Genetic correlations for behavioural traits towards humans with slaughter traits in farmed ostriches

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Background

- ➢ **Origin of the ostrich industry**
  South Africa (mid 1800s)

- ➢ **Contribution to national and international markets**
  Major products:
  - ► Leather
  - ► Meat
  - ► Feathers

- ➢ **Products traded based on quality**

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Ostrich husbandry and management

➢ **Chicks rearing methods**

➢ **Management activities**

  ➢ Egg collection during breeding season
  ➢ Feather gathering
  ➢ Handling and feeding
  ➢ Weighing
  ➢ Health management i.e. dosing, vaccination
  ➢ Transportation

➢ **Challenges with management**

  ➢ Wild demeanour, resulting in husbandry challenges
  ➢ Unpredictable temperament
  ➢ Inconsistent husbandry practices

# Ostrich behavioural characteristics towards humans

➢ Some birds demonstrate willingness to associate with humans

➢ Such behaviour could be influenced by:
  ➢ Positive human-ostrich interactions at an early age
  ➢ Genetics?

Aims of the study

➢ To verify previous heritability estimates of ostrich behavioural traits based on binomially distributed repeated records describing human-ostrich interactions

➢ To estimate genetic correlations among behavioural traits towards humans

➢ To estimate genetic correlations of behavioural responses towards humans with slaughter traits in ostriches
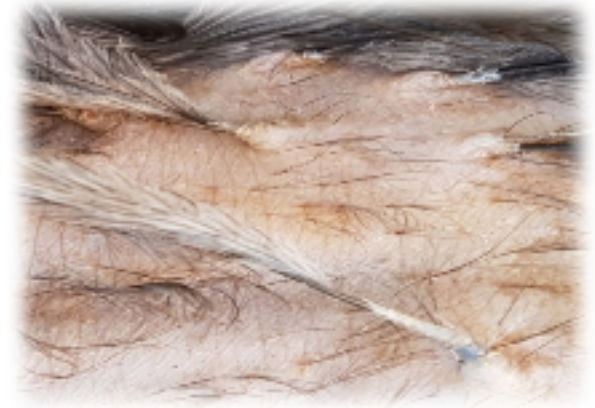
Materials and methods: Behavioural observations

➢ Performed at least 3 times per week from 8-19 months of age (N = 1012 SA Black birds): Oudtshoorn Research Farm

➢ **Behavioural traits recorded:**

Desirable responses:
- ► Willingness to approach
- ► Allow touch interactions
- ►Wing flapping

Undesirable responses:
- ► Keeping a distance
- ► Excessive pecking

➢ Initial records in a binomial format (Muvhali et al., 2023):
- ► 1: Behavioural expression of trait measured
- ► 0: No expression of trait measure

➢ Not suitable for deriving genetic correlations among traits and with live weight and slaughter traits

➢ Totaled to a single record per bird and subjected to the arc sin transformation for analysis
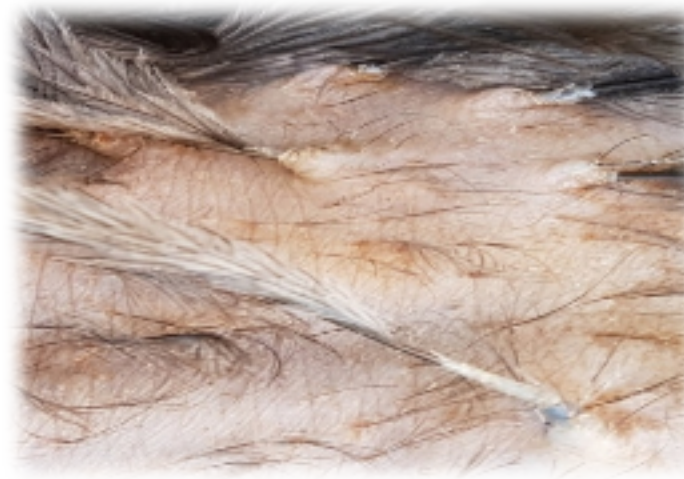
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Materials and methods: Slaughter and skin traits

➢ **Quantitative slaughter traits:**

   ► Slaughter weight (12-14 months old)

   ► Skin size

➢ **Subjectively scored qualitative slaughter traits:**

   ► Nodule size (1-9)

   ► Nodule shape (1-9)

