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Domestication effects on the human-chicken relationship

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Contents

1 Abstract

Domesticated species possess certain cognitive abilities that allow them to thrive in an environment with regular human interaction, and these interactions contribute to the overall human-animal relationship. Studying the human-animal relationship allows us to better understand how domesticated animals perceive and navigate their environment, which can then be used to improve their welfare. In chickens, this relationship is poorly understood, and further research would provide insight into the welfare needs of this animal. Here we show breed differences in the interspecific sociocognitive abilities of *Gallus gallus*, where the domesticated White Leghorn interacted more with a familiar human than the red junglefowl, and both the domesticated White Leghorn and the red junglefowl breed that had been selected for low fear of humans were habituated to human presence. This study sheds light on the effect of domestication on social cognition in chickens and begins to describe the human-chicken relationship.

Keywords: attentiveness, chicken, domestication, human-animal relationship, social cognition, social learning

2 Introduction

Humans and animals interact with one another in a wide variety of contexts, from the laboratory to the pasture, the wild to our own homes. Studies on these interactions have developed independently from one another over recent decades, and due to the resulting conflicts in methodology, as well as the lack of consensus on terminology, it is arguably not a unified field at the current time (Hosey & Melfi, 2014). Within the study of agricultural animals, however, this field of research commonly centers around what is referred to as the human-animal relationship (hereafter HAR). As defined by Estep and Hetts (1992), the HAR is a relationship built upon previous interactions between the human and animal which then influence future interactions. This relationship is expressed through mutual behaviors, and can either be positive, negative, or neutral (Waiblinger et al., 2006).

The quality of an HAR is influenced by genetics (Mota-Rojas et al., 2020). It is therefore possible that HAR quality is influenced by the selection for tameness which leads to domestication (Belyaev et al., 1985; Wright et al., 2010). Domestication is characterized by adaptations that allow species to thrive in a captive human environment. These adaptations can be physiological (e.g. changes in body size, egg size, and feed efficiency, Agnvall et al., 2014, 2015, 2017; changes in brain size and composition, Katajamaa & Jensen, 2020) as well as behavioral (e.g. reduced fear response and increased stress tolerance, Jensen, 2014; changes in intraspecific social behavior, Gjøen & Jensen, 2022).

Improving the HAR is important to the welfare of domesticated species because a captive environment necessitates regular interaction with humans (Hemsworth & Coleman, 1998). The most abundant domesticated animal on the planet is the chicken (*Gallus gallus domesticus*; Food and Agricultural Organization of the United Nations, 2023). According to Jones (1996), the two most common stressors experienced by chickens are unexpected changes to their physical or social environment, and human exposure. Direct contact with a human (e.g. when handling and transporting the bird) was shown to establish predatory overtones in an open field experiment (Suarez & Gallup, 1981). In addition, the visible presence of a human within an open field increased ambulation latency in chicks, a response similar to the visible presence of a natural predator (Suarez & Gallup, 1982). Human presence can induce further negative behaviors such as behavioral inhibition, withdrawal panic, and violent escape reactions, which are ultimately detrimental to chicken welfare (Jones, 1996). However, familiarization with humans through periods of gentle contact reduces fear responses in chicks (Jones & Faure, 1981) and adult laying hens (Barnett et al., 1994; Bertin et al., 2019), demonstrating that familiarizing animals with their caretakers can improve the HAR.

Generally, HAR research focuses on sociocognitive abilities in relation to humans: the ability of an animal to distinguish between individual humans, interpret human behavior, and communicate with and learn socially from humans (Jardat & Lansade, 2021). Interspecific communication is commonly measured through contact-seeking behavior, in which an animal approaches and looks at another individual, and this has been described in a number of domesticated species (Miklósi et al., 2003, 2005; Malavasi & Huber, 2016; Mastellone et al., 2020). Social learning from humans has also been studied in a number of domesticated species: dogs, cats, and horses will adapt their behavior towards a novel object based on a familiar human's behavior (Jardat & Lansade, 2021), and goats performed better in a problem-solving task after observing a human's actions (Nawroth et al., 2016). The interspecific sociocognitive ability of chickens has not received much scientific attention as of yet. However, chickens are a group-living, highly social species with demonstrated intraspecific sociocognitive ability. They will modify their behavior based on the observation of conspecifics: when shown videos of conspecifics feeding from a colored food bowl, chicks were significantly more likely to choose that bowl from multiple options (McQuoid & Galef, 1992). Adult laying hens can learn to solve a puzzle-box feeder by observing conspecifics, and although the red junglefowl (*Gallus gallus*) could also perform this task, they were not as successful as their domesticated counterpart, which suggests that social learning is affected by domestication (Rutkauskaite & Jensen, 2022). These intraspecific social skills may enable chickens to have social abilities in interspecific interactions.

Another sociocognitive ability found in many group-living species is social buffering, in which an individual's response to a stressful event is reduced by the presence of a familiar companion (Gust et al., 1994; Terranova et al., 1999; Kikusui et al., 2006). Social buffering has been demonstrated in chickens: chicks exhibited a lower stress response to an aversive stimulus (an air puff) when their mother was nearby (Edgar et al., 2015). Interspecific social buffering has been demonstrated previously between dogs and humans (Shiverdecker et al., 2013). However, to this author's knowledge, there has been no investigation of whether human presence could possibly buffer stress in chickens.

A great deal of social information is acquired visually. Many highly social species, including the red junglefowl, have been shown to follow a conspecific's gaze and derive both spatial and social information from this (Zeiträg et al., 2022). An animal's attentiveness to human ostensive cues such as gaze direction is a common measure of the HAR (Jardat & Lansade, 2021), and a variety of species can follow human gaze (Emery, 2000). Hand-raised ravens would follow the gaze direction of a familiar human looking up, changing their head orientation to scan the sky with one eye (Bugnyar et al., 2004). Looking at something can also provide referential meaning (Brooks & Meltzoff, 2002), and when an individual watches someone react to a situation, they may use this information to shape their own personal interpretation (Feinman, 1982). Chickens do perceive human gaze: they will remain in tonic immobility for longer durations when an unfamiliar human is staring directly at them (Gallup et al., 1972). However, it is uncertain whether chickens can obtain referential information from human gaze.

