

Can linearly scored traits be used to predict orthopaedic health?

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Linear scoring in Swedish Warmblood (SWB) horses

- Introduced in 2013
- Nine-point scale from A to I
 - Exception: foals five-point scale A to E
- Conformation, Gaits, Jumping & Behaviour (new 2025)

- EBVs for 59 linearly scored traits
 - Young Horse Test for 3-y-olds
 - Riding Horse Test for 4-y-olds
 - Stallion Performance Test

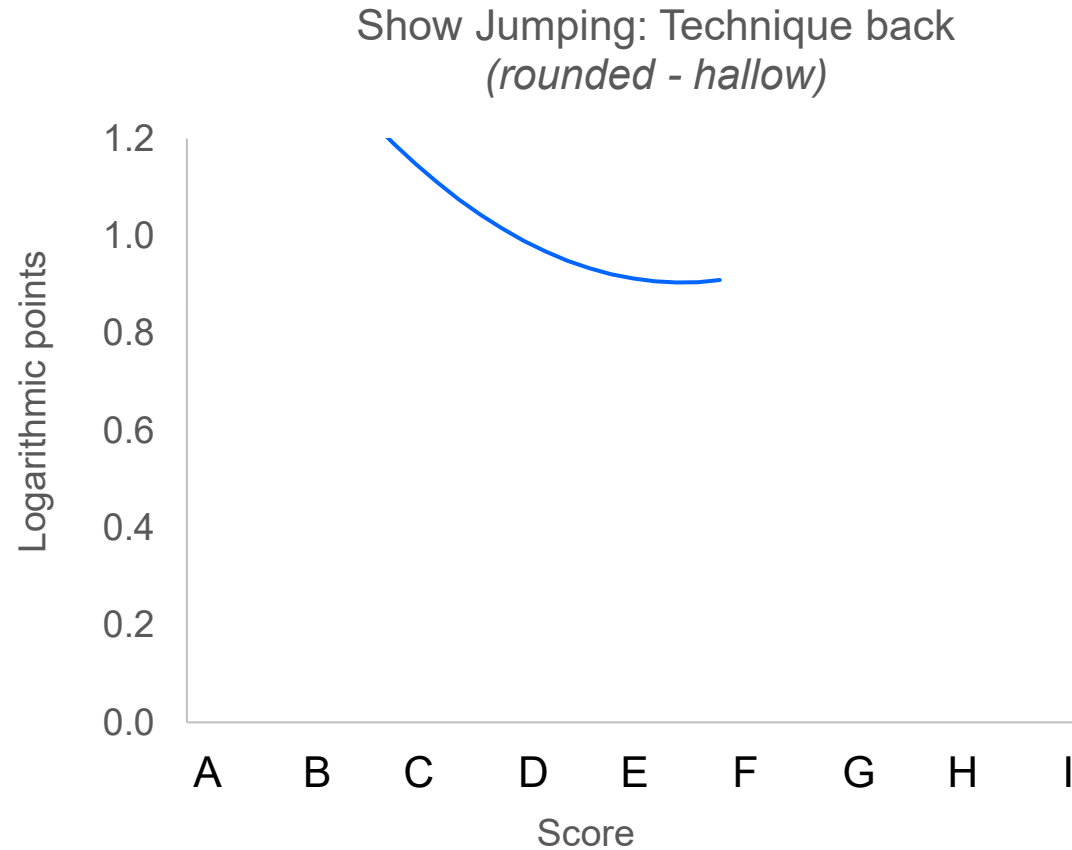
	JUMPING	Obvious	Average									Obvious	Comment
			A	B	C	D	E	F	G	H	I		
37	Take off	powerful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	weak	
38	Take off: quickness	quick	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	slow	
39	Take off: direction	upwards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	forwards	
40	Technique: foreleg	bent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	hanging	<input type="checkbox"/> under the body <input type="checkbox"/> stretched out
41	Technique: back	rounded	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	hollow	
42	Technique: haunches	open	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	tight	
43	Scope	much	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	little	
44	Elasticity	elastic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	stiff	



