



Personality traits and exploratory behaviour of free-range slow-growing broilers

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Societal demand:
Expression of the natural behaviour of animals

van Asselt et al., 2017



Production of free-range and organic broilers

IFOAM, 2018

Issue:
Only 30 to 80% of the broilers use the outdoor range when provided

Taylor et al., 2018

Variability due to the environment

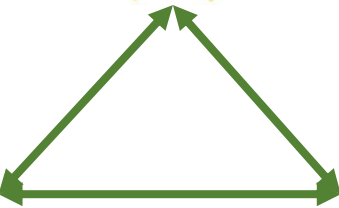
Variability due to the animal



Stadig et al., 2017



Riber et al., 2018



Fanatico et al., 2016

Group

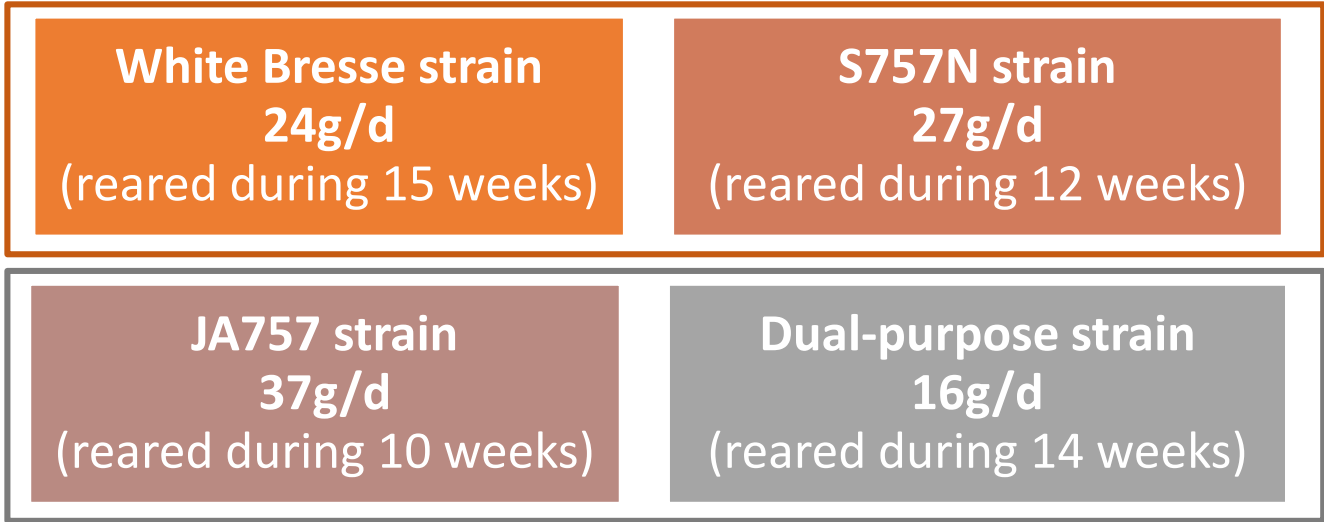
- Genetic Cartoni Mancinelli et al., 2020
- Physiologic et metabolic Castellini et al., 2016