The present study aims to begin describing the human-chicken relationship. The behavior of the domesticated chicken in the presence of a familiar human will be compared to that of the ancestral red junglefowl, as well as between two groups of red junglefowl that have been divergently selected for high and low fear of humans. In addition, this study will investigate several interspecific sociocognitive abilities (contact-seeking, social referencing, and social buffering) that have been measured previously between humans and other domesticated species.

3 Materials and Methods

3.1 Animals and housing

The experiments were approved by the local ethical committee for animal experimentation in Linköping, license number 14916-2018. All of the birds used in the study were housed within the chicken facilities of Linköping University and kept under identical rearing conditions. The birds consisted of four different groups: a group of a female White Leghorn laying hybrid (SLU 13, hereafter WL, *n* = 14) originating from a Scandinavian selection and crossbreeding experiment (Liljedahl et al., 1979), and three groups of female red junglefowl originating from the grandchildren of a population that had been brought to Sweden from Thailand and bred in a zoo (Lindqvist et al., 2002; Fig. 1).

Figure 1: Side-by-side comparison of the a) White Leghorn and b) red junglefowl.

The three red junglefowl groups were: the parental generation (PG, *n* = 16), and red junglefowl selected for low fear of humans (LF, *n* = 6) and high fear of humans (HF, *n* = 16) from the eleventh generation of selection (S11). Selection for the LF and HF groups is based on scoring in a fear-of-human test at 12 weeks of age (Fig. 2). For a detailed breakdown of the breeding and selection of these lineages, see Agnvall et al. (2012). The home pens of each breed group consisted of an indoor enclosure (ground floor = 2.5 x 3 m, ceiling height = 2.9 m) and a connected outdoor enclosure (floor = 2.5 x 4.05 m, ceiling height = 2.5 - 2.9 m).

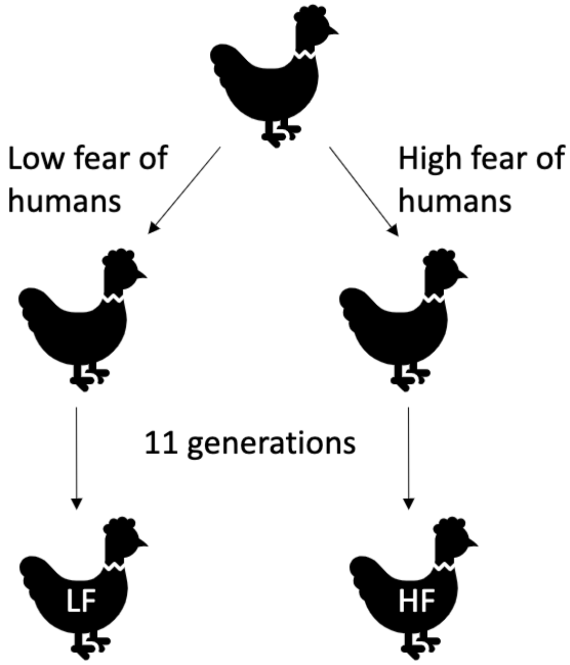


Figure 2: Selection and breeding of the LF and HF breed groups. See Agnvall et al. (2012).

At the beginning of the test week, birds were transported from their home pen to test pens (Fig. 3), where they were housed in pairs. Four test pens were constructed within a lab room that maintained a temperature between 15 - 20 °C and a relative humidity of 40 - 70%, and natural light was let in through the windows to reflect the current day/night cycle. The pens were arranged in a row, and the ordering of the group pairs was counterbalanced across the entire testing period. Each pen measured 1.2 m x 1.2 m (1.8 m in height), with netting secured over the top and a plexiglass and cardboard barrier over the walls to inhibit vision into other pens. The pairs were provided with a perch and a layer of wood shavings on the floor, and provided access to feed, water, and oyster shell ad libitum. The supply of feed and oyster shell was maintained by a technician; the birds did not see the experimenter handle feed at any point.

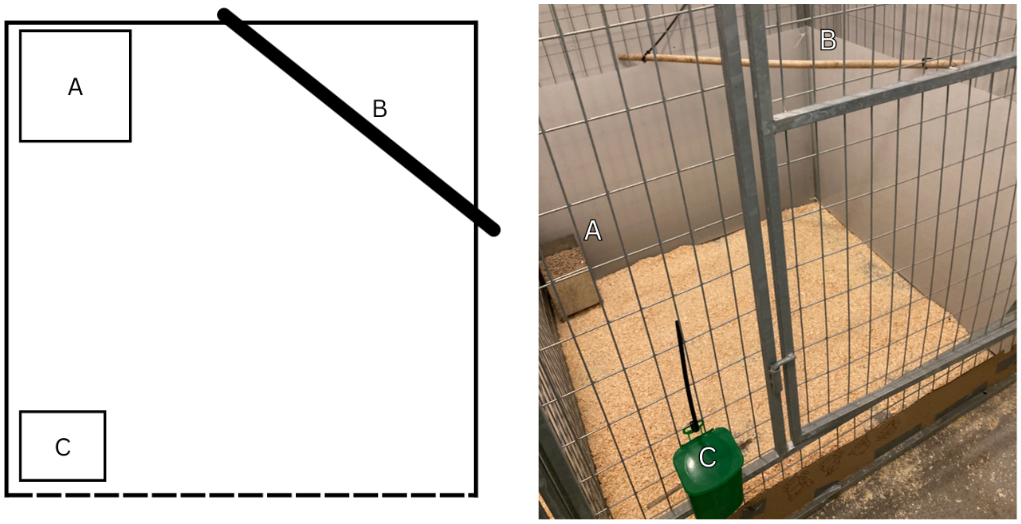


Figure 3: Setup of test pens, each containing one a) feed box, b) perch, and c) water drinker. The dotted line indicates the uncovered door.