   ► Hair follicles (1-5)

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Materials and methods: Data analysis

➢ **Single trait analysis for operational model**

➢ **Fixed effects (behavioural traits):**
   - ► Husbandry treatments
   - ► Sex
   - ► Hatch year
   - ► Familiarity of human observer (Familiar or Unfamiliar)

➢ **Random factor:**
   - ► Additive genetic variance

➢ **Multi-trait model:**
   - ► r_g and r_p between traits

➢ **Fixed effects (Slaughter weight):**
   - ► Slaughter group
   - ► Hatch year
   - ► Sex

➢ **Fixed effects (Skin traits):**
   - ► Slaughter group
   - ► Sex

➢ **Co-variates:**
   - ► Age at weighing or at slaughter

➢ All analysis performed in ASReml4

Results: Genetic parameters

➢ Five-trait estimates of heritability and correlations among arc sin transformed juvenile ostrich behavioural traits

Component and trait	Touch	Distance	Approach	Wing flapping	Excessive pecking
(Co)variance ratios, h² in **bold** on the diagonal, r_g below and r_p above the diagonal					
Touch	**0.42 ± 0.05**	-0.82 ± 0.01	0.82 ± 0.01	0.34 ± 0.03	0.38 ± 0.03
Distance	-0.87 ± 0.03	**0.48 ± 0.05**	-0.99 ± 0.01	-0.42 ± 0.03	-0.32 ± 0.03
Approach	0.87 ± 0.03	-0.99 ± 0.01	**0.48 ± 0.05**	0.43 ± 0.03	0.33 ± 0.03
Wing flapping	0.38 ± 0.11	-0.51 ± 0.09	0.51 ± 0.09	**0.33 ± 0.06**	0.17 ± 0.03
Excessive pecking	0.78 ± 0.12	-0.63 ± 0.12	0.64 ± 0.12	0.49 ± 0.18	**0.19 ± 0.06**

Results: Correlations

➢ Genetic (r_G) and phenotypic (r_P) correlations between ostrich behavioural traits towards humans and quantitative slaughter traits (slaughter weight and skin size)

Slaughter trait and correlated trait	r_G	r_P
Slaughter weight (kg)		
Touch	-0.04 ± 0.19	0.07 ± 0.04
Distance	0.11 ± 0.18	-0.08 ± 0.04
Approach	-0.11 ± 0.18	0.08 ± 0.04
Crust skin size (dm²)		
Touch	0.01 ± 0.23	0.07 ± 0.07
Distance	0.19 ± 0.22	-0.04 ± 0.08
Approach	-0.18 ± 0.22	0.05 ± 0.08

Results: Correlations

➤ Genetic (r_G) and phenotypic (r_P) correlations between ostrich behavioural traits towards humans and subjectively scored qualitative slaughter traits (nodule size, nodule shape and hair follicles)

Slaughter trait and correlated trait	r_G	r_P
Nodule size score (n)		
Touch	-0.20 ± 0.27	0.07 ± 0.11
Distance	0.38 ± 0.24	-0.02 ± 0.11
Approach	-0.35 ± 0.23	0.05 ± 0.11
Nodule shape score (n)		
Touch	-0.12 ± 0.28	0.10 ± 0.09
Distance	0.32 ± 0.27	-0.10 ± 0.10
Approach	-0.35 ± 0.26	0.11 ± 0.10
Hair follicle score (n)		
Touch	0.49 ± 0.24	-0.02 ± 0.10
Distance	-0.49 ± 0.23	0.03 ± 0.10
Approach	0.48 ± 0.23	-0.04 ±0.10

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Conclusions

➢ The behavioural responses of ostriches towards humans was heritable
  ➢ Selection for birds showing willingness to associate with humans may improve temperament

➢ Genetic correlations among behavioural response traits indicated that approach, touch and keeping a distance were genetically very similar traits

➢ No unfavourable genetic correlations of behavioural traits towards humans with slaughter weight and most skin traits
  ➢ This imply that a docile temperament will not compromise slaughter and skin traits

➢ Unfavourable genetic correlations were found between behavioural traits and hair follicle scores

Future directions

➤ To reassess these parameters as more data becomes available

➤ To estimate genetic correlations of behavioural responses towards humans with reproductive traits such as egg and chick production

➤ To seek methods for applying genomic selection to desirable behavioural traits to improve human-animal relationships

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