# **Overall Selection Index**

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### Networks



#### Networks of Data Sources



#### Data come from 3 primary sources:

- 1. Pedigree relationships
- 2. Measurements made on individual dogs AKA: traits or phenotypes
- Genomic data, when it is available.
  SNPs; whole-genome sequence; genetic test panel



### Convert data into INFORMATION

## Breeding Goals / Breeding Plan

1. Find out where you are at.

- 2. Decide where you want to go.
- 3. Follow a plan that will get there.

Trait	N with undesirable scores	Total	Heritability
Skin issues	970	5775	0.34
Hip quality	1146	7389	0.45
Activated (stress)	266	2537	0.17
Inhibited (stress)	260	2527	0.10
Body Sensitivity	229	2514	0.12
Dog Distraction	225	2472	0.08
Noise Reaction	128	2532	0.11
Elbow quality	130	6817	0.28

Trait	Percent with undesirable scores	N with undesirable scores	Total	Heritability
Skin issues	16.8%	970	5775	0.34
Hip quality	15.5%	1146	7389	0.45
Activated (stress)	10.5%	266	2537	0.17
Inhibited (stress)	10.3%	260	2527	0.10
Body Sensitivity	9.1%	229	2514	0.12
Dog Distraction	9.1%	225	2472	0.08
Noise Reaction	5.1%	128	2532	0.11
Elbow quality	1.9%	130	6817	0.28

#### Networks of Data Sources



Data come from 3 primary sources:

1. Pedigree relationships



#### Phenotypic Data



### Phenotypic Correlation Matrix

	tio for	CIRON SOR	Stingson R	Inhibited stress	Activated Stress	16. <sub>16</sub>	HERS	G.C.K	Crage	Self Modulation	De Distection	Coly Sensitivity	feat Objects	lacts Innie line
Hip Score	1.00	0.05	0.00	0.07	0.06	0.09	0.01	0.04	0.04	0.06	-0.04	0.10	0.10	0.01
Elbow Score	0.05	1.00	-0.01	0.01	0.01	0.01	-0.01	0.00	0.03	0.00	0.01	0.00	0.00	0.04
Skin Score	0.00	-0.01	1.00	-0.13	-0.06	-0.09	-0.01	-0.06	0.01	-0.14	0.03	-0.06	-0.11	-0.09
Inhibited Stress	0.07	0.01	-0.13	1.00	0.09	0.59	0.07	-0.05	-0.02	0.50	-0.16	0.39	0.60	0.38
Activated Stress	0.06	0.01	-0.06	0.09	1.00	0.27	0.03	0.53	0.24	0.38	0.24	0.21	0.25	0.03
Noise	0.09	0.01	-0.09	0.59	0.27	1.00	0.03	0.09	0.08	0.53	-0.10	0.37	0.60	0.29
Harness	0.01	-0.01	-0.01	0.07	0.03	0.03	1.00	0.00	0.03	0.06	0.04	0.26	0.04	0.13
Excitable	0.04	0.00	-0.06	-0.05	0.53	0.09	0.00	1.00	0.35	0.27	0.35	0.08	0.08	-0.04
Chase	0.04	0.03	0.01	-0.02	0.24	0.08	0.03	0.35	1.00	0.21	0.31	0.05	0.06	0.03
Self Modulation	0.06	0.00	-0.14	0.50	0.38	0.53	0.06	0.27	0.21	1.00	0.09	0.33	0.51	0.39
Dog Distraction	-0.04	0.01	0.03	-0.16	0.24	-0.10	0.04	0.35	0.31	0.09	1.00	-0.05	-0.14	-0.01
Body Sensitivity	0.10	0.00	-0.06	0.39	0.21	0.37	0.26	0.08	0.05	0.33	-0.05	1.00	0.36	0.21
Object Fear	0.10	0.00	-0.11	0.60	0.25	0.60	0.04	0.08	0.06	0.51	-0.14	0.36	1.00	0.33
Lacks Initiative	0.01	0.04	-0.09	0.38	0.03	0.29	0.13	-0.04	0.03	0.39	-0.01	0.21	0.33	1.00