3.2 Arena

An arena was constructed in a separate lab room for the open field trials (Fig. 4). The arena measured 2.4 m x 2.4 m (1.8 m in height) with netting secured over the top, and it was virtually divided into a 6 x 6 grid, each square measuring 0.4 m x 0.4 m. A piece of cardboard was placed over one wall as a visual barrier for the experimenter to stand behind during trials without human presence. The floor of the arena was covered in a layer of wood shavings. For the novel arena trials, an aluminum soda can (either green or yellow) was placed inside of the arena, and lamps were set up within the test room so that each trial could begin in complete darkness. For the fear response trials, corn kernels were scattered evenly across the ground to encourage foraging.

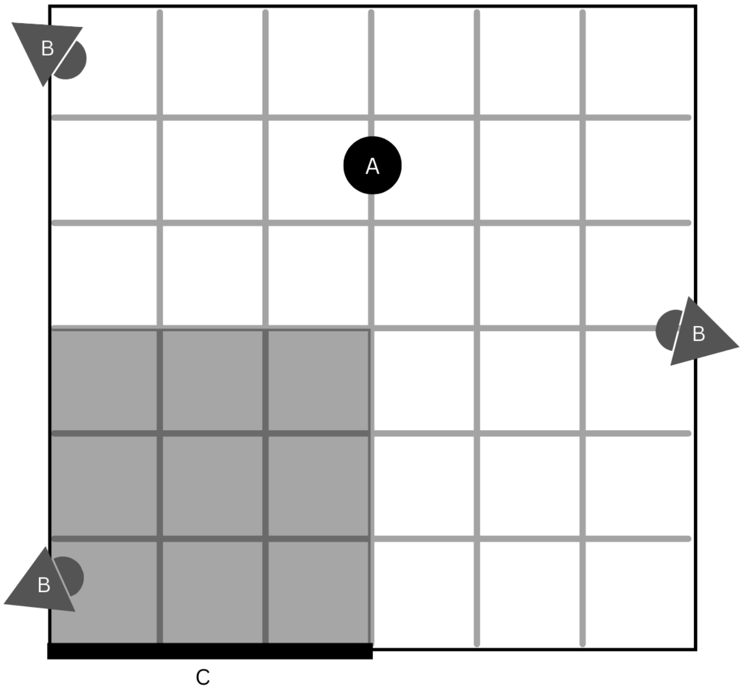
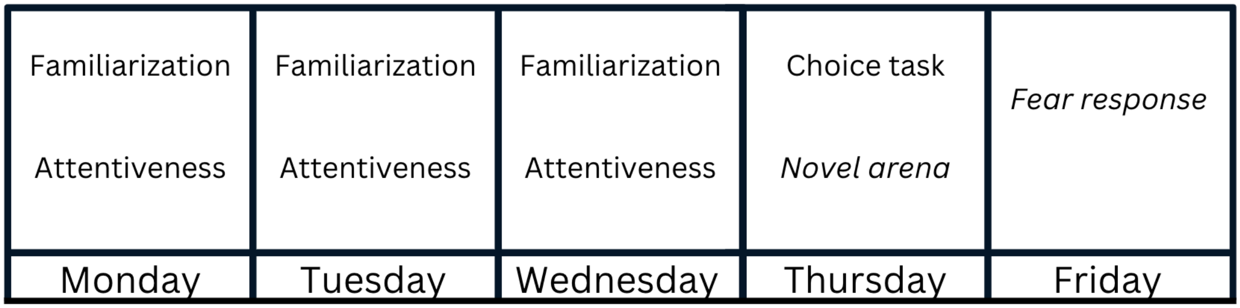


Figure 4: Setup of the arena. The novel arena trials included a) novel object, and b) interior lamps. Both trials included c) visual barrier for the experimenter. The shaded quadrant is where the experimenter sat when inside the arena.

3.3 Experimental Design

Data collection began on September 12th, 2022 and concluded on October 28th, 2022, lasting for a total of seven weeks. Four pairs of birds were tested per week (except for the final week, in which only three pairs were tested), and each week followed a five-day testing schedule (Fig. 5).



Familiarization Attentiveness	Familiarization Attentiveness	Familiarization Attentiveness	Choice task *Novel arena*	*Fear response*
Monday	Tuesday	Wednesday	Thursday	Friday

Figure 5: Schematic of trials. Trials marked in italics took place in the separate arena; all others took place in the test pens.

3.3.1 Familiarization

For the first three days, the experimenter would sit inside of each test pen for 15 minutes. The experimenter spoke quietly throughout, in a calm tone characterized by longer duration sounds (Waiblinger et al., 2002). This was repeated in each test pen. The experimenter wore the same pair of blue overalls during familiarization, as well as in all trials.

3.3.2 Attentiveness trials

Following each familiarization session, the experimenter entered the test pen and knelt, holding out a small colored bowl (either blue or red) just above the eye level of the test pair so they could not see inside. The color of the bowl was counterbalanced between groups. Each session began with a verbal cue, then the experimenter held out the bowl with a neutral expression for 30 seconds. Trials were recorded on a GoPro Hero 11, and a virtual circle of approximately 12 cm in diameter was placed around the bowl in the experimenter's hands. Each test pair was scored together for the total time spent in proximity to the bowl (within approximately 3 cm) and the total time spent with both their head and body facing the bowl.

3.3.3 Choice task

With a partition obscuring the view of the test pair, the experimenter placed a red and blue bowl side-by-side in the test pen, each containing approximately 1 oz of corn kernels. The partition was removed, and the test pair was allowed to feed from the bowls ad libitum for three minutes. Trials were recorded, and virtual circles of approximately 12 cm in diameter were placed around each bowl. Each test pair was scored together for the latency to approach the bowls, the color of the bowl that was first approached, the latency to peck inside of a bowl, and the total amount of time spent in proximity to the bowls.

3.3.4 Novel arena trials

The individual bird being tested was transported to the arena by the experimenter and placed on the ground in darkness. The trial began when the lamps were switched on, and lasted for five minutes. Each individual bird was tested twice, once alone and once with the experimenter seated quietly in the corner of the arena. The corner that the experimenter sat in was the same across all trials. Trials were recorded, and a virtual 6 x 6 grid was overlaid on the arena, as well as a virtual circle of approximately 12 cm in diameter around the novel object. The color of the novel object was swapped in between trials. Which novel object was used in which trial and the order of trials was counterbalanced across groups. The individual bird's overall activity was scored as the total number of times it crossed a grid line. Each bird was also scored for the total amount of time spent in proximity to the novel object and the total amount of time spent within the quadrant that the experimenter sat in (even when the experimenter was not present in the arena).