Individual

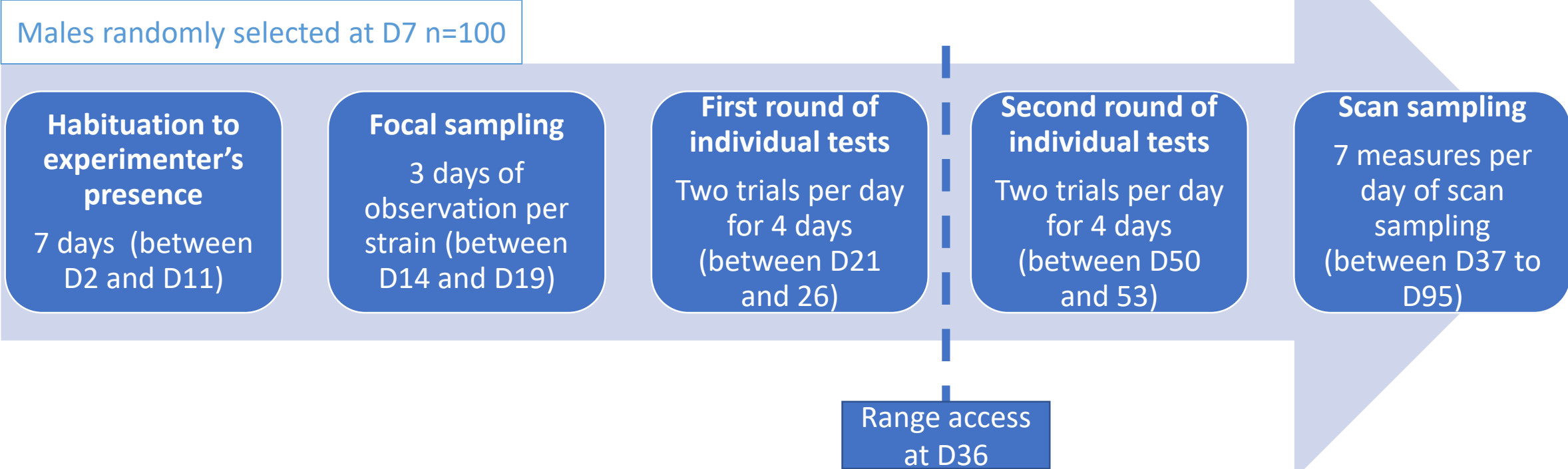
- Cognition capacity Ferreira et al., 2019
- Personality Hernandez et al., 2014

What are the personality traits usable as levers to significantly improve range use ?

PPILOW Method – Experimentation from February until June 2021



4 strains: 1 per range
750 animals per strain
50% male. 50% female



PPILOW Method – Experimentation from February until June 2021

Focal sampling : Time-Budget (TB) for state behaviors
 $TB (\%) = 100 \times (\text{Time spent on a state behavior in seconds}) / (30 \times 6 \times 3 = 540)$

Figure legend:




-  Metal arena for conspecifics of 35 cm of diameter
-  Panels of 25*25cm
-  Arena of 135 cm of diameter

FIGURE OF SOCIAL MOTIVATION TEST :

