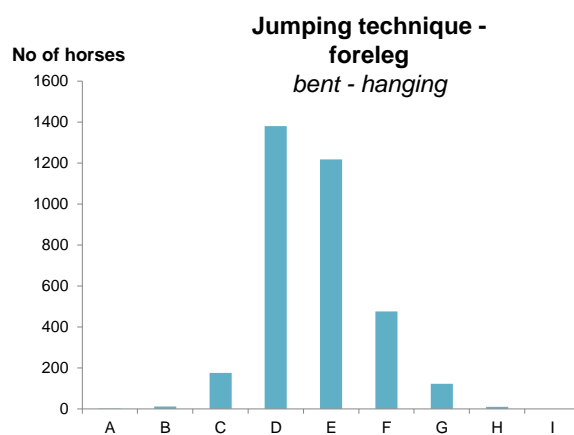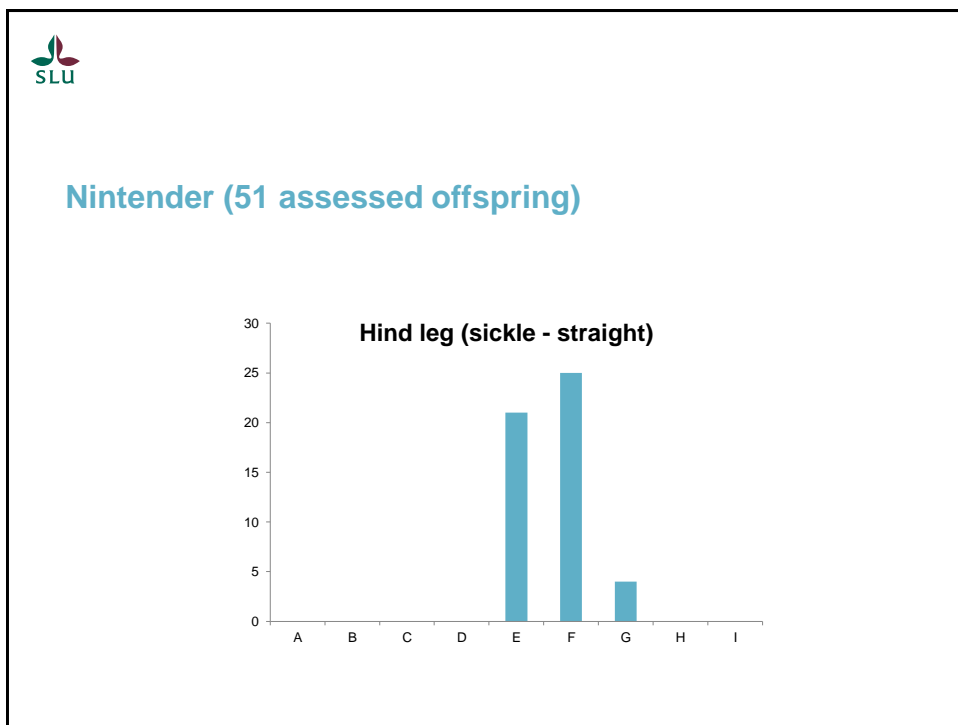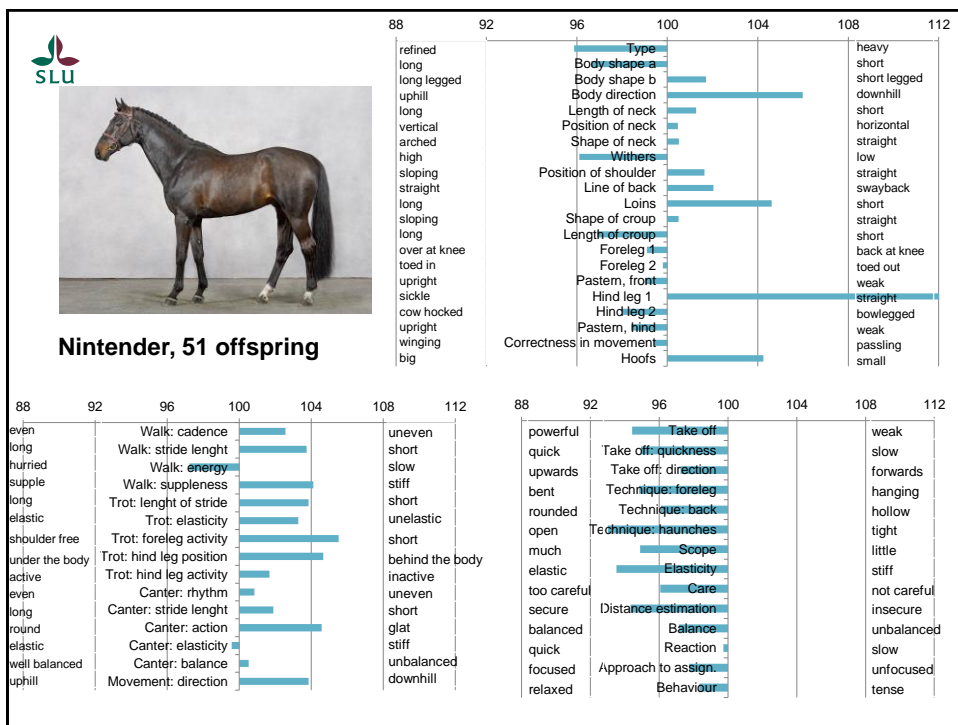