3.3.5 Fear response trials

The test pair was transported to the arena by the experimenter and placed on the ground with the lights on. The trial began with a ten minute habituation period, and then a loud anthropogenic noise (i.e. a door slam or mechanical bang) was played through an overhead speaker. Each test pair was tested twice, once on their own and once with the experimenter seated quietly in the corner of the arena. Which noise was used in which trial and the order of the trials was counterbalanced across groups. The corner that the experimenter sat in was the same across all trials. The three minutes following playback were recorded, and a virtual 6 x 6 grid was overlaid on the arena. The anthropogenic noise was swapped between trials. Each test pair was scored together for the latency to first step, the latency to first peck the ground, and the latency to first cross a gridline.

3.4 Data analysis

No breed distributions met the criteria for normal distribution (Shapiro Wilk, $p < 0.001$), and so the data was analyzed using non-parametric tests in the software RStudio (2021.09.0 Build 351). Independent Kruskal-Wallis tests were used to compare differences between breeds, followed by multiple pairwise comparisons via the Dunn test, adjusted by the Bonferroni correction. Pearson's Chi Squared test was used to determine whether there was a breed difference in which color bowl they approached first during the choice task. Wilcoxon Signed-Rank tests were used to compare each breed group's behavior in the arena with and without the experimenter present.

4 Results

4.1 Breed group differences

Summary measures of all the behaviors recorded for each breed are listed in the Appendix. Several trials were removed from analysis due to technical issues with video recording (Attentiveness: 2/24 HF, 3/24 PG, 2/21 WL; Novel arena: 4/12 LF; Fear response: 2/16 HF, 2/16 PG).

4.1.1 Attentiveness

During the three-day attentiveness trial, no significant differences were found in behavior based on the day, so the data from these days were combined into a single group. The amount of time spent with both head and body facing the bowl in the experimenter's hands differed significantly by breed (Kruskal-Wallis $\chi^2 = 27.139$, df = 3, $p < 0.001$, Fig. 6), where the WL group faced the bowl for longer than both the HF ($p < 0.001$) and the PG group ($p < 0.001$).

The amount of time spent in proximity to the bowl in the experimenter's hands also differed significantly by breed (Kruskal-Wallis $\chi^2 = 32.715$, df = 3, $p < 0.001$, Fig. 6), where the WL group was close to the bowl for significantly longer than the LF group ($p = 0.0016$), the HF group ($p < 0.001$), and the PG group ($p < 0.001$).

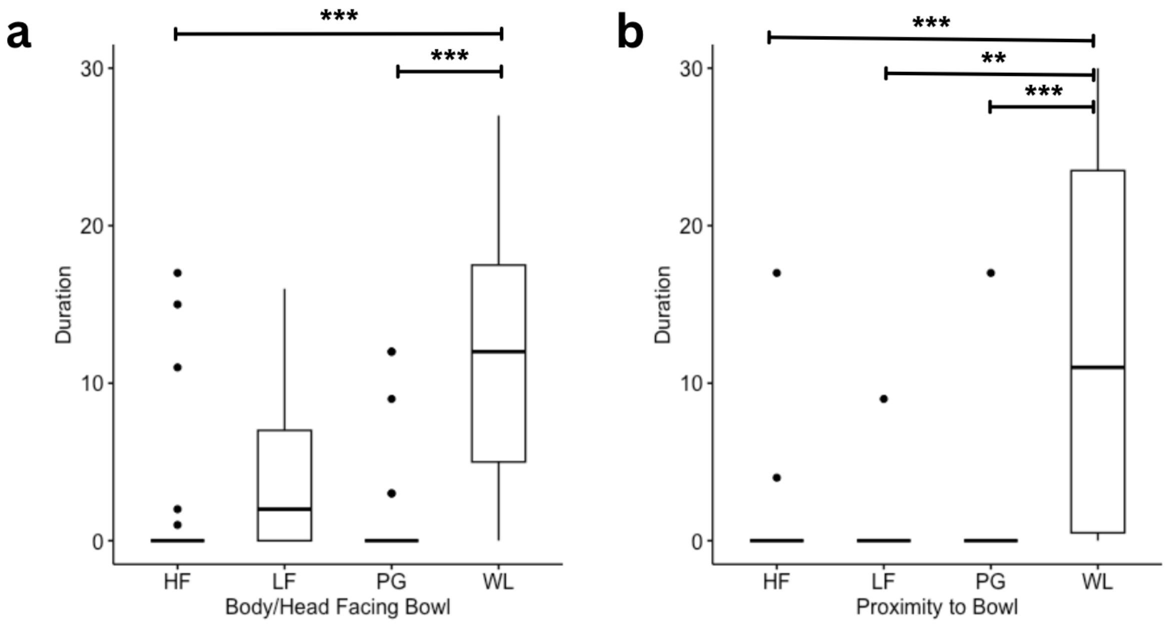


Figure 6: Mean duration of a) body and head oriented in the direction of the bowl, and b) time spent in proximity to the bowl. *** $p < 0.001$, ** $p < 0.01$

4.1.2 Choice task

The latency to approach the bowls after the partition was first removed differed significantly by breed (Kruskal-Wallis $\chi^2 = 12.831$, df = 3, $p = 0.0050$, Fig. 7), where the WL group approached the bowls faster than both the HF group ($p = 0.0029$) and the PG group ($p = 0.064$). The latency to first peck in a bowl differed significantly between breeds as well (Kruskal-Wallis $\chi^2 = 15.051$, df = 3, $p = 0.0018$, Fig. 7), where the WL group was faster than both the LF group ($p = 0.017$) and the HF group ($p = 0.0031$).