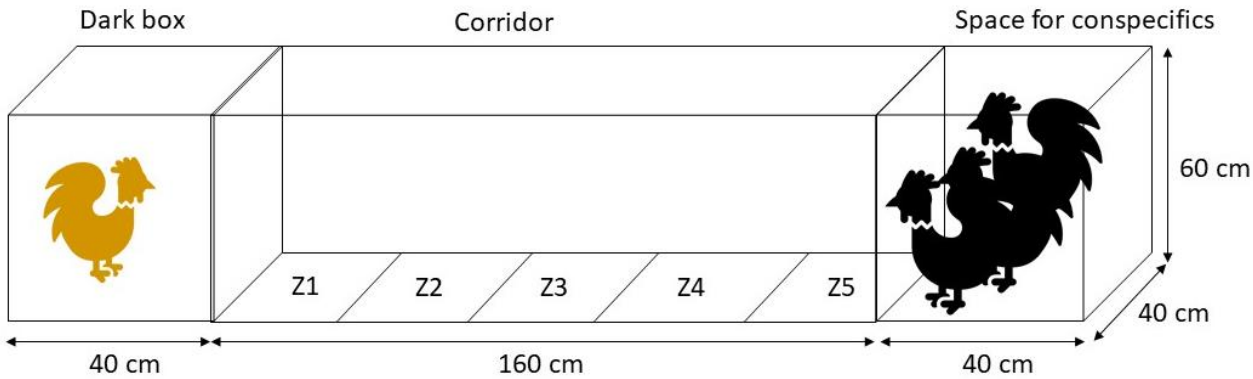
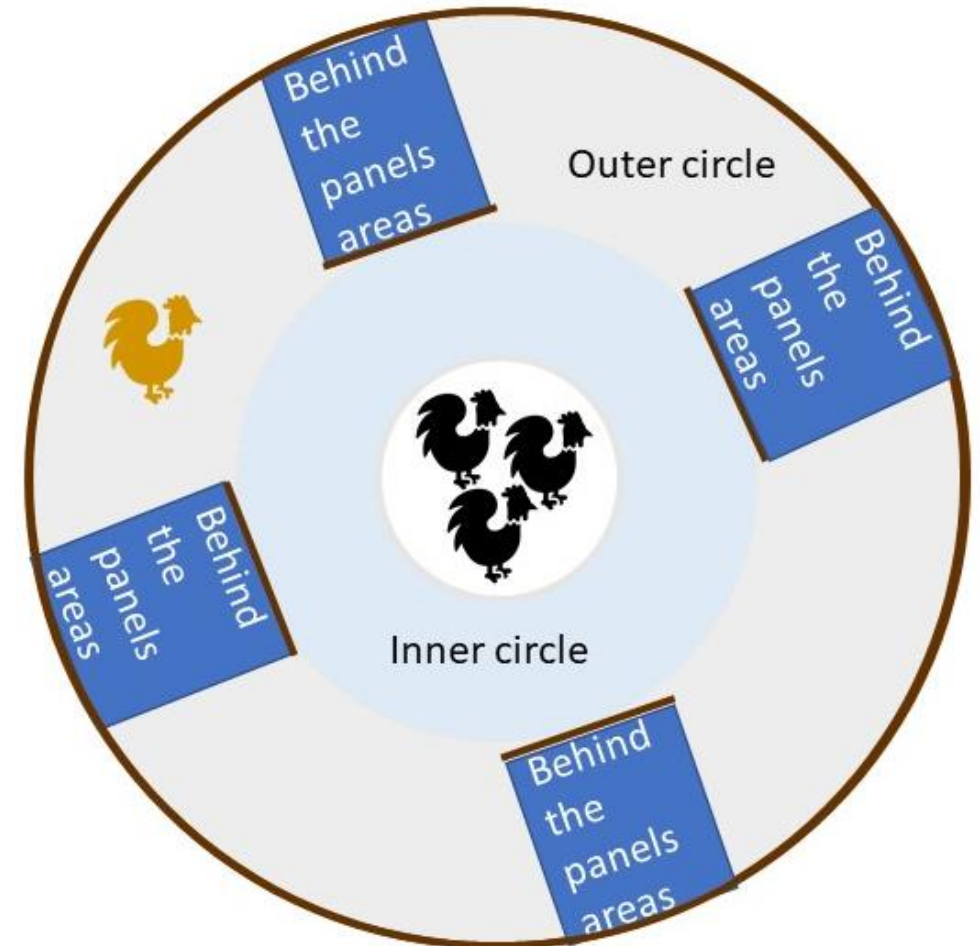
