Impact of genetic strain and environmental complexity on broiler chicken behavior

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Introduction

- Fast-growing broilers have been selected for efficiency and higher yield. This can negatively impact health and welfare (Torrey et al., 2021).
- Inactivity in broilers can indicate reduced physical ability to perform desired behaviors. Stimulating physical activity can improve leg health and allow for the expression of natural behaviors (de Jong et al., 2021).
- Environmental complexity can stimulate physical activity (de Jong et al., 2021).
- Little is known about the benefits of complexity on bird behavior across genetic strains.

Objective

Determine the effect of complex (CE) or simple (SE) environments on behavior of slow- (SG) and fast-growing (FG) broilers

Methods

Animals

- 600 birds: Ross 708 (**FG**) & Hubbard Redbro (**SG**)
- 50 birds/12 pens (0.175 m^2/bird)
- 3 replicates per treatment

Complexity (Fig. 1)

- Simple environment (**SE**) with litter, feeders, drinkers
- Complex environment (**CE**)
  - Permanent: perches and dust bath with sand
  - Temporary: seeds & mirrors, oats & strings, cabbage & hay

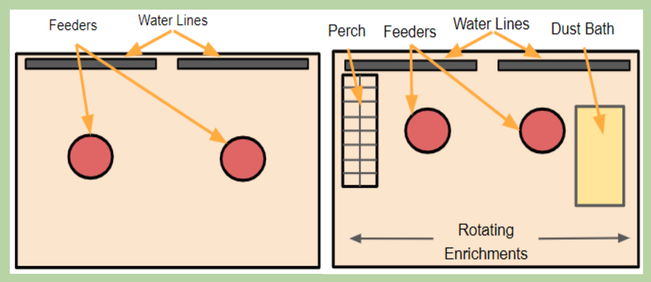

Figure 1. Simple (left) and complex (right) pen layout

Measurements:

- Birds were video recorded and behavior coded using BORIS software following an ethogram.
- 4 birds per pen were observed at 7am and 8pm, at days 16, 27, 30, 37, and 48 of age.
- Behaviors organized into 7 categories
  - Consummatory (**Con**): Eating, Drinking
  - Locomoting (**Loc**): Locomotion
  - Comfort (**Com**): Dustbathing, Preening, Stretch
  - Exploratory **(Exp**): Foraging, Exploratory Peck
  - Social (**Soc**): Allogrooming, Agonistic Behavior
  - **Play**: Frolicking, Food Running, Sparring
  - **Inactive**: Sitting, Standing, Rest

Statistics

Behaviors were expressed as % of total observation (5 min) and analyzed in JMP using standard least squares methods with strain, complexity, age, and their interactions as fixed factors. Significance was set at $p<0.05$.

Results

SG spent a greater proportion of time locomoting ($p=0.001$), playing ($p=0.001$), and being social ($p=0.013$) than FG **(Fig. 2)**. Inactivity did not differ **(Fig. 3)**.

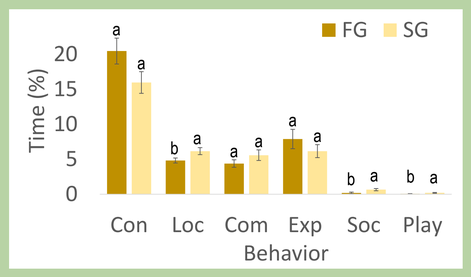

Figure 2. Mean time (%) spent on behaviors by genetic strain

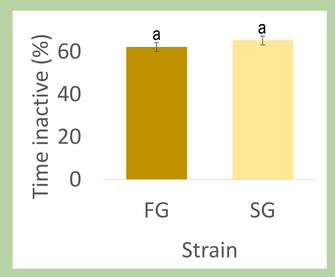

Figure 3. Mean time (%) spent inactive by genetic strain

Birds in SE spent a greater proportion of time locomoting than birds in CE ($p=0.037$; **Fig. 4**). Inactivity did not differ (**Fig. 5**).