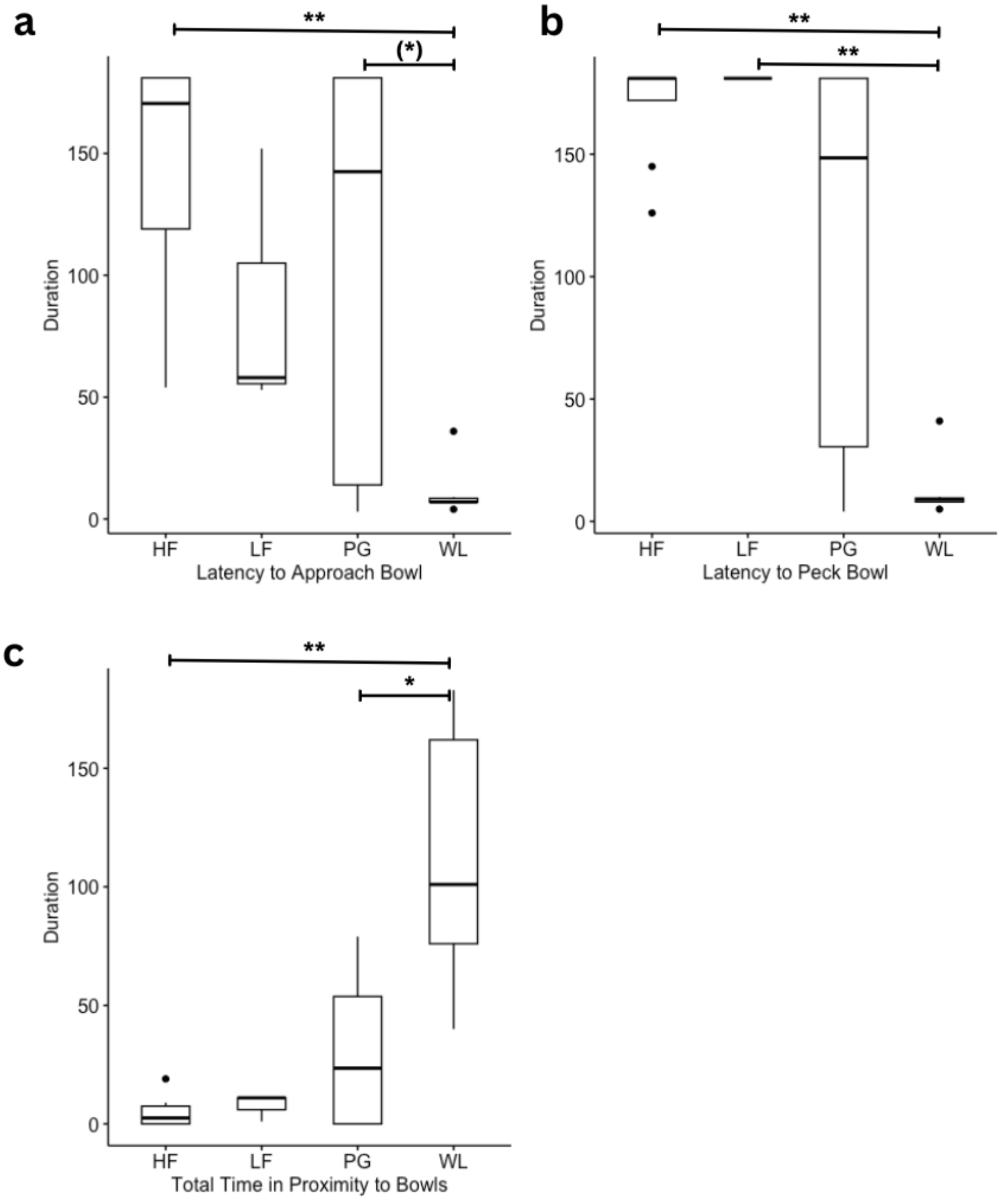


Figure 7: Mean duration of a) latency to approach bowls, b) latency to peck inside of a bowl, and c) time spent in proximity to bowls. ** $p < 0.01$, * $p < 0.05$, (*) $p < 0.1$

The total amount of time spent in proximity to the bowls also differed significantly by breed (Kruskal-Wallis $\chi^2 = 13.164$, df = 3, $p = 0.0043$, Fig. 7), where the WL group spent more time near the bowls than both the HF group ($p = 0.0034$) and the PG group ($p = 0.040$).

No significant association was found between breed and whether or not the bird approached the treatment bowl first ($\chi^2 = 8.5777$, df = 6, $p = 0.20$, Table 1).

Table 1: Number of groups per breed that first approached the treatment color bowl (Y), the alternative color bowl (N), or neither bowl.

Breed	Y	N	Neither
"High fear" red junglefowl	2	2	4
"Low fear" red junglefowl	2	1	0
"Parental" red junglefowl	1	3	4
White Leghorn	3	4	0

4.1.3 Novel arena

Activity alone in a novel arena differed significantly between the four breed groups (Kruskal-Wallis $\chi^2 = 17.934$, df = 3, $p < 0.001$, Fig. 8), where the WL group moved around the arena more than the PG group ($p < 0.001$). The same difference in activity occurred when the experimenter was present in the field (Kruskal-Wallis $\chi^2 = 12.909$, df = 3, $p < 0.001$, Fig. 8).

Time spent in the specified quadrant did not differ significantly between breed groups when the experimenter was not present (Kruskal-Wallis $\chi^2 = 1.4862$, df = 3, $p = 0.69$, Fig. 8). However, when the experimenter was present and seated in the quadrant, the time spent in the quadrant differed significantly between breeds (Kruskal-Wallis $\chi^2 = 16.729$, df = 3, $p < 0.001$, Fig. 8), where the HF group spent less time in the quadrant than either the WL (*p* = 0.0035), the LF (*p* = 0.016, or the PG group (*p* = 0.038).

Time spent in proximity to the novel object did not differ significantly between groups when they were alone in the arena (Kruskal-Wallis χ^2 = 1.0262, df = 3, *p* = 0.79, Fig. 8), or when the experimenter was present (Kruskal-Wallis χ^2 = 3.48, df = 3, *p* = 0.32, Fig. 8).