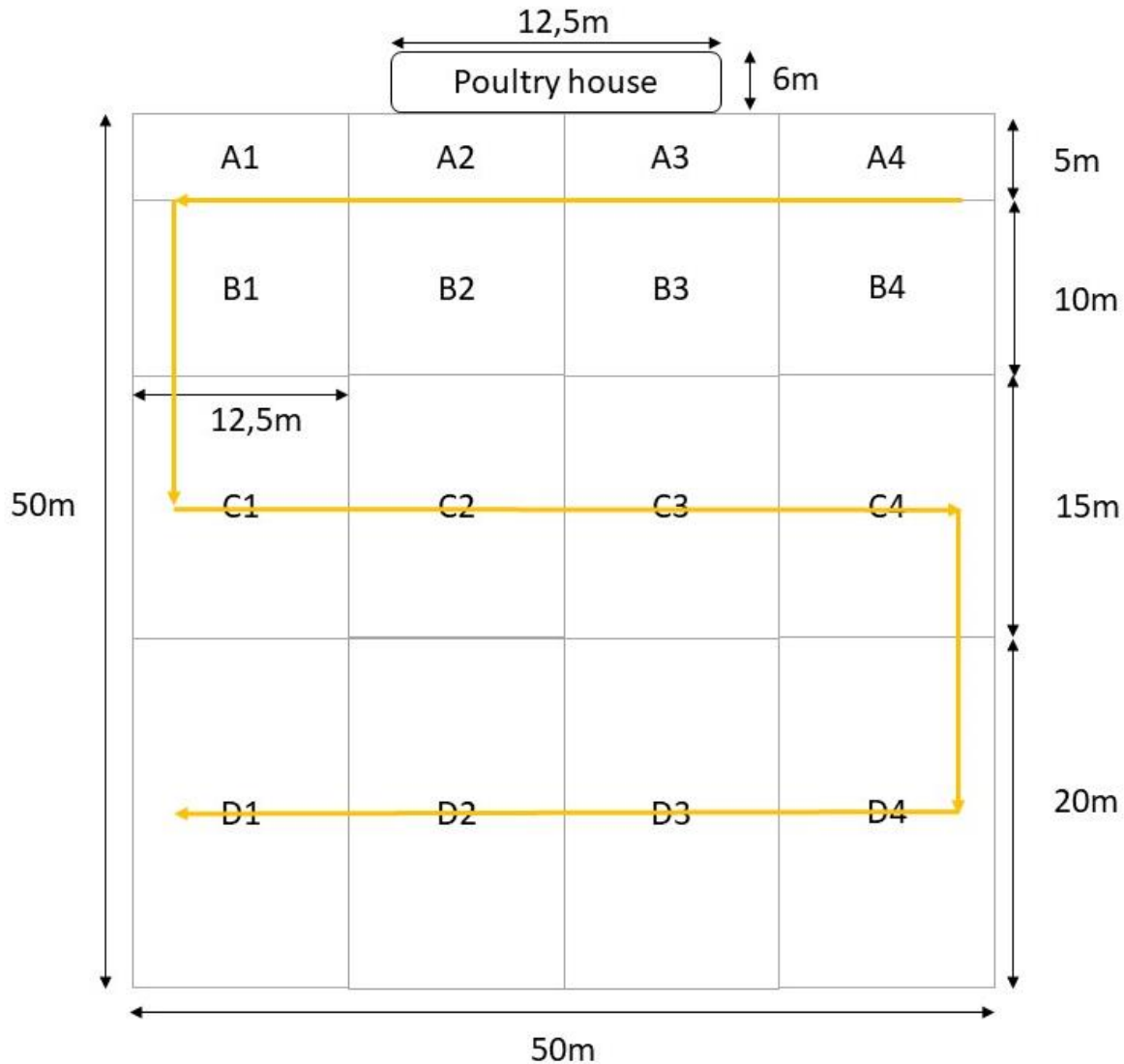