Publishing breeding values

name it genetic profile/linear profile?

100 = average of all assessed horses (no numbers only bars?!)
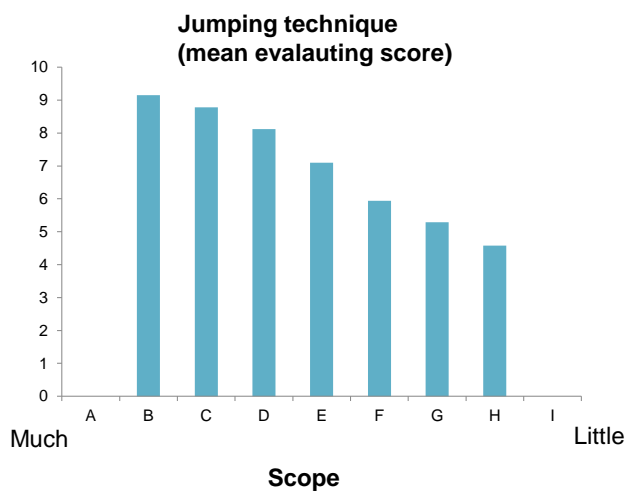
Genetic standard deviation of 4 units

Same direction of scale as protcol?

Accuracy – SE (in units) or r_{TI}? Levels of accuracy instead of numbers?
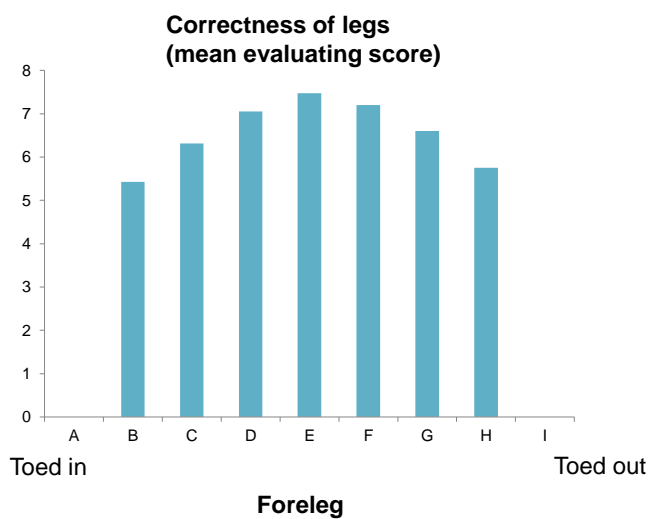
Nintender, 51 offspring

Nintender (51 assessed offspring)

Hind leg (sickle - straight)

Correlation between phenotypes

**Jumping technique
(mean evalauting score)**

Much   Little

Scope

Correlation between phenotypes

**Correctness of legs
(mean evaluating score)**

Toed in   Toed out

Foreleg

Conclusions

Possible to estimate EBVs

Good complement to traditional scoring

Useful for breeders

Implementation?

International collaboration (OLD-SWB)