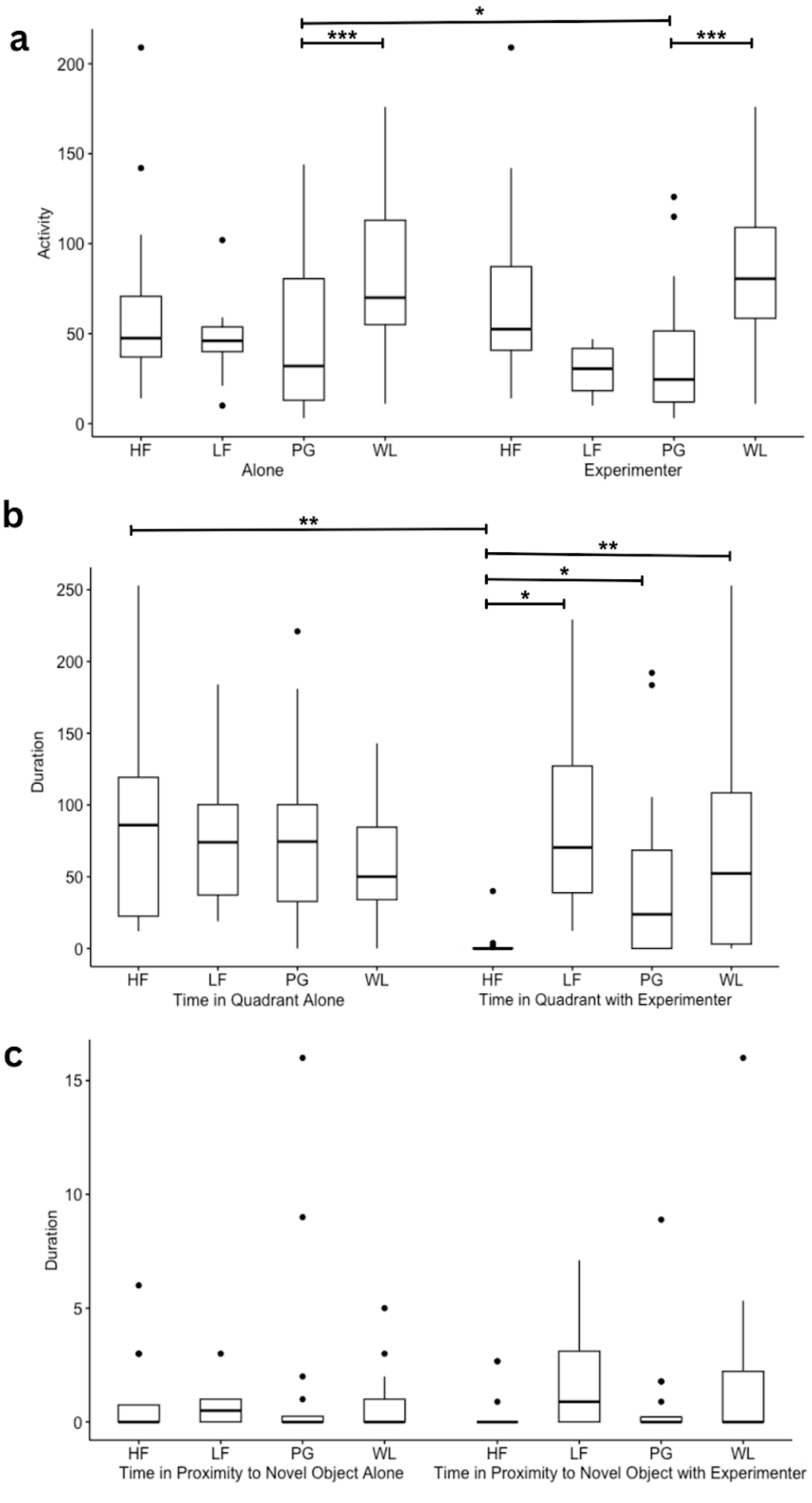


Figure 8: Mean a) activity, b) duration of time inside a specified quadrant, and c) time in proximity to the novel object. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

4.1.4 Fear response

When exposed to a frightening auditory stimulus while alone in an open field, there was no significant difference between breeds in latency to first step (Kruskal-Wallis $\chi^2 = 0.41964$, df = 3, $p = 0.94$, Fig. 9), peck the ground (Kruskal-Wallis $\chi^2 = 0.61753$, df = 3, $p = 0.89$, Fig. 9), or move to a new square of the grid (Kruskal-Wallis $\chi^2 = 1.288$, df = 3, $p = 0.73$, Fig. 9). Similarly, there was no significant difference in these behaviors when the experimenter was present (Step: Kruskal-Wallis $\chi^2 = 1.0837$, df = 3, $p = 0.78$; Peck: Kruskal-Wallis $\chi^2 = 1.3111$, df = 3, $p = 0.73$; Move: Kruskal-Wallis $\chi^2 = 1.5937$, df = 3, $p = 0.66$; Fig. 9).