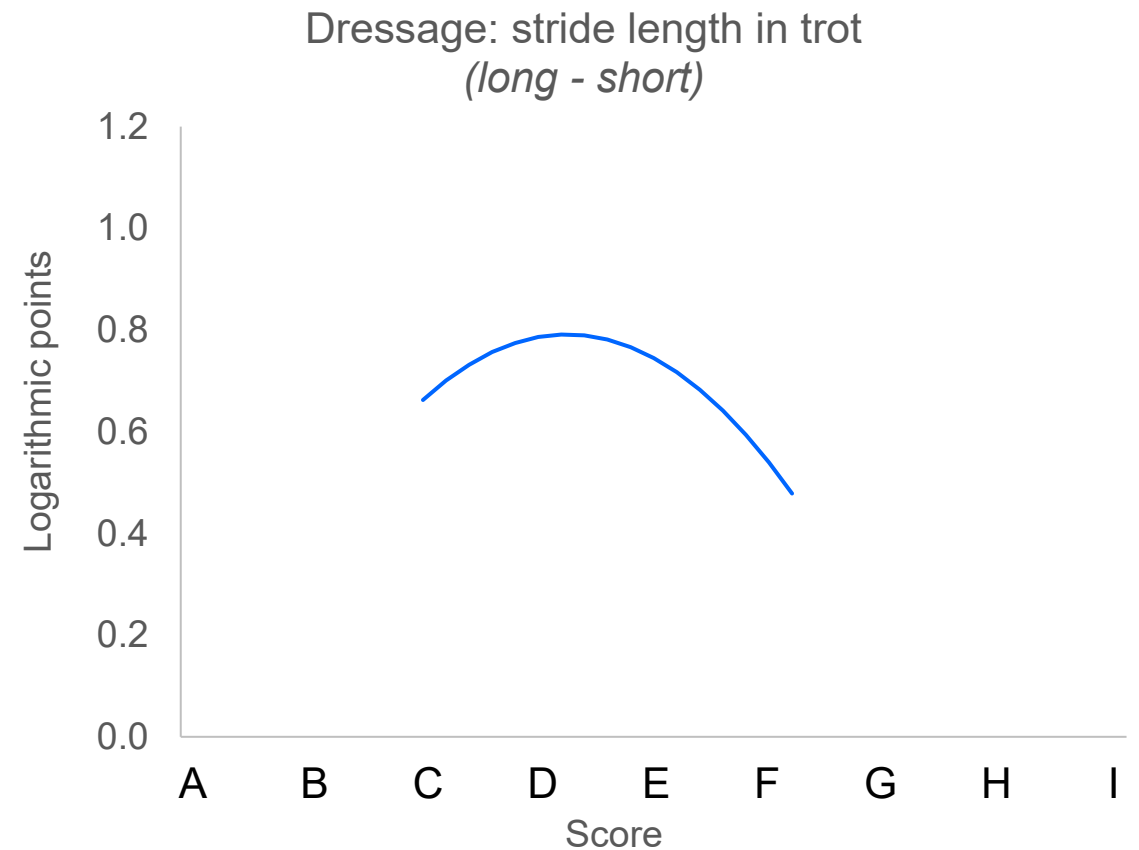
What we already knew

- SWB is specialized into jumping and dressage horses
- Linearly scored traits have phenotypic associations with competition performance