FIGURE OF MULTIVARIATE TEST :



PPILOW Method – Experimentation from February until June 2021

FIGURE OF SCAN SAMPLING :  Observer's path



7 times per day of scan sampling
from sunrise to sundown

11 to 15 days of scan sampling
depending on the rearing length

Distance Index =
 number of times recorded in zone A * 2.5 +
 number of times recorded in zone B * 10 +
 number of times recorded in zone C * 22.5 +
 number of times recorded in zone D * 40

PPILOW Results Comparison of four genotypes in their early behaviour

Significant differences of the variables measured before range access depending on the genotype

		Dual-Purpose	JA757	S757N	White Bresse	p-value
State behaviour recorded during focal sampling (average relative %)	Immobility	29.3 ^a	18.4 ^c	25.0 ^b	29.5 ^a	<0.001
	Resting	17.0 ^b	25.6 ^a	20.3 ^b	17.6 ^b	<0.001
	Sleeping	6.1 ^c	9.2 ^b	11.8 ^a	12.1 ^a	<0.001
	Locomotion	8.7	10.5	9.9	8.3	0.059
	Foraging	21.8	19.3	18.3	19.0	0.136
	Drinking	4.0 ^{ab}	3.9 ^{ab}	4.9 ^a	3.1 ^b	0.008
	Eating	10.7	9.1	8.4	8.5	0.727
Variables of the social motivation test (average)	Latency to exit (s)	111 ^a	78 ^b	82 ^b	63 ^c	<0.001
	Latency to arrive to the zone close to conspecifics (s)	119 ^a	106 ^b	107 ^b	82 ^c	<0.001
	Number of pecks	0.1 ^c	2.6 ^a	0.8 ^b	2.2 ^a	<0.001
Variables of the multivariate test (average)	Latency to make a first step (s)	19.5 ^a	12.6 ^{ab}	2.2 ^b	3.5 ^b	<0.001
	Foraging (s)	95 ^{ab}	52 ^c	74 ^{bc}	115 ^a	<0.001
	Number of times the chicken walked behind a wooden panel	0.2 ^b	0.2 ^b	0.3 ^b	0.9 ^a	<0.001
	Time in the outer circle (s)	40	50	27	34	0.086



	Eating	10.7	9.1	8.4	8.5	0.727
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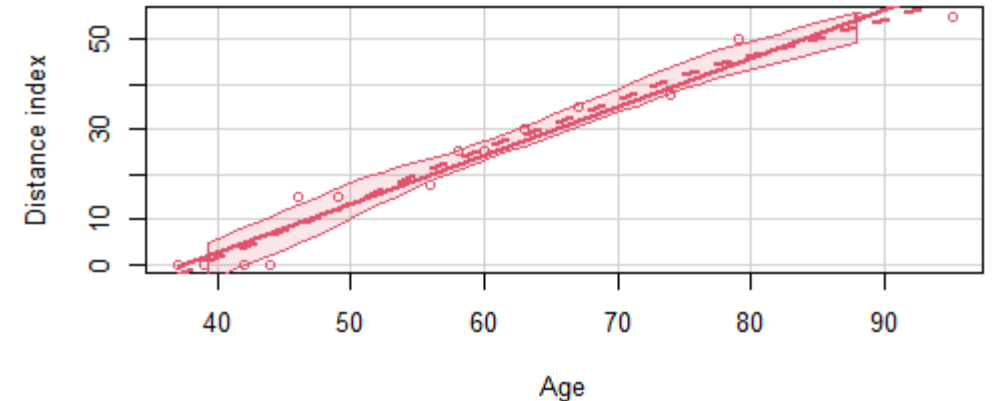
PPILOW Results Time consistency of range use, sociability and boldness

Range use : linear regression models per animal

Ferreira et al., 2022

	JA757	S757N	White Bresse	Dual-Purpose
R² adj>0.9	47%	63%	81%	47%
0.7<R²adj<0.9	39%	26%	18%	36%
0.4<R² adj<0.7	10%	11%	1%	15%
0.2<R² adj<0.4	1%	0%	0%	0%
R²adj <0.2	3%	0%	0%	2%

Linear regression for the animal A7 of the Dual-purpose strain



Individual tests : Correlations between the variables of the first (before range access) and the second round (after range access)

	JA757		S757N		White Bresse		Dual-Purpose	
Ferreira et al., 2022	Social motivation test variables							
	rho	p-value	rho	p-value	rho	p-value	rho	p-value
Latency to exit	0.08	0.431	0.12	0.217	0.33	<0.001	0.03	0.756
Latency to arrive in the zone close to conspecific	0.20	0.050	0.14	0.174	0.27	0.006	-0.05	0.599
Number of pecks	0.01	0.916	0.11	0.257	0.20	0.050	-0.04	0.713
	Multivariate test variables							
Latency to make a first step	0.17	0.091	-0.09	0.389	0.05	0.616	0.35	<0.001
Foraging time	0.02	0.839	0.15	0.137	-0.11	0.260	0.11	0.295
Number of times the chicken walked behind a wooden panel	NA	NA	0.00	0.993	-0.11	0.290	0.16	0.113
Time spent in the outer zone	0.21	0.039	0.05	0.636	-0.02	0.848	0.26	0.010

