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Agreement between repeated evaluations of gait quality in Franches-Montagnes stallions

Annik Imogen Gmel, SNSF

International Workshop on Linear Profiling in the Warmblood Horse



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Judgement and linear description in the FM

- Linear description was introduced in the FM shortly after the ZVCH (Swiss Warmblood) in 1992
- Judgement based on whether it corresponds to the breeding goals (good/bad)
 - Scale 1 → 9
 - Grades for type, conformation and gaits
- Linear description : where the animal is situated on the biological range of the breed (less/more)
 - Scale 1 → 9
 - Linear description (39 traits)

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+ **Assessed gait criteria in the FM**

- **Judgement:** one score for gait quality overall
- **Linear description:**
 - Walk : step length (short – long)
 - Trot : step length (short – long)
 - Trot : Impulsion (weak – powerful)
 - Trot : Suppleness (stiff – elastic)
 - Correctness of gaits (plaiting – dishing)

DESCRIPTION LINEAIRE POUR CHEVAUX FM
LINEARE BESCHREIBUNG FÜR FM - PFERDE

Barcode Etiquette
nouveau version

N° ident.

Lieu / Ort: _____ Signature du juge/Unterschrift des Richter: _____
N° ID / Nr.: _____ Père / Vater: _____ Date / Datum: _____
Nom / Name: _____ M. F. T. F. M. M.

Type / Typ: _____ Conformation / Körperbau: _____ Klause / Gänge: _____ H. au garrot / Widerrist: _____

		1	2	3	4	5	6	7	8	9	extrem	extrem
1. Expression de la tête / Kopfausdruck	triste / traurig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	rigide / steif	<input type="checkbox"/>
2. Caracte / Charakter	peu / wenig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	forte / stark	<input type="checkbox"/>
3. Long de l'encolure / Halslänge	courte / kurz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	longue / lang	<input type="checkbox"/>
4. Abache de l'encolure / Halsabach	basse / tief	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	haute / hoch	<input type="checkbox"/>
5. Mousseline de l'encolure / Halswolle	peu / wenig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	massive / massiv	<input type="checkbox"/>
6. Hauteur du garrot / Widerristhöhe	peu / wenig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	haut / hoch	<input type="checkbox"/>
7. Longueur du garrot / Widerristlänge	court / kurz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	long / lang	<input type="checkbox"/>
8. Hauteur de l'épaule / Schulterhöhe	courte / kurz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	longue / lang	<input type="checkbox"/>
9. Schräglage	faible / gering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	forte / stark	<input type="checkbox"/>
10. Longueur de dos / Rückenlänge	court / kurz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	long / lang	<input type="checkbox"/>
11. Largeur de dos / Rückenbreite	étroite / schmal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	large / breit	<input type="checkbox"/>
12. Long de la croupe / Kreuzlänge	courte / kurz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	longue / lang	<input type="checkbox"/>
13. Rappentage	faible / gering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	forte / stark	<input type="checkbox"/>
14. Fosse / Vertiefung	peu / wenig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	profonde / tief	<input type="checkbox"/>
15. Angle des sautoirs / Sprunggelenkwinkel	faible / gering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	forte / stark	<input type="checkbox"/>
16. Angle des jarrets / Sprunggelenkwinkel	faible / gering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	forte / stark	<input type="checkbox"/>
17. Angle des sautoirs / Sprunggelenkwinkel	faible / gering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	forte / stark	<input type="checkbox"/>
18. Fondement / Fundament	faible / gering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	forte / stark	<input type="checkbox"/>
19. Pes / Schritt	court / kurz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	long / lang	<input type="checkbox"/>
20. Trot, amplitud / Amplitude	court / kurz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	long / lang	<input type="checkbox"/>
21. Trot, engagement / Engagement	peu / wenig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	forte / stark	<input type="checkbox"/>
22. Trot, équilibre / Gleichgewicht	faible / gering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	forte / stark	<input type="checkbox"/>
23. Contact des hanches / Kontakt der Hüften	faible / gering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	forte / stark	<input type="checkbox"/>
24. Type / Typ	faible / gering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	forte / stark	<input type="checkbox"/>

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+ **Previous knowledge – Heritability, phenotypic and genotypic correlation on 15'905 FM horse 1994-2013**

	Gait score	Walk step length	Trot step length	Trot impulsion	Trot suppleness	Correctness
Gait score	0.35	0.74	0.99	0.00	0.98	0.31
Walk step length	0.49	0.17	0.75	0.69	0.66	0.13
Trot step length	0.84	0.45	0.31	0.99	0.98	0.27
Trot impulsion	0.82	0.41	0.80	0.29	0.98	0.29
Trot suppleness	0.77	0.38	0.73	0.76	0.28	0.29
Correctness	0.04	0.02	0.04	0.03	0.04	0.02