Association with competition performance



Linear association



Association with optimum

What we already knew

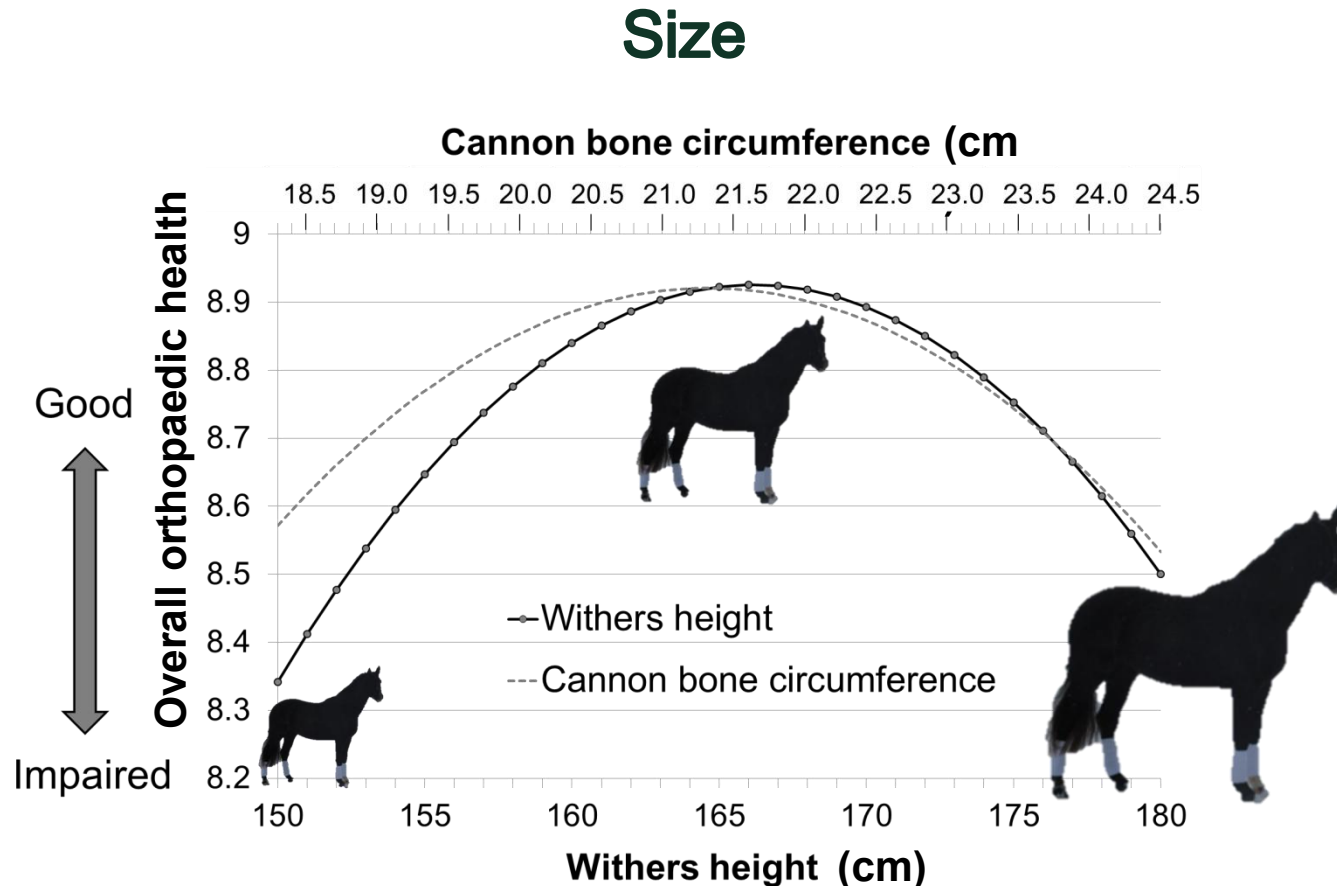
- SWB is specialized into jumping and dressage horses
- Linear scored traits have phenotypic associations with competition performance
- Orthopaedic diseases is the most common health problem
- Scores at riding horse test were associated with orthopaedic health
 - Veterinary examination at test with palpatory examination and flexion test until 2005

Important traits for good orthopaedic health

Head-neck-body conformation



Trot movements



What we already knew

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- Scores at riding horse test were associated with orthopaedic health
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- **Insurance policies very common in Sweden**

What we wanted to find out

- Phenotypic associations between linearly scored traits and orthopaedic diagnoses from insurance data
- Differences between show jumping and dressage horses?
- Linear associations or intermediate optima?

Data

Insurance data from Agria

All reimbursed diagnoses

15,619 SWB horses, born 2010-2020 (56% of born horses)

5,991 assessed at a young horse test (evaluated traits, linearly scored traits, and height at withers)

Orthopaedic diagnose Yes/No

Analysis

Jumping and dressage horses analyzed separately

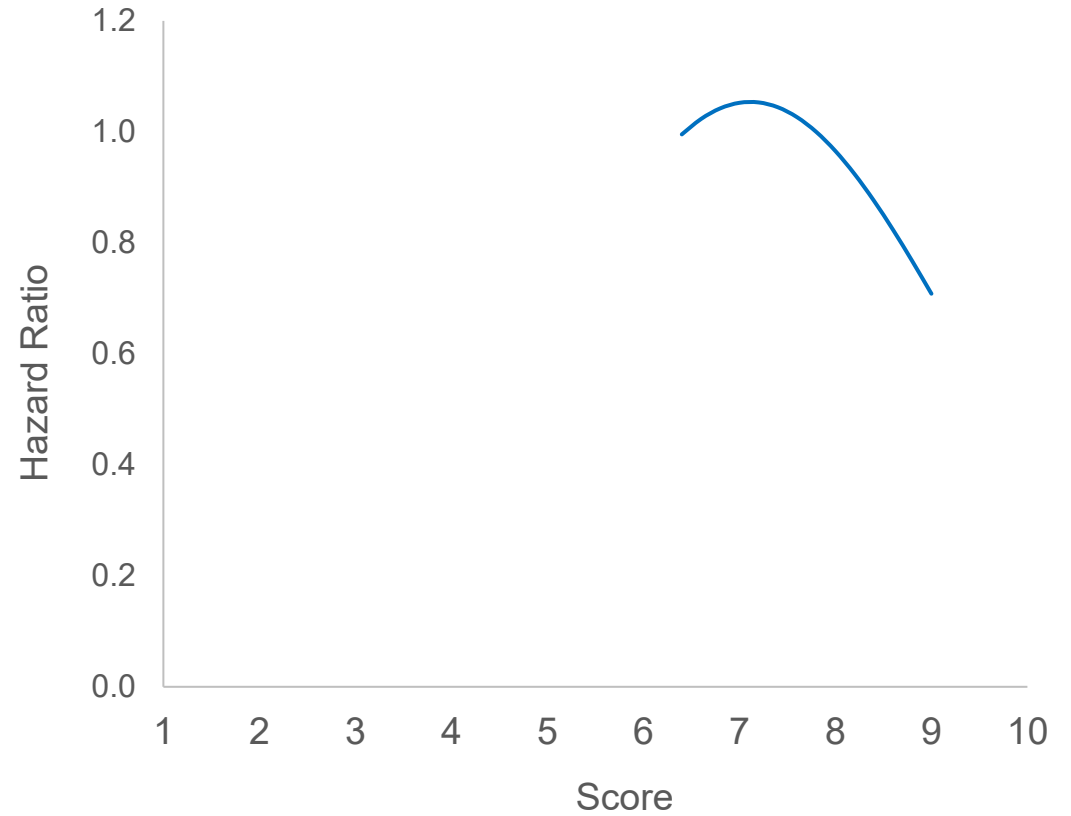
Survival analysis with Cox model: linear or quadratic association between orthopaedic diagnosis and evaluated/linear score?