### Black Box EBV Calculator



#### **Estimated Breeding Values**



### Genotypic Correlation Matrix

	tio core	CHOW GOR	Stin Sole	Inhibited Stress	Activated Stess	Big	Yarness	Scieble	Crack	Set Modulation	Og Disterion	BOY ENSTAIR	fear Objects	QCKS INTHE UNK
Hip Score	1.00	0.18	-0.08	0.22	0.18	0.25	0.09	0.12	0.20	0.27	-0.08	0.11	0.31	0.11
Elbow Score	0.18	1.00	-0.09	0.32	0.20	0.31	0.18	0.12	0.09	0.39	-0.03	0.17	0.34	0.24
Skin Score	-0.08	-0.09	1.00	-0.16	-0.15	-0.04	-0.25	-0.05	-0.14	-0.17	0.07	0.00	-0.16	-0.14
Inhibited Stress	0.22	0.32	-0.16	1.00	0.29	0.67	0.24	0.13	0.09	0.65	-0.14	0.56	0.70	0.36
Activated Stress	0.18	0.20	-0.15	0.29	1.00	0.42	0.14	0.66	0.34	0.58	0.33	0.29	0.47	0.11
Noise	0.25	0.31	-0.04	0.67	0.42	1.00	0.21	0.20	0.26	0.74	-0.02	0.45	0.76	0.36
Harness	0.09	0.18	-0.25	0.24	0.14	0.21	1.00	0.03	0.24	0.32	0.04	0.39	0.25	0.31
Excitable	0.12	0.12	-0.05	0.13	0.66	0.20	0.03	1.00	0.30	0.41	0.36	0.22	0.29	0.00
Chase	0.20	0.09	-0.14	0.09	0.34	0.26	0.24	0.30	1.00	0.41	0.30	0.20	0.29	0.29
Self Modulation	0.27	0.39	-0.17	0.65	0.58	0.74	0.32	0.41	0.41	1.00	0.14	0.47	0.74	0.41
Dog Distraction	-0.08	-0.03	0.07	-0.14	0.33	-0.02	0.04	0.36	0.30	0.14	1.00	0.02	-0.05	0.15
Body Sensitivity	0.11	0.17	0.00	0.56	0.29	0.45	0.39	0.22	0.20	0.47	0.02	1.00	0.43	0.17
Object Fear	0.31	0.34	-0.16	0.70	0.47	0.76	0.25	0.29	0.29	0.74	-0.05	0.43	1.00	0.33
Lacks Initiative	0.11	0.24	-0.14	0.36	0.11	0.36	0.31	0.00	0.29	0.41	0.15	0.17	0.33	1.00

Trait	Percent with undesirable scores	N with undesirable scores	Total	Heritability
Skin issues	16.8%	970	5775	0.34
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Activated (stress)	10.5%	266	2537	0.17
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Noise Reaction	5.1%	128	2532	0.11
Elbow quality	1.9%	130	6817	0.28

Trait	Relative Economic Values	Percent with undesirable scores	N with undesirable scores	Total	Heritability
Skin issues	1	16.8%	970	5775	0.34
Hip quality	0.92	15.5%	1146	7389	0.45
Activated (stress)	0.62	10.5%	266	2537	0.17
Inhibited (stress)	0.61	10.3%	260	2527	0.10
Body Sensitivity	0.54	9.1%	229	2514	0.12
Dog Distraction	0. 54	9.1%	225	2472	0.08
Noise Reaction	0.30	5.1%	128	2532	0.11
Elbow quality	0.11	1.9%	130	6817	0.28

### **Selection Index Theory**

$$P b = G a$$
  
 $\hat{b} = P^{-1} G a$ 

where:

- P = phenotypic correlation matrix
- G = genotypic correlation matrix
- a = vector of relative economic values
- b-hat = solution vector of optimal weights

Selection index equations first published in 1943 by Dr. L.N. Hazel https://www.ans.iastate.edu/about/history/people/lanoy-n-hazel



## Thank you!

Questions?