Very high correlation for the three trot traits and gait score

🇨🇭 Assessed gait criteria in the FM

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 - Trot : Suppleness (stiff – elastic)
 - Correctness of gaits (plaiting – dishing)
- Additional judgement traits for both gaits
 - Step length (amplitude)
 - Overtracking
 - Activity
 - Suppleness
 - Regularity



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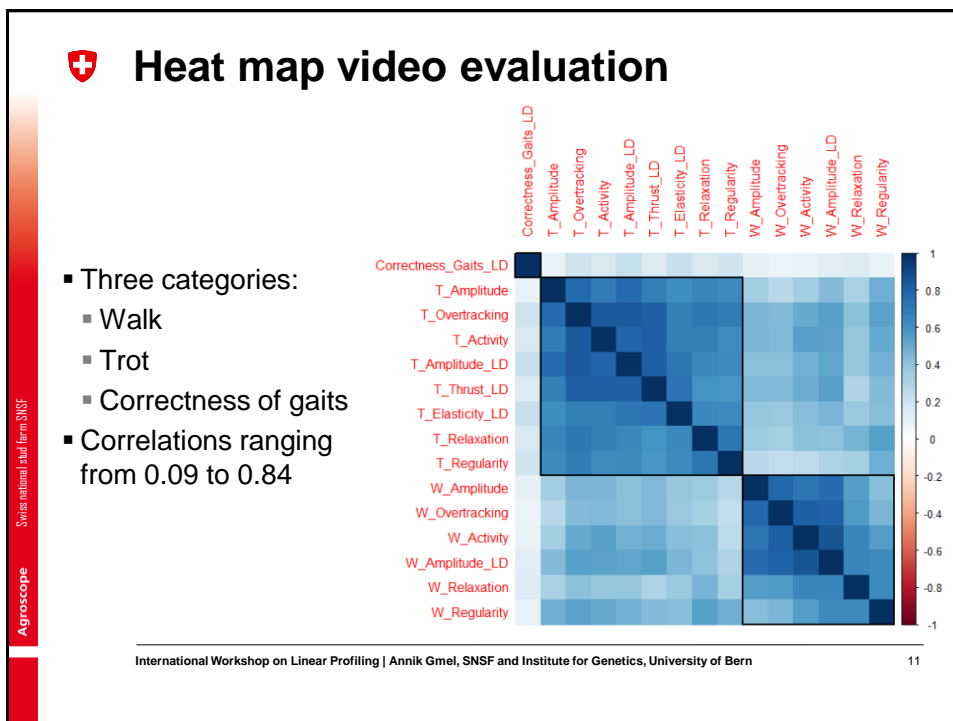
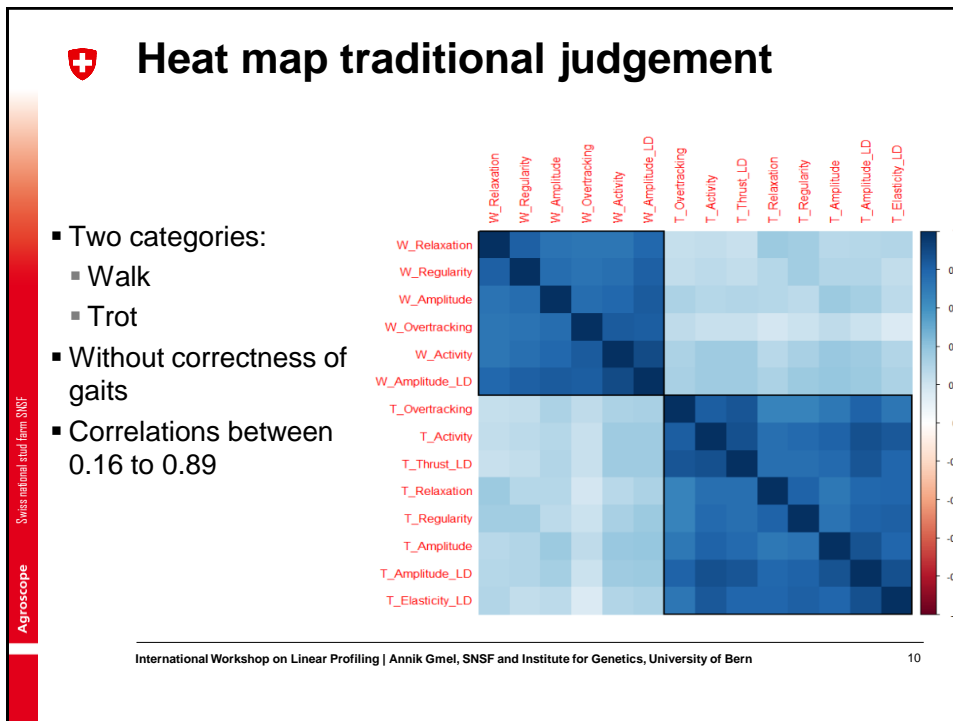
🇨🇭 Study set up