If significant – plot graph!

Results – Trot at hand

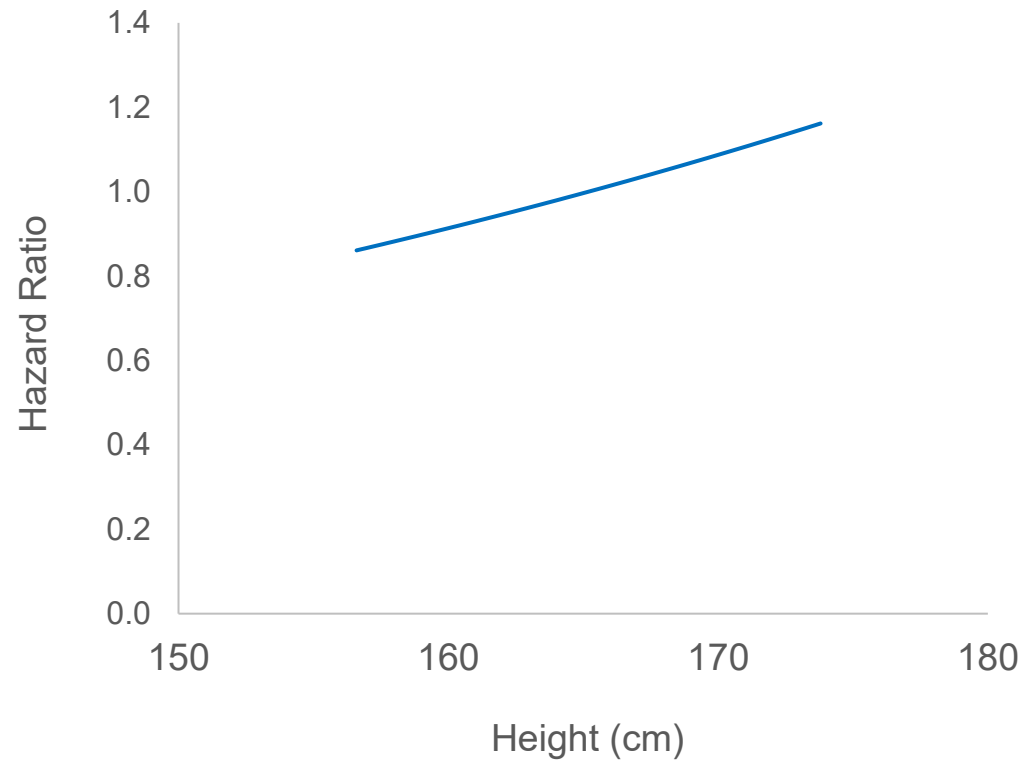


Jumping horses

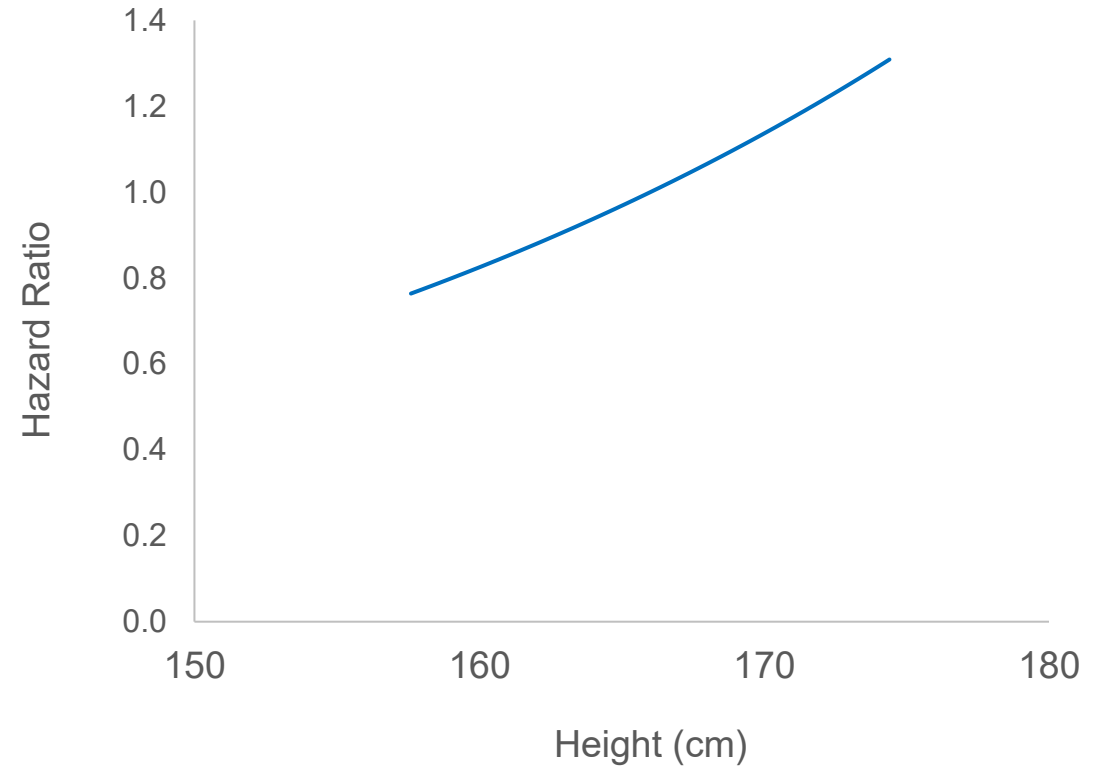


Dressage horses

Results – Height at withers



