HOW DOES THE SOCIAL ENVIRONMENT AFFECT COGNITIVE PERFORMANCE?

Susana Garcia Dominguez, Laura Garnham & Hanne Løvlie

IFM Biology, LiU | susga670@student.liu.se, MSc student

We explored if group size during development had an effect on cognitive performance across tasks in red junglefowl chicks

BACKGROUND

The main factors contributing to individual variation in cognitive performance still remain unclear[1]. The Social Intelligence Hypothesis[2] proposes that social challenges, such as those that arise from group-living, may contribute to better cognitive performance. According to this hypothesis, individuals in larger groups need to remember information from more individuals, which represents a greater cognitive demand compared to those living in smaller groups[3]. However, this has not yet been experimentally tested.

RESULTS

Chicks in smaller groups learnt a colour association faster than chicks in larger groups, but they did not differ in their ability to reverse this association nor to inhibit their impulsive responses.

CONCLUSIONS

Our results suggest that early social environment had some effect on cognitive performance in red junglefowl chicks, but mostly in the opposite direction to the one predicted by the Social Intelligence Hypothesis. Unlike the other traits, associative learning seems to be more affected by the environment. Indeed, this is supported by previous work on heritability among cognitive traits[4]. The influence of other factors (e.g. more stress in larger groups) will be further explored.

Fig. 1. Chicks in smaller groups learnt faster than chicks in larger groups in an associative learning task (U=574.5, p=0.016, n=57). There was no difference in performance for the reversal learning (U=493, p=0.26, n=58) nor for the inhibitory control task (U=275, p=0.12, n=58). Mean ± SE shown.

METHODS

For their first 5 weeks of life, we assigned red junglefowl chicks (n=76), *Gallus gallus*, to a small (n=6, $n_{replicates}$=4) or large social group size (n=16, $n_{replicates}$=3). We presented each test chick (n=58) with three standardized cognitive tasks: 1) discriminative learning, 2) reversal learning[5] and 3) inhibitory control[6] (see Fig. 1). In all tasks, a piece of mealworm was given as a reward. Performance in the learning tasks was measured as the number of trials a chick needed to reach the learning criterion (i.e. six correct colour choices in a row; correct=rewarded). Inhibitory control was measured as the number of trials (out of five) in which the chick impulsively peck at the cylinder instead of directly at the reward.

REFERENCES: [1]Boogert et al. 2018, [2]Humphrey 1976, [3]Ashton et al. 2018, [4]Sorato et al. 2018, [5]Shaw et al. 2015, [6]MacLean et al. 2014