

The Effect of the Age on the Contrafreeloading Activity of Female Goats at the Agriculture Educational Center

 J.N. Andrews
Honors Program
Andrews University

Daryna Kulinich
Advisor Katherine Koudele, PhD
Department of Sustainable Agriculture

 Department of
Sustainable Agriculture
Andrews University

Abstract

Contrafreeloading is the tendency of animals to work for food despite an identical resource available for free with no extra effort required. This study investigates the effect of age on the contrafreeloading (CFL) behavior of female Guernsey goats, hypothesizing that the younger goats will engage in more CFL than older goats. Guernsey goats at Andrews University Agriculture Education Center were split into three age groups: 1) mature does (age 6-7 years, n=3), 2) young does (age 2 years, n=4), and doe kids (3-5 months old, n=6). Each goat underwent three trials in three weeks (one trial/week). During the five-minute trials, each goat walked individually into the test pen and found two choices of alfalfa hay. The first choice was freely available, while the second was in a suspended bin with holes for more challenging access and permitting the animals to engage in CFL. The amount of hay eaten each week was measured and was statistically significant among the age groups. The hypothesis was supported that the doe kid group would express an increased interest in CFL behavior.



Introduction

Contrafreeloading (CFL) is the tendency of animals to work for food despite an identical resource available for free or fed ad libitum. Although contrafreeloading is strongly linked to domestics, some wild animals—from zoos or rescues—display this behavior. It appears to be involved with gathering information about various food sources and demonstrates the need for brain-stimulating activities in domestic or captive animals. According to McGowan, Robbins, Alldredge, & Newberry (2009), "contrafreeloading may be an artifact of captivity" (p.485). While wild animals are always busy fulfilling basic needs, while domestic animals have everything provided; hence they have extra energy and time for this activity. Captive animals can lack mental stimulation, so by CFL, they find ways to expend the excess energy into something useful. Delgado, Sang Gyu Han & Bain (2021) state that "Domesticated and captive animals often are encouraged to engage in foraging behaviors as a form of enrichment" (p.1). It is widely used by facilities such as zoos with many captive wild animals to avoid the formation of harmful vices. Among domestic animals, cats are the one exception.

In a study with dwarf and dairy goats (Rosenberger, Simmler, Nawroth, Langbein, & Keli, 2020), the different productivity levels were compared to the amount of CFL activity. In other words, the question was, would the higher producing animals (dairy goats) exhibit higher levels of CFL? Overall, there was no significant difference between the dairy and dwarf goats' decision to contrafreeload. Both breeds approached the closed door (the hard-to-get food) to get the food, even though the same was offered in an open stall, so production level was not an important factor in the decision to CFL. The studies on domesticated animals suggest that animals exhibit CFL in various amounts and open the possibilities for further studies of different types of animals.

Methodology

The testing area was located near goats' pen-mates to eliminate stress-induced behaviors. Test trials were run with goats not included in the study to determine the time frame for each trial. Before the experiment, all goats experienced habituation trials to get familiar with the surrounding. Guernsey goats at Andrews University Agriculture Education Center were split into three age groups: 1) mature does (age 6-7 years, n=3), 2) young does (age 2 years, n=4), and doe kids (3-5 months old, n=6). Goats received food the night before the trial but consumed nothing in the morning to stimulate participation. Each goat underwent three trials in three weeks (one trial/week). During the five-minute trials, each goat walked into the test pen individually and found two alfalfa hay choices. The first choice was freely available, while the second was in a suspended bin with holes for more challenging access and permitting the animals to engage in CFL. Goats marked as participating walked towards the contrafreeloading apparatus and began feeding. If the goat did not participate within the given time, the trial was marked as "no participation," and the subsequent trial began. Consumed hay was weighed before and after each trial session for each goat. Each contrafreeloading (CFL or easy choice bin) initially had 300g of hay, which was replenished after trials.