Jumping horses



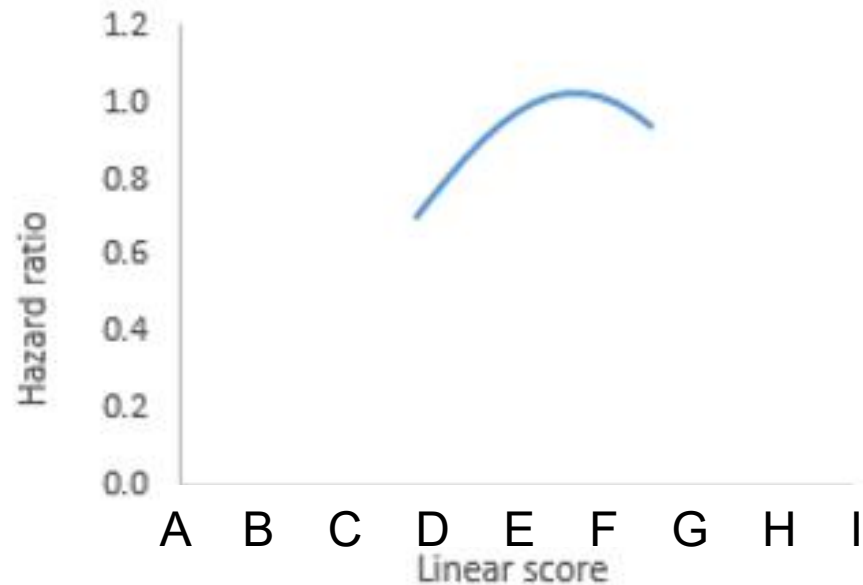
Dressage horses

Results – Linearly scored traits

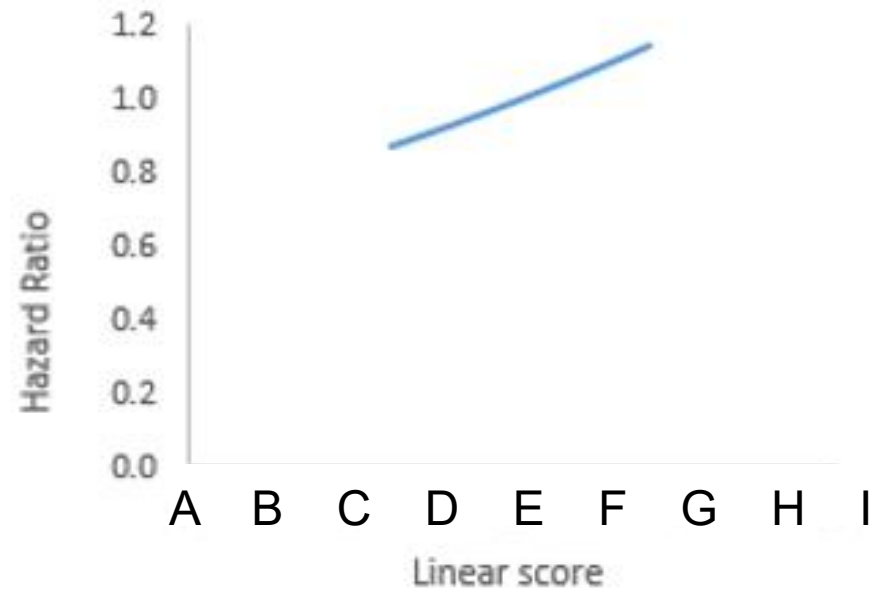
- Few significant associations
- In some cases difficult to interpret

