DEPARTMENT
OF AGRICULTURAL, FOOD
AND ENVIRONMENTAL SCIENCES

2023 PSA Annual Meeting
July 10-13, 2023 | Philadelphia, PA
Philadelphia Marriott Downtown

Optimizing reliability, accuracy, and validity of three scan sampling intervals in the behavioral observations of slow growing broiler chickens

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OBJECTIVE

In the present study, we hypothesized that the length of the sampling interval could affect the results and, consequently, the conclusions drawn and the interpretations made about poultry behavior. Therefore, we evaluated the reliability, accuracy, and validity of three different sampling intervals (i.e., 10, 15, and 30 minutes) for the behavioral observations of broiler chickens.

MATERIALS AND METHODS

A total of 400 one-day-old chicks (100 chicks/breed of both sexes) of four different slow-growing chicken genotypes (A, B, C, and D) was randomly housed in 8 pens (2 pens/genotype, 50 birds each) and raised in a free-range system. From 42 to 81 days, 2 videos/week of 2 hours length for each replicate were performed. Each video was analysed with three different sizes of sample intervals (10-min, 15-min, and 30-min) by two expert observers. At each scan the same length of observation (10 seconds) was performed.

STATISTICAL ANALYSIS

The behaviors were classified using the binning technique applied to the recordings at 10-min intervals in Low-, Medium- and High- occurrence. The Bland Altman test was applied as an innovative statistical approach to compare sample intervals and to support the researcher choices. Moreover, the validity of the three scan sampling intervals was evaluated in an experimental trial by the application of the Odds Ratios (ORs).

RESULTS

The funnel-shaped in the Bland-Altman plots (Figure 1 a-b) indicates that differences in the relative percentages tend to decrease as the occurrence of the behavior increases. Thus, the percentage of animals engaging in rare behaviors could be overestimated or underestimated by up to 2-fold compared to that under the 10-min sampling interval, while the relative differences are smaller for more frequent behaviors.
The Odds Ratios (ORs) showed that for three out of six comparisons between genotypes (Figure 2 a-c), there was a difference in the OR for the Attacking behavior estimated by the three sampling methods ($p<0.05$). Differences among the ORs estimated by different sampling intervals were also found for Walking and Dust bathing in the comparison between A and C chickens ($p<0.01$; Figure 2d). However, these differences did not influence the interpretation of the ORs, as Walking and Dust bathing were significantly higher in A chickens than in C animals with all sampling methods.

CONCLUSION

The present study indicated that 30-minute sampling interval could be applied in complex experimental designs characterized by a high number of chickens and comparison of several experimental factors (e.g., genotypes, diets) if the aim is to characterize broad behavioral differences such as locomotor activity and foraging. Conversely, sampling intervals shorter than 10 minutes are necessary for studies requiring the analysis of rare behaviors, such as aggression, stereotypies, and allopreening.

KEYWORDS

Behavior occurrence, chickens, scan sampling method, interval length, Bland-Altman plots