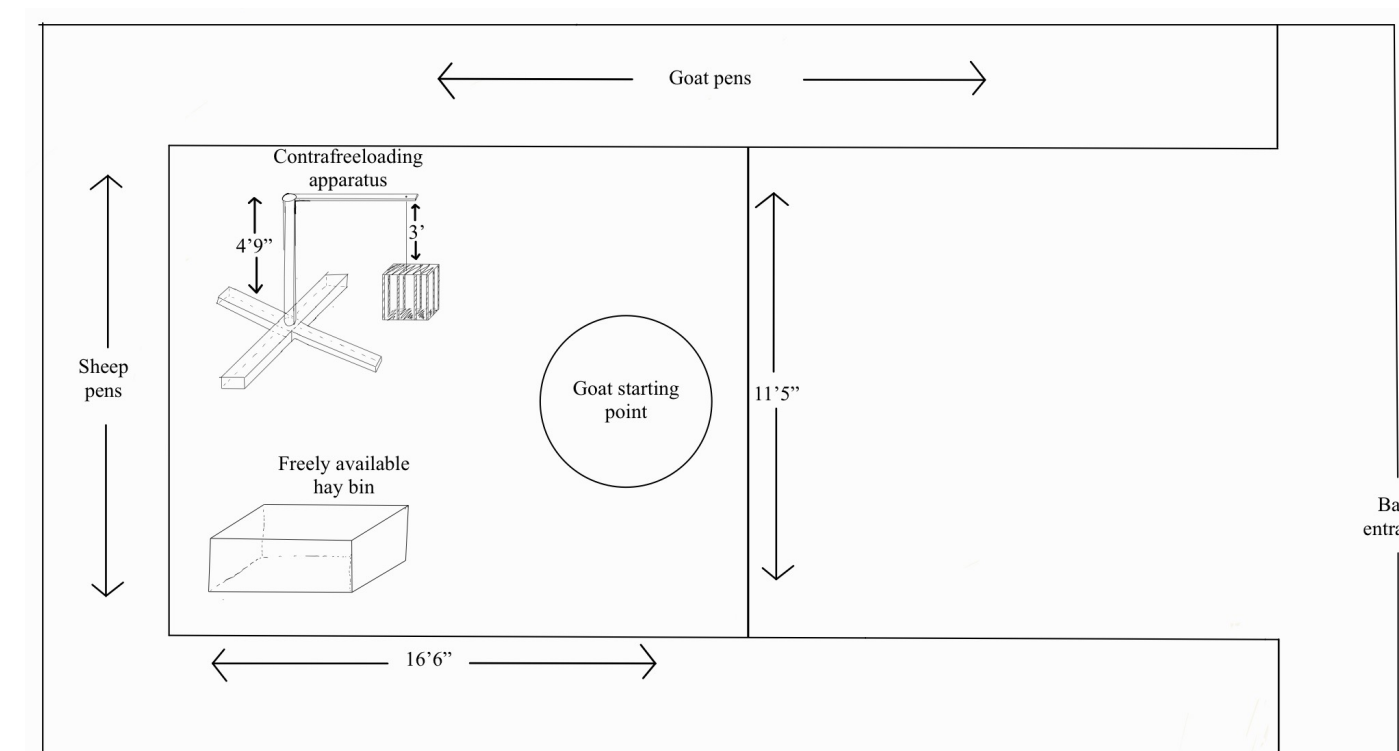


Figure 1: Testing Area

Results & Data

All statistical analyses were performed in Jamovi Software. I ran a Repeated Measures ANOVA with a 0.05 α -value. Such analysis allows to analyze multiple groups of related dependent variables under different conditions and at different periods. The "week" ($p=0.393$) or "group" ($p=0.165$) factors in the repeated measures ANOVA (Figure 2) alone were not found to be statistically significant with the 0.05 α -value, however, the relationship between the week*group ($p=0.021$) is statistically significant. With the statistically significant interactions between "group" and "week," I can conclude that groups were more likely to engage in CFL behavior with the progression of weeks and trials. Drawing from this conclusion and Figure 3, the baby goat group increasingly participated in CFL by weeks.

Repeated Measures ANOVA

Within Subjects Effects					
	Sum of Squares	df	Mean Square	F	p
Week	8170.2020	2	4085.1010	0.9838	0.39310
Week * GROUP	63122.2222	4	15780.5556	3.8006	0.02071
Residual	74738.8889	18	4152.1605		

Note. Type 3 Sums of Squares

Between Subjects Effects					
	Sum of Squares	df	Mean Square	F	p
GROUP	32402.7778	2	16201.3889	2.2142	0.1652
Residual	65852.7778	9	7316.9753		