Results – Linearly scored traits, Jumping horses

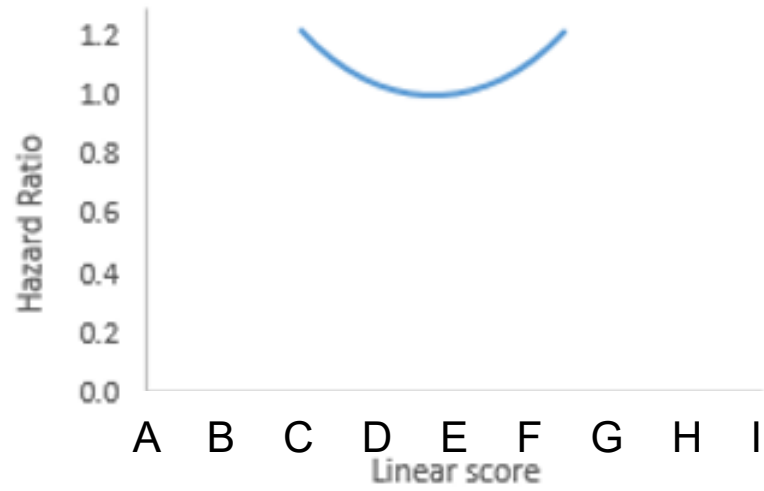
a) Trot: hind leg position
(under the body – behind the body)



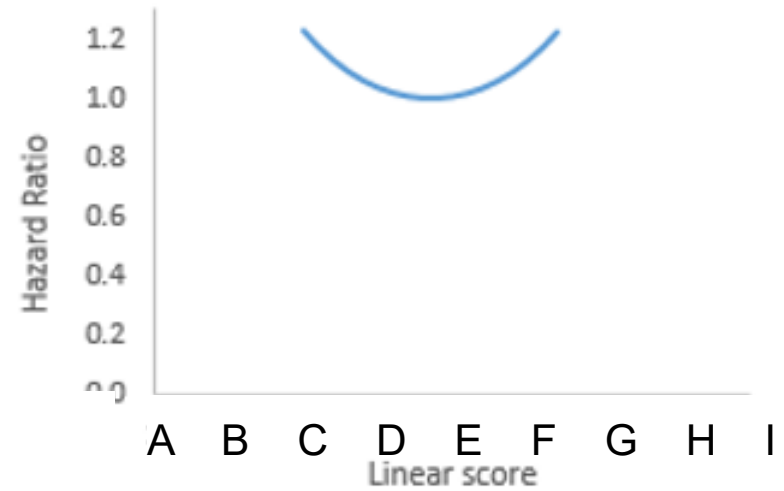
b) Trot: hind leg activity (*active – inactive*)



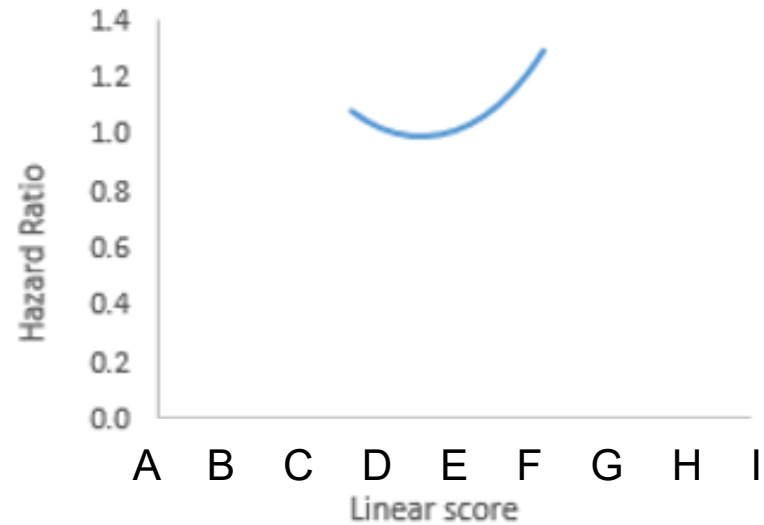
c) Jumping: power in take-off (*powerful – weak*)



d) Jumping: Scope (*much – little*)