PPILOW Results Prediction of range use

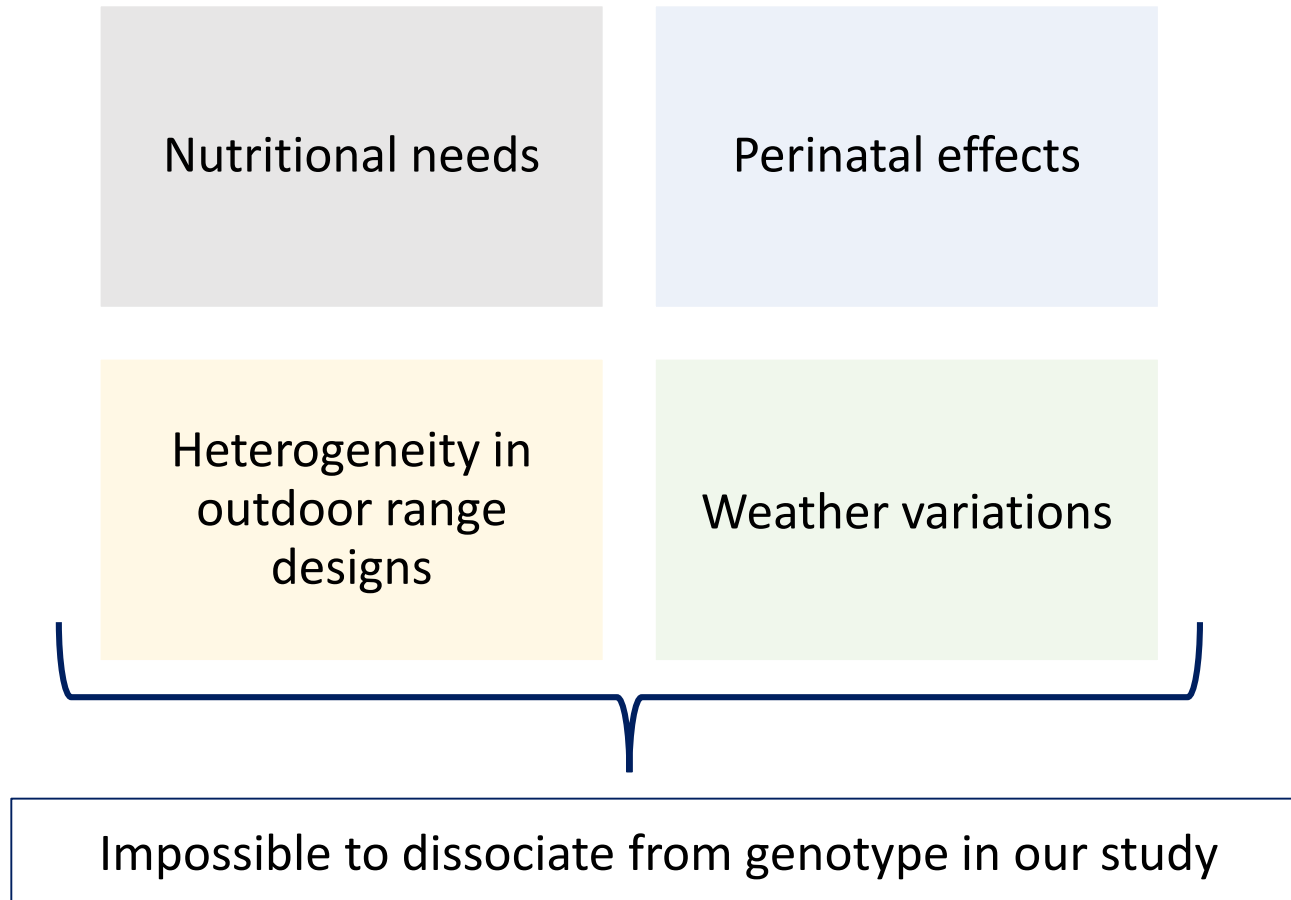
Correlations between the cumulated distance index after n days of scan sampling and the final distance index in the four studied genotypes