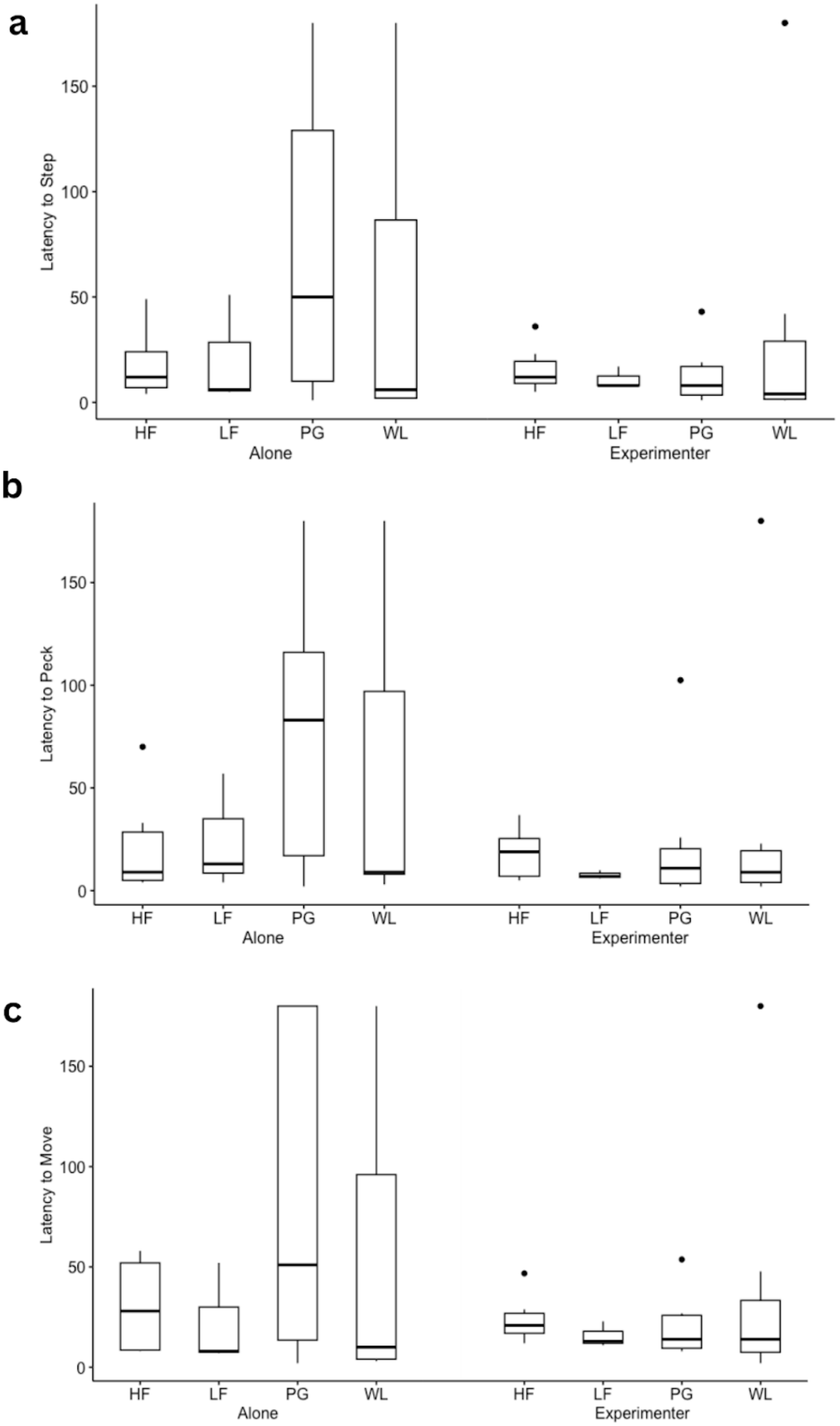


Figure 9: Mean latency to a) step, b) peck the ground, and c) cross a gridline.

4.2 Human presence

When the experimenter was present in the novel arena, the HF group spent significantly less time in the same quadrant as the experimenter ($V = 131.5$, $p = 0.0011$, Fig. 8). In addition, the PG group was significantly less active when the experimenter was present ($V = 113.5$, $p = 0.020$, Fig. 8). The WL and LF groups showed no significant difference in either behavior when the experimenter was present ($p > 0.1$). The experimenter's presence did not significantly affect the time spent in proximity to the novel object in any breed group ($p > 0.1$, Fig. 8). In response to a frightening auditory stimulus, the experimenter's presence had no significant effect on the latency to unfreeze in any breed group ($p > 0.1$, Fig. 9).

5 Discussion

The HAR has been studied in a number of domesticated species, including cats, dogs, and horses, as well as a large variety of agricultural animals, including cattle, goats, pigs, and sheep (Jardat & Lansade, 2021). Chickens are the most abundant domesticated animal, with a global population of over 33 billion individuals as of 2020 (Food and Agricultural Organization of the United Nations, 2023), and yet we know surprisingly little about the human-chicken relationship. The present study was intended to begin describing the interactions between chickens and a familiar human in a variety of contexts, in the hopes of establishing paths for future research.

During the attentiveness trials, the WL group was most attentive to the experimenter, facing the bowl in her hands for significantly longer than the PG or HF groups, and standing in close proximity to the bowl for significantly longer than any other group. In a previous study comparing "looking behavior" in socialized dogs and wolves, the dogs would look to a human when faced with an impossible task, while the wolves would not (Miklósi et al., 2003), which implies that human contact-seeking is a behavioral change that arose through the domestication process. However, this is not necessarily a general rule across species: socialized red junglefowl chicks have previously been reported to seek contact with a familiar human (Rubene & Løvlie, 2021). In the present study, the domesticated WL group demonstrated the greatest degree of contact-seeking behavior with the experimenter.

In the choice task, the WL group was most eager to interact with the bowls overall. However, it is unclear whether they had obtained information about the bowl from previously observing the experimenter's behavior, since the color that the group first approached was not affected by the color of the treatment bowl that they had been previously shown in the attentiveness trials. Studies on ravens (*Corvus corax*) have shown that observation does not necessarily infer referential communication: although ravens had previously been demonstrated to follow the gaze of a human experimenter (Bugynar et al., 2004), in a later study they were unable to locate hidden food in an object choice task based on human gaze cues alone (Schloegl et al., 2008). Dogs, cats and horses have been observed to adapt their own behavior towards a novel object based on a familiar human's behavior towards it, such as the intonation of their voice or the emotions displayed in the object's presence (Jardat & Lansade, 2021). In the present study, the experimenter's behavior remained neutral throughout the attentiveness trial. Further study on social communication between humans and chickens should investigate different possible contexts where referential information could be communicated and utilized.