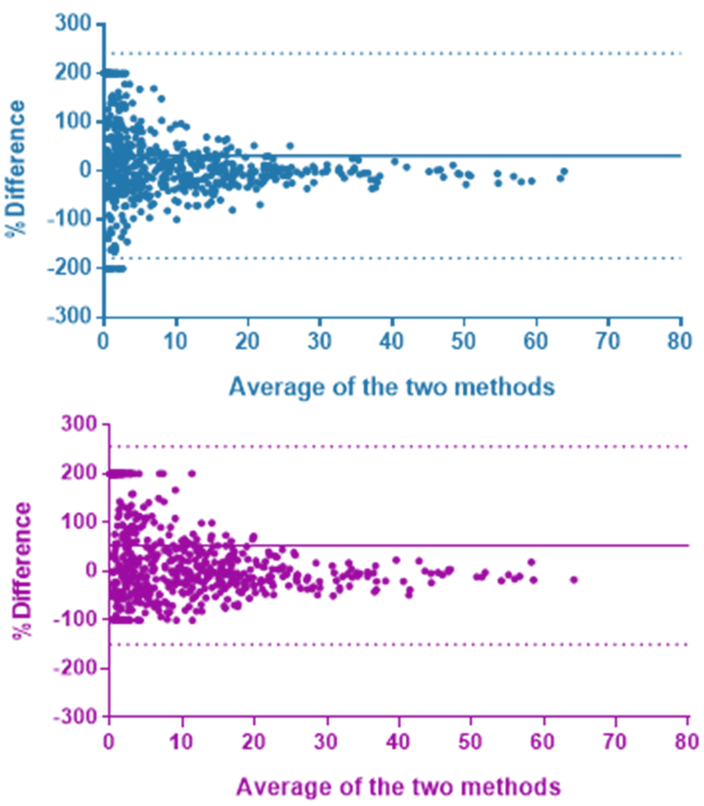

Figure 1. Bland–Altman plots of the percent differences between 10- and 15-minute (Panel a) and between 10- and 30-minute (Panel b) intervals.

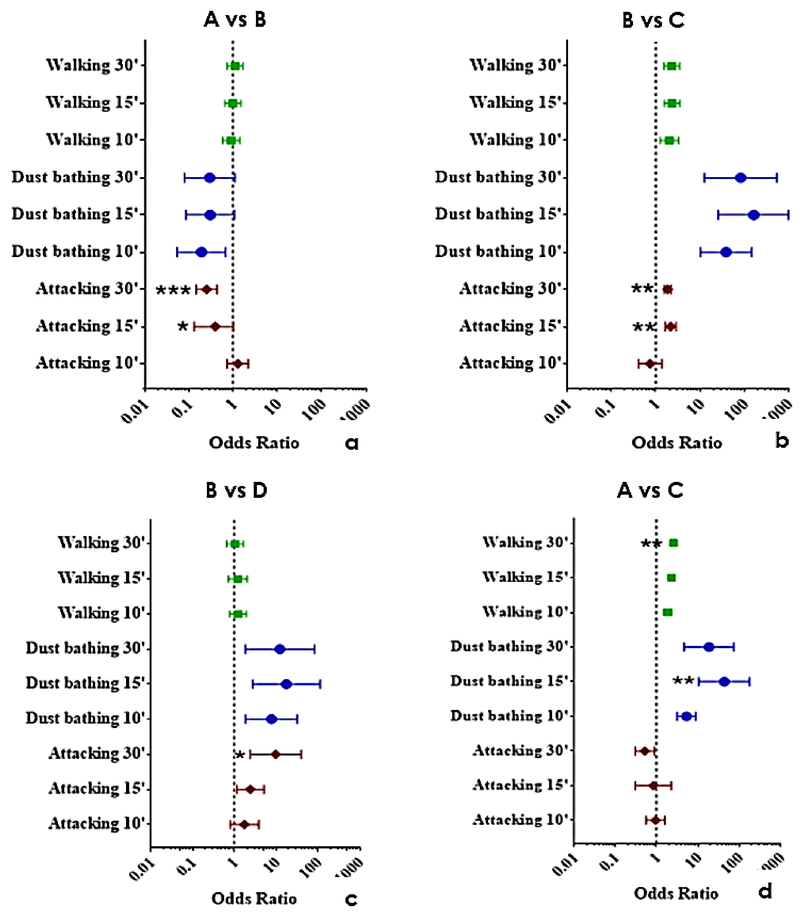

Figure 2. Odds ratios for the genotype effect (a-d) under the three sampling methods on high-, medium- and low-occurrence behaviors (Walking, Dust bathing and Attacking, respectively). ***P<0.001, **P<0.01, and *P<0.05 vs. 10-min interval data on each behavior.

Acknowledgements

The research was funded by H2020 Project INTAQT Grant agreement ID: 101000250