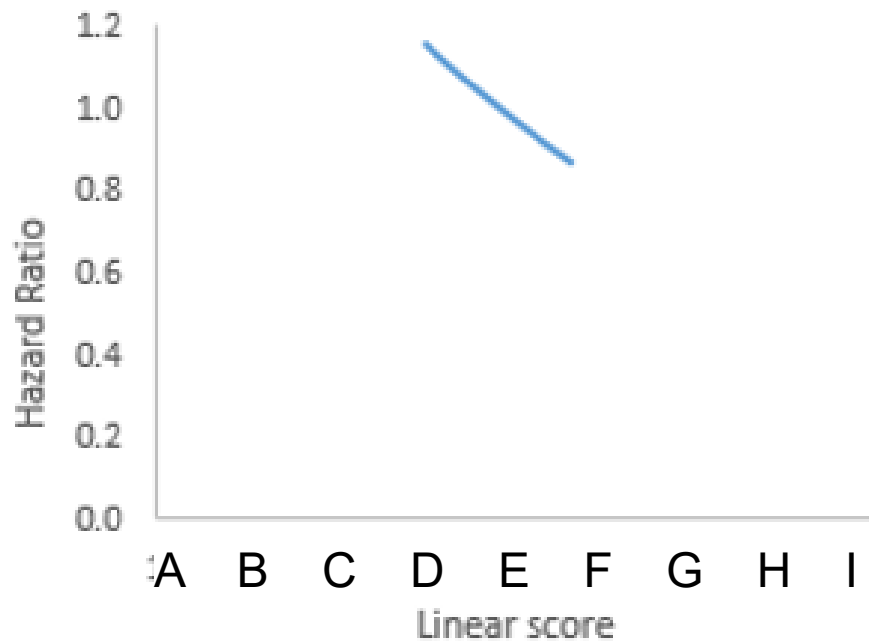


e) Jumping: Balance (*balanced – unbalanced*)