Note. Type 3 Sums of Squares

Figure 2: Repeated Measures ANOVA

Results & Data

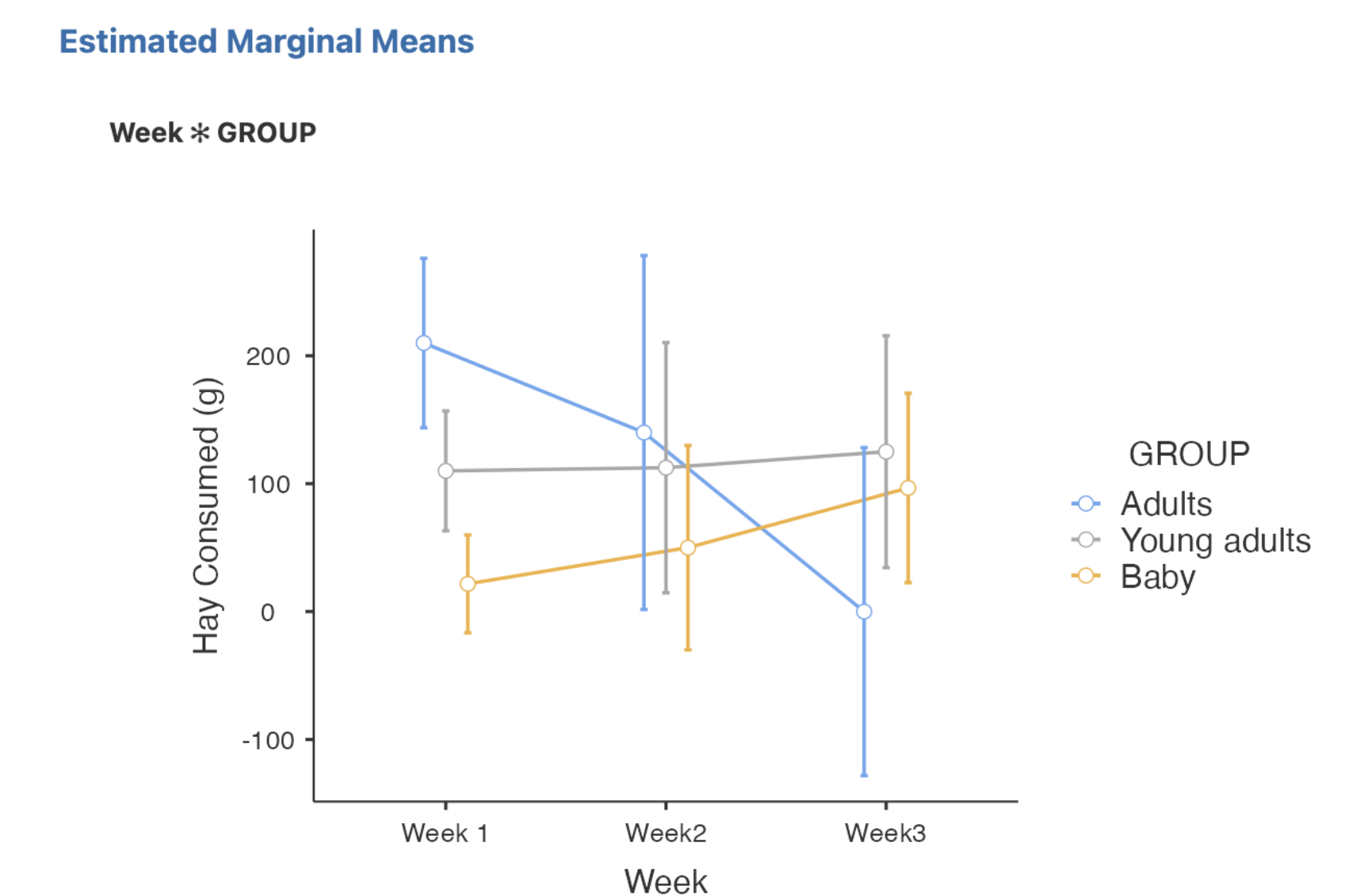


Figure 3: Repeated Measures ANOVA, Estimated Marginal Means graph

Discussion

All three groups were motivated to work for food, nonetheless, adults were more vigilant in early trials, presumably to higher stress reactivity. Another possible variable that should have been considered when the trials were designed that could significantly impact the results is the upbringing of different groups. The adult group was not bottle-raised as kids, while the young adults were 100% bottle-raised, and kids were 50/50% between bottle-raised and dam-raised. Bottle-raising goats tend to be friendlier, seek food from, and feel much more comfortable around humans. In line with my hypothesis, the doe kid group expressed an increased interest in CFL behavior with each trial. Contrary to my expectations, three groups individually did not show a difference in CFL behavior but rather changes in responses with the increasing trial number. This was a pilot study, and future research can benefit from a larger sample size.

Bibliography

- Andrews, C., Viviani, J., Egan, E., Bedford, T., Brilot, B., Nettle, D., & Bateson, M. (2015, September). *Early life adversity increases foraging and information gathering in European starlings, Sturnus vulgaris*. Elsevier Ltd.
- Bessa Ferreira, V. H., Simoni, A., Germain, K., Leterrier, C., Lansade, L., Collin, A., Mignon-Grasteau, S., le Bihan-Duval, E., Guettier, E., Leruste, H., Calandreau, L., & Guesdon, V. (2021, March). *Working for food is related to range use in free-range broiler chickens*. Scientific Reports.
- Delgado, M. M., Sang Gyu Han, B., & Bain, M. J. (2021, July). *Domestic cats (Felis catus) prefer freely available food over food that requires effort*. Springer Publishing.
- Frederick, M. J., & Cocuzo, S. E. (2017, September). *Contrafreeloading in Rats is Adaptive and Flexible: Support for an Animal Model of Compulsive Checking*. SAGE Publications.
- Rosenberger, K., Simmler, M., Nawroth, C., Langbein, J., & Keli, N. (2020, December). *Goats work for food in a contrafreeloading task*. Scientific Reports.
- Sasson-Yenor, J. (2017, May 5). *Assessing Preference for Contrafreeloading and Other Feeding Strategies in Giraffe (Giraffa camelopardalis)*. CUNY Academic Works.
- Van Os, J. M. C., Mintline, E. M., DeVries, T. J., & Tucker, C. B. (2018, March). *Domestic cattle (Bos taurus Taurus) are motivated to obtain forage and demonstrate contrafreeloading*. PLOS ONE.