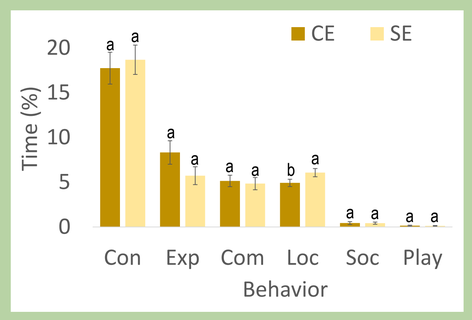

Figure 4. Mean time (%) spent on behaviors in complex (CE) or simple (SE) environments

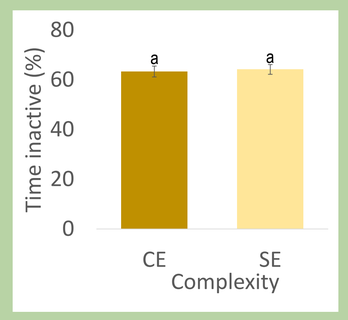

Figure 5. Mean time (%) spent inactive in complex (CE) or simple (SE) environments

Proportion of time spent on consummatory ($p=0.009$), locomotion ($p<0.0001$), and play ($p<0.0001$) behaviors decreased as birds aged (**Fig. 6**). Proportion of time spent inactive ($p<0.0001$) increased with bird age (**Fig. 7**).

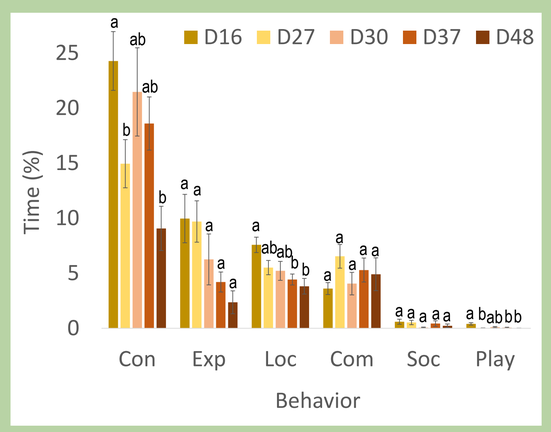

Figure 6. Mean time (%) spent on behaviors by the birds' age in days (D)

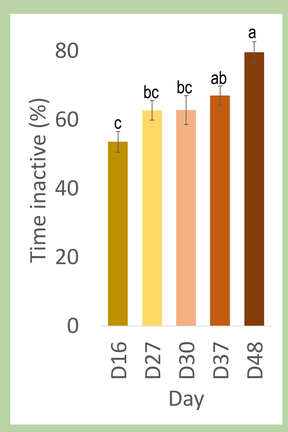

Figure 7. Mean time (%) spent inactive by the birds' age in days (D)

Discussion

- SG showed more active behaviors compared to FG, yet most time was still spent inactive. Our findings do confirm that activity differs in two broiler strains with opposing growth rates.
- Inactivity was not affected by slow growing or fast growing. High proportions of time spent inactive among SG and FG are consistent with other studies (Dawson et al., 2021).
- Contrary to expectations, the complex environment did not stimulate natural -active- behaviors. Birds tend to cluster around enrichments for shelter, which can prevent other birds from utilizing them (Göransson et al., 2021).
- Consummatory behavior, locomotion and play decreased as birds aged in line with previous findings (Dawson et al., 2021).
- SG strains can be considered for commercial production because their increased activity levels could benefit health.
- The complex environment assessed in this study did not benefit behavioral expression.

Conclusion

Active behaviors were increased in slow-growing broilers compared to fast-growing broilers. However, inactivity did not differ among strains.

Environmental complexity did not show benefits for broiler chicken behavioral expression and physical activity in the current study.

Acknowledgments

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