- 7 judges
- 24 FM stallions
- 2 situations
 - Traditional judgement
 - Video evaluations

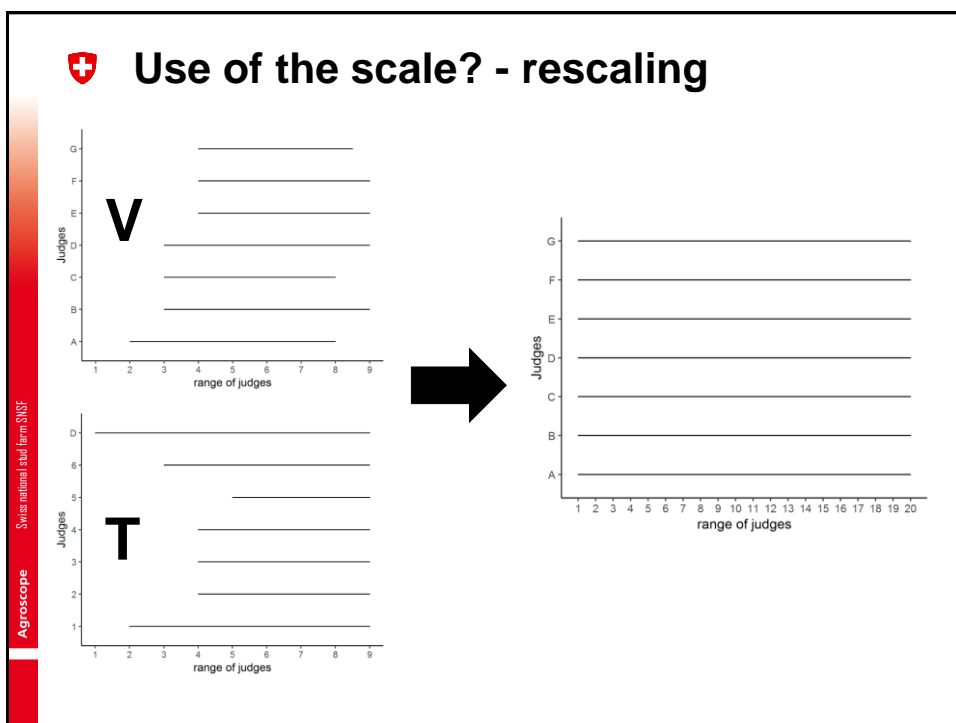


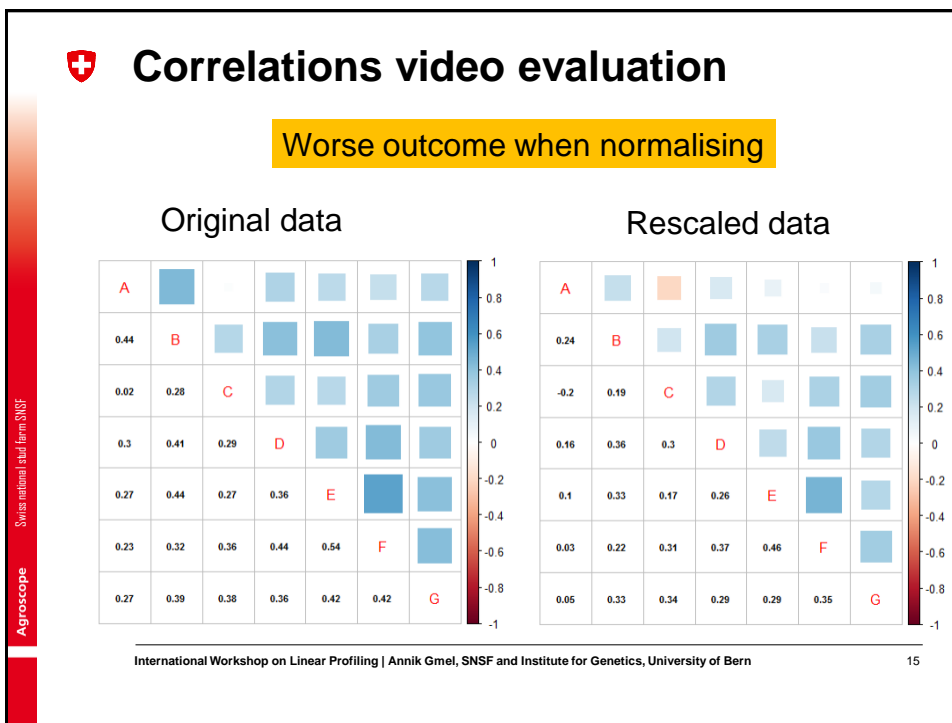
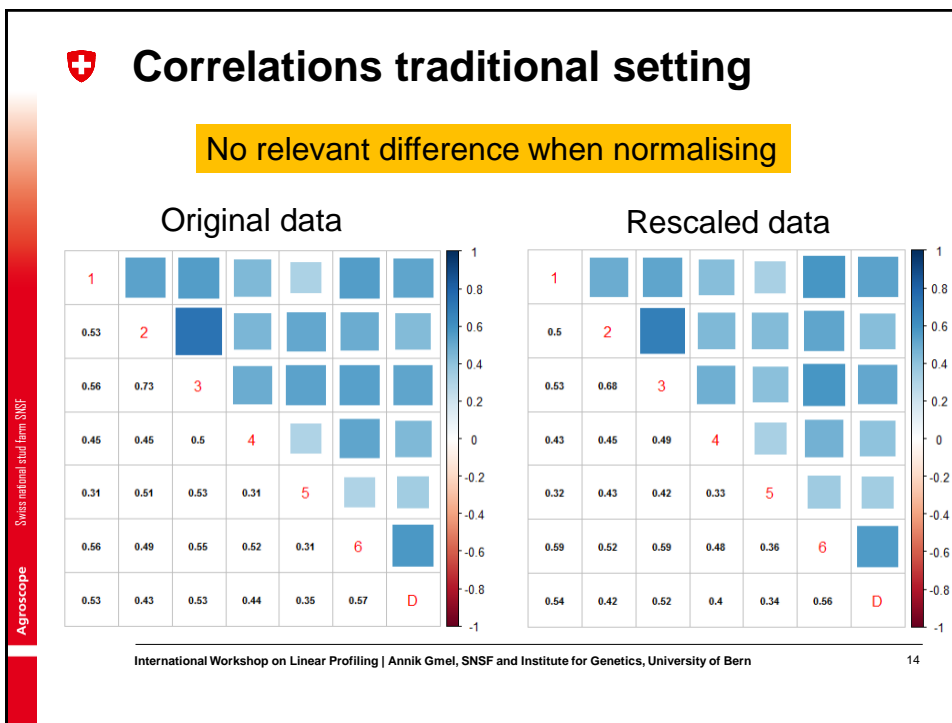
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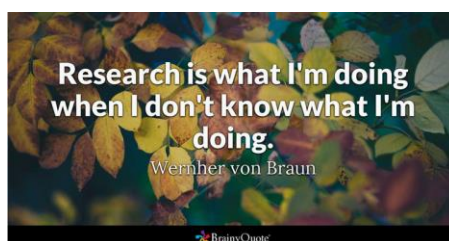
Trait	Traditional		Video	
	Fleiss Kappa	ICC	Fleiss Kappa	ICC
Walk step length	0.157	0.480	0.110	0.239
Walk overtracking	0.094	0.400	0.014	0.205
Walk suppleness	0.073	0.424	0.025	0.183
Walk regularity	0.137	0.386	0.052	0.125
Walk activity	0.089	0.367	-0.016	0.206
Walk step length LD	0.132	0.351	0.070	0.290
Trot step length	0.121	0.432	0.077	0.279
Trot overtracking	0.104	0.352	0.063	0.244
Trot activity	0.043	0.280	0.016	0.170
Trot regularity	0.111	0.274	0.011	0.135
Trot suppleness	0.085	0.395	0.062	0.303
Trot step length LD	0.148	0.425	0.032	0.297
Trot impulsion LD	0.057	0.344	0.064	0.321
Trot suppleness LD	0.093	0.437	-0.008	0.205
Correctness of gaits	-	-	0.031	-0.047





🇨🇭 Preliminary conclusions

- Inclusion of more criteria not helpful if they are not properly described
 - For now, all walk traits correlate and all trot traits correlate
 - One walk score and one trot score would be enough
- Statistic calibration does not help if judges do not agree on trait
- What is a “good” gait quality?



🇨🇭 Thank for your attention!



Questions are welcome!