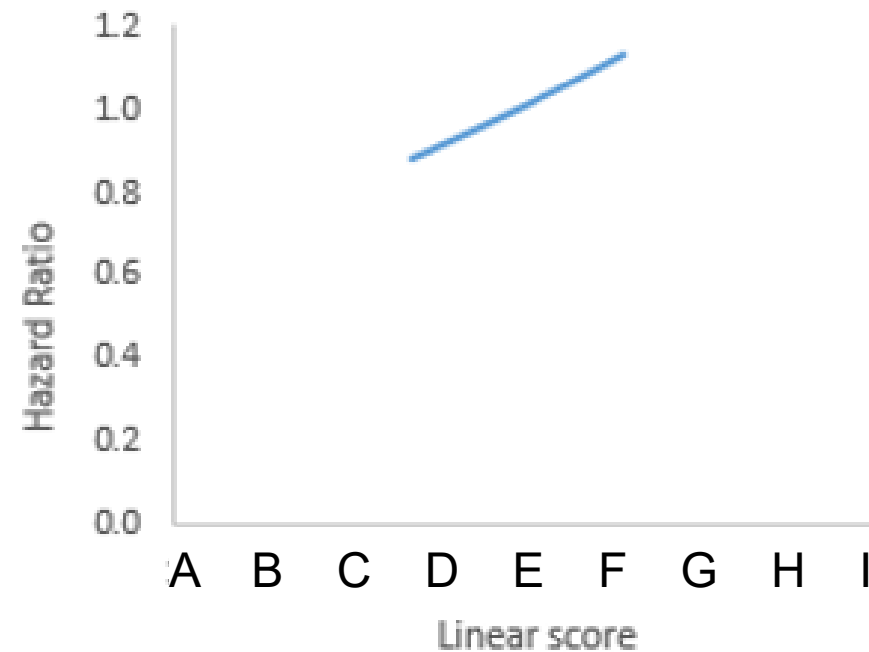


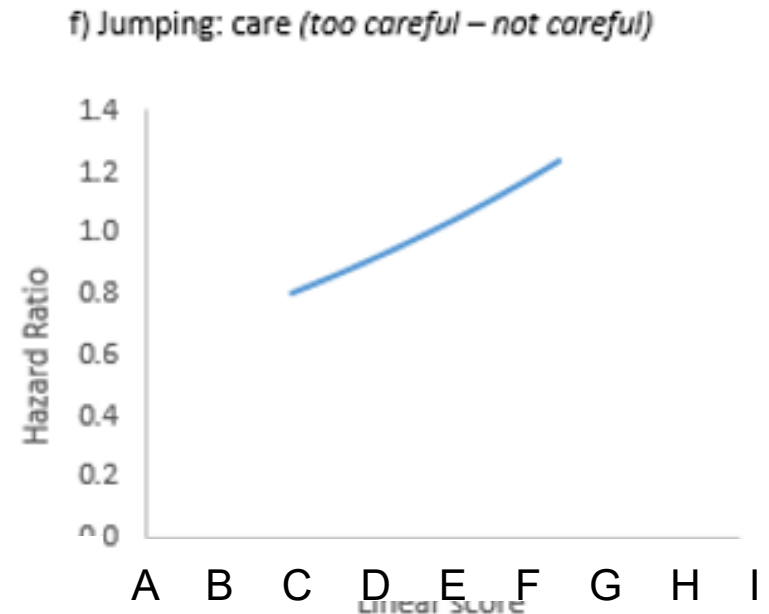
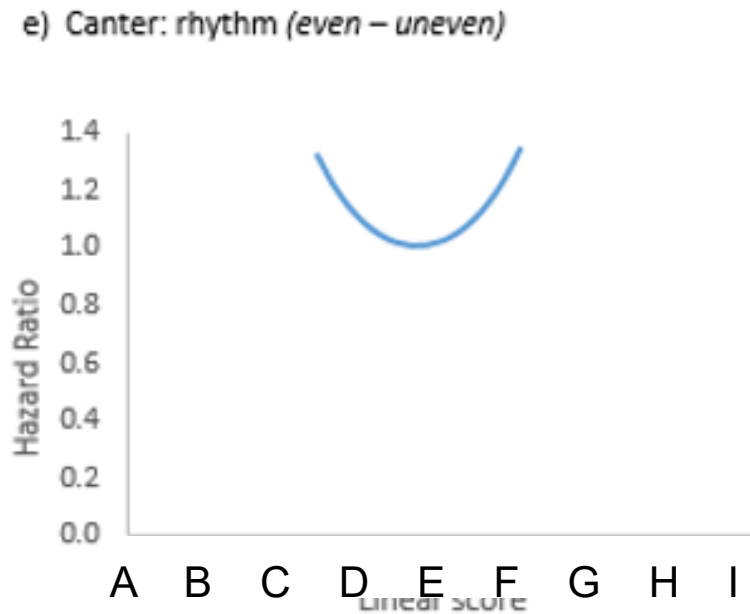
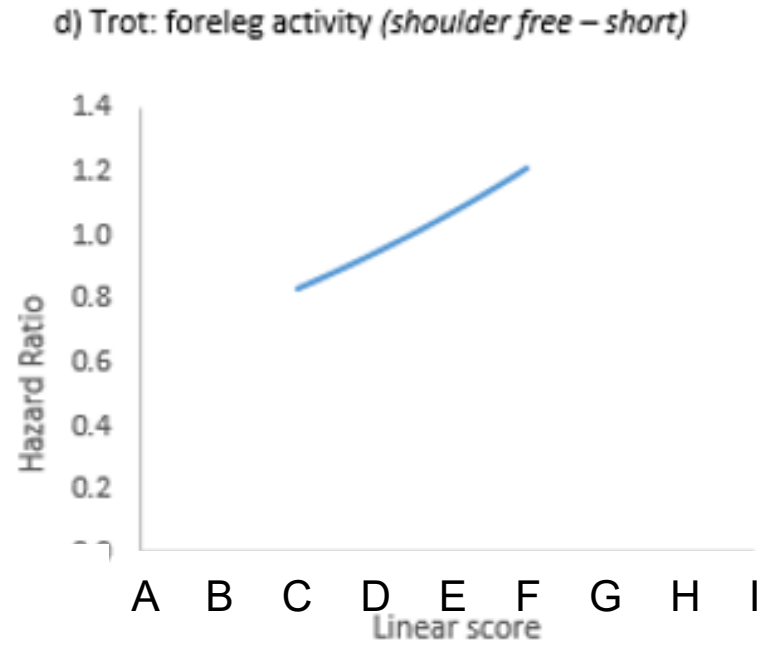
Results – Linearly scored traits, Dressage horses

a) Pastern, front (*upright – weak*)



b) Hind leg (*sickle – straight*)





Conclusions

- Good movements in trot and not too tall horses – good orthopaedic health
 - Confirms earlier findings
- Individual linear scores not informative as indicators of orthopaedic health
 - “Miss the whole picture”
 - Combination of traits?
- Other health measurements are needed

What is next?

- Behaviour traits introduced 2025
 - Vigilance (high – low)
 - Reactivity (active – passive coping)
 - Confidence (confident – insecure)
 - Locomotory activity (high – low)
- Analyses of linear scoring of foals
 - 7,500 foals
 - Possible to include in breeding value estimations?

Thanks for your attention!