Days of life	n days of scan	JA757		S757N		White Bresse		Dual-Purpose	
		Rho	p-value	Rho	p-value	Rho	p-value	Rho	p-value
37	2	0.70	<0.001	0.56	<0.001	0.62	<0.001	0.37	<0.001
39	3	0.79	<0.001	0.67	<0.001	0.65	<0.001	0.41	<0.001
42	4	0.83	<0.001	0.73	<0.001	0.68	<0.001	0.48	<0.001
44	5	0.87	<0.001	0.76	<0.001	0.74	<0.001	0.54	<0.001
46	6	0.90	<0.001	0.84	<0.001	0.80	<0.001	0.58	<0.001
49	7	0.94	<0.001	0.90	<0.001	0.85	<0.001	0.68	<0.001
56	8	0.97	<0.001	0.91	<0.001	0.88	<0.001	0.75	<0.001
58	9	0.97	<0.001	0.94	<0.001	0.90	<0.001	0.79	<0.001
60	10	0.98	<0.001	0.96	<0.001	0.93	<0.001	0.85	<0.001
63 or 65	11	1	0.00	0.98	<0.001	0.95	<0.001	0.88	<0.001
67	12			1	0.00	0.97	<0.001	0.90	<0.001
74	13					0.98	<0.001	0.92	<0.001
88	14					0.99	<0.001	0.97	<0.001
95	15					1	0.00	1	0.00

PPILOW Results Early indicators of the ranging behaviour

Correlations between the variables measured before range access and the final distance index for the four studied genotypes

		JA757		S757N		White Bresse		Dual-Purpose	
		rho	p-value	rho	p-value	rho	p-value	rho	p-value
State behaviour recorded during focal sampling	Immobility	0.01	0.916	-0.01	0.890	-0.02	0.876	-0.15	0.140
	Resting	-0.17	0.096	0.06	0.554	-0.08	0.412	0.00	0.982
	Sleeping	-0.24	0.014	Mattioli et al., 2021		0.02	0.849	0.11	0.285
	Locomotion	0.26	0.008	0.09	0.381	-0.01	0.921	0.06	0.541
	Foraging	0.29	0.004	-0.02	0.865	0.17	0.089	0.04	0.700
	Drinking	0.05	0.652	-0.23	0.022	0.11	0.292	0.00	0.980
	Eating	-0.14	0.157	0.00	0.996	-0.10	0.350	0.00	0.970
	Negative interaction	0.05	0.616	0.08	0.416	0.02	0.838	0.09	0.377
	Dustbathing	-0.13	0.198	0.10	0.324	NA	NA	0.08	0.456
	Perching	-0.04	0.669	-0.08	0.411	0.06	0.541	0.13	0.186
Variables of the social motivation test	Latency to exit	-0.09	0.349	-0.04	0.693	-0.08	0.443	-0.02	0.862
	Latency to arrive to the zone close to conspecifics	-0.13	0.189	0.05	0.620	-0.10	0.326	0.09	0.356
	Number of pecks	0.03	0.767	-0.14	0.168	-0.06	0.526	-0.09	0.356
Variables of the multivariate test	Latency to make a first step	-0.09	0.373	0.05	0.650	0.07	0.488	0.00	0.977
	Foraging	0.17	0.093	0.04	0.706	0.00	0.974	0.22	0.033
	Number of times the chicken walked behind a wooden panel	0.05	0.601	-0.03	0.802	-0.04	0.712	-0.05	0.628
	Time in the outer circle	0.02	0.856	0.20	0.050	0.00	0.966	-0.01	0.921



Our main findings are :

- Effects of genotype on broilers early behaviour: inactive behaviours and individual tests variables are affected by the genotype
- Range use = time-consistent -> personality trait for all genotypes
- Minimum days of scan samplings might depend on growth rate
- Social motivation and boldness time-consistency are still unclear
- No early behaviour is strongly correlated to range use for all genotypes. however. the foraging behaviour calls for further investigation

PPILOW PARTNERS



Thank you for your attention

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