The novel arena and fear response trials investigated the impact of human presence on chicken behavior in a stressful situation. For the trials with no human presence, the experimenter was hidden outside of the arena and behind a visual barrier. This barrier was positioned next to the same quadrant that the experimenter would sit in during trials with human presence. During the novel arena trials without human presence, all breeds spent the same amount of time in that quadrant, implying that the experimenter sufficiently escaped detection. During the trials with human presence, the HF group spent less time in that quadrant, presumably to avoid proximity to the experimenter, and the PG group was less active. The behavior of the WL and LF groups was unchanged by the experimenter's presence. During the fear response trials, ambulation latency in response to a sudden anthropogenic noise did not significantly change between trials. This was observed across all breed groups, regardless of domestication status. A visible human in an open field has been shown to increase ambulation latency in chicks reared with minimal exposure to humans (Suarez & Gallup, 1982). However, familiarization has been shown to lower a chicken's fear response to human presence (Barnett et al., 1994). In both the novel arena and the fear response trials, WL and LF behavior remained consistent regardless of human presence, which indicates that these groups were habituated to the experimenter. If the experimenter had acted as a social buffer, her presence in the arena would have reduced their fear response (Edgar et al., 2015), and therefore human presence did not appear to buffer the stress of these birds. The behavior of the HF and PG groups depended on the context: exploratory behavior was suppressed by human presence in the novel arena trials, but ambulation latency remained consistent between the fear response trials. In the latter test, the birds were in pairs, so perhaps the presence of a conspecific buffered their stress.

The small sample size of the LF group was a limitation for the study, but there were still observable differences in behavior based on selection for tameness. The domesticated WL group interacted more with the familiar experimenter, and human presence did not contribute negatively to stressful situations. This implies that the selection process of domestication does improve the quality of the human-chicken relationship. Further, the consistency of WL and LF behavior in the open field trials supports the idea that familiarization habituates chickens to human presence. In commercial farming, one of the regular stressors that chickens face is contact with humans (Jones, 1996; Hemsworth & Coleman, 1998), so habituation through a familiarization process would contribute greatly to their welfare. Familiarization in this study consisted of several sessions of calm and positive contact, both visual and verbal, but not physical (some individuals did establish physical contact by perching on and investigating the experimenter, but this was not initiated by the experimenter herself). Previous studies have demonstrated that positive physical contact, such as gentle handling and petting, helps habituate chickens to human presence and reduces overall fear of humans (Barnett et al., 1994; Graml et al., 2008; Bertin et al., 2019). It was necessary to handle the birds in this study when transporting them between the test pen and the arena, which may have added a predatory overtone to the open field trials (Suarez & Gallup, 1981). In a future study, positive physical contact should be incorporated into the familiarization process to see whether this could further improve the outcome.

6 Societal and Ethical Considerations

Chickens are the most abundant domesticated animal in the world, and yet there is relatively little study into how these birds perceive and navigate the captive environment. One could blame our inherent mammalian biases for this disparity, or perhaps it is because of the bird's great abundance: they are so internationally ordinary that fewer people are attracted to study them. Regardless, a more conscious effort needs to be made in future research to give these birds proper attention. Agricultural animals are generally overlooked, both in the research community and in society. In an increasingly urbanized world, more and more people will go their entire lives without ever interacting with the animals that they consume, essentially decoupling animal products from their source. This weakens public understanding of the welfare needs of commercially raised species. Studies that strive to describe these animals as living, breathing organisms with a unique repertoire of cognitive abilities serve to reestablish and strengthen this connection, with the hope to inspire passion for ethical welfare research and legislation.

Additionally, commercial chicken facilities have become increasingly automated in recent years. This has reduced the level of human contact in a hen’s life, arguably worsening the stress of the inevitable situations where human interaction is necessary (e.g. visual presence from daily maintenance of the facility). Research into the habituation of chickens to human presence will help us to better understand how we can foster healthy human-chicken relationships that will improve welfare in commercial facilities. We can then use this research to develop efficient familiarization procedures that would be practical for a stockperson to implement in an industrial environment.

7 Acknowledgements

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8 References

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Appendix

Mean, standard deviation, median, and interquartile range of data collected for all trials.

Trial	Behavior	Breed	Count	Mean	SD	Median	IQR
Attentiveness	Head/body facing bowl (s)	HF	22	2.09	5.09	0	0
		LF	9	4.56	5.32	2	7
		PG	21	1.86	3.97	0	0
		WL	19	11.7	8.35	12	12.5
	Time in proximity to bowl (s)	HF	22	0.955	3.68	0	0
		LF	9	3	0	0	-
		PG	21	0.810	3.71	0	0
		WL	19	12.5	11.5	11	23
Choice task	Latency to approach bowls (s)	HF	8	147	46.5	170	62
		LF	3	87.7	55.8	58	49.5
		PG	8	107	84.9	142	167
		WL	7	11.1	11.1	7	1.5
	Latency to peck bowls (s)	HF	8	170	21.7	181	9
		LF	3	181	0	181	0
		PG	8	112	80.1	148	150
		WL	7	12.9	12.5	9	1.5
	Total time near bowls (s)	HF	8	5	6.59	2.5	7.5
		LF	3	7.67	5.77	11	5
		PG	8	29.4	32.7	23.5	53.8
		WL	7	114	56.1	101	86
Novel arena	Activity	HF	32	60.8	38.8	47.5	33.8
		LF	8	46.9	27.8	43.5	21.5

		PG	32	46.1	41.1	32	67.5
		WL	28	85.7	45.3	70	58
	Time in quadrant (s)	HF	32	45.3	63.7	14.5	86
		LF	8	104	75.0	98	71.8
		PG	32	63.5	64.5	56	95.5
		WL	28	68.0	65.8	50	81
	Time in proximity to novel object (s)	HF	32	0.688	1.47	0	0
		LF	8	1.5	2.73	0.5	1.25
		PG	32	1.34	3.56	0	0.25
		WL	28	1.71	3.68	0	1.25
Fear response	Latency to step (s)	HF	14	16.9	13.1	12	14.5
		LF	6	15.8	17.7	8	8.25
		PG	14	43	59.1	16.5	45.5
		WL	14	43.6	72.4	5	33.5
	Latency to peck the ground (s)	HF	14	19.2	18.5	13.5	20.5
		LF	6	15.7	20.5	7.5	6.75
		PG	14	49.1	58.7	19.5	92.8
		WL	14	45.3	73.2	9	16.2
	Latency to cross gridline (s)	HF	14	26.9	17.9	22	29.8
		LF	6	18.5	17.3	11	11
		PG	14	54.3	69.9	23.5	44.2
		WL	14	47.5	72.7	11	35.8