

Evaluation of the feeding time and reactivity of foals to the introduction of unknown objects in the feeder during feeding

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Abstract: The aim of this study was to evaluate the feeding time and reactivity of foals to the introduction of unknown objects in the feeder together with the concentrate. Eleven foals were used, five females and six males, with ages between 10 and 12 months. The animals were housed in Coast Cross pasture and fed with concentrate, made with soybean meal, wheat bran and core, given to supply 20% of their nutritional requirement. Time of consumption without and with the objects (plastic balls) was recorded for three consecutive days and the means were calculated. Behavioral observations were made during the time the objects were placed in the feeders, and scores were assessed to three behavioral variables. There was an effect ($p < 0.05$) of gender on the feeding time of the concentrate, both without and with the object, with a shorter time for females. No gender effect ($p > 0.05$) was observed for the variables Position of Eyes, Position of the Ears, Vocalization and Snorting. Moving objects in the feeder do not increase or decrease feeding time. Females consume the concentrate with and without the objects faster than males, which show greater reactivity and alertness.

Keywords: alimentation, environmental enrichment, equine

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Introduction

After domestication, the areas available for horse grazing were reduced and the concentrated feed was often introduced into the diet, reducing the feeding time of the animal, which could lead to disorders in behavior. Ribeiro et al. (2009) studying the behavior and eating disorders of horses fed with concentrate and horses fed with hay (Tifton), reported that horses that received hay spent more of their time feeding, thus shortening leisure time, in addition to reducing the occurrence of behavioral disorders.

Meyer (1995) reported that the feeding time of roughages for horses is 40-60 minutes/kg of product, while the feeding time for concentrate is 20 minutes/kg of product. Horses have a normal feeding pattern of small meals at frequent intervals, usually consuming 10 meals a day, devoting approximately 53% of their day to feeding activities (Ralston, 1984).

Haenlein et al. (1966) informed that young horses receiving a completely pelleted diet developed nervousness, wood chewing and chewing of other horse's tails and manes. Some researchers believe that boredom related primarily to increased leisure time is one of the major causes of behavioral disorders in equines (Jackson et al., 1984; Turner et al., 1984; Krzak et al., 1991). Anxious animals show consumption of concentrate at higher speeds which can lead to inadequate use of the nutrients, in addition to digestive disorders such as colic. Little is known about alternatives to decrease the rate of concentrate consumption by equines. For these animals, alternatives have been tested in everyday situations, like the introduction of large rocks in the feeders, but no scientific evidence has been described of this.

It is important to know the temperament of the animal so that preventive actions can be taken, and this refers to its nature, reflecting its behavior regards new stimuli and challenges. The presentation of new objects during feeding can alter the response of the animal, behavior known as reactivity, which is the animal's action in the face of new challenges.

The aim of the present study was to evaluate the time of consumption and the reactivity of foals, males and females, to the introduction of unknown objects (plastic balls) placed in the feeder together with the concentrate during feeding.

Material and Methods

The present study was approved by the Committee on Ethics in the Use of Animals (CEUA) of the School of Animal Science and Food Engineering of the University of Sao Paulo: protocol number 2673240516.

The experiment was carried out in the Equine Sector of the USP Campus Fernando Costa, using eleven foals with undefined breed, six males and five females, ranging in age from 10 to 12 months.

The animals were housed in Coast Cross pasture (*Cynodon dactylon*) and were taken daily to the feeding stall where they were fed a concentrated meal of corn meal, soybean meal, wheat bran, core and salt, supplied to provide 20% of the nutritional requirement for the category (NRC 2007). The males received 2kg of the concentrate, the large females 1,5kg and the smaller females 1,2kg.

In order to determine the consumption time without the unknown objects, the animals were observed for three days and the average time of consumption was recorded, a period equivalent to the observation time of the animals with the objects (7 plastic colored balls) (Figure 1).



Figure 1. Foals feeding with the objects placed inside the feeders.

The animals were evaluated by six trained observers, positioned in front of each box, with no contact with the horses. The behavioral observations were performed by continuous visual method, at the moment the animal started feeding, using a methodology adapted from Calviello (2015), by assessing scores to four behavioral variables described in Table 1.

For each animal, a response class called reactivity was assigned (Calviello, 2015). In parallel, the reactivity was determined by composite score of the variables observed, using the Likert (1932) scale concepts, with the lowest score being considered the most calm, following the classification: calm (0-20%), little reactive (20-40%), reactive (40-60%), very reactive (60-80%) and aggressive (80-100%). The composite score was determined by the use of all the scores of each variable, and the higher possible score was determined for that group of variables. Following, with the use of a Likert-based scale, the reactivity scores of each animal was obtained. The percentage was created between the reactivity score for the animal in relation to the higher possible score.

Data were analyzed with a variance test by gender and score, with multiple comparison by PDIFF at 5% and the comparison of the consumption means analyzed with the statistical program SAS (2004).

Table 1. Scores assessed to the behaviors observed during the experimental period.

Behavioral variables	Score	Description
Position of the Eyes	1	Relaxed eyes
	2	Attentive eyes
	3	Wide eyes
Position of the Ears	1	Ears upright or relaxed
	2	Ears facing forwards or backwards
	3	Ears in constant movement (shifting position) or pinned back
Snorting	1	Yes
	2	No
Vocalization	1	Absent
	2	Ocasional
	3	Frequent

Results and Discussion

The composite score for each gender and their respective time of consumption with and without the objects inside the feeder was computed in Table 2. There was no effect ($p>0.05$) of the addition of the object over the composite score, both males and females were classified as calm, with females presenting a composite score value of 14,29% and males 18,37% while feeding with the objects in the feeder. It was observed that the animals came into contact with the objects, without showing fear. In addition, they were able to move them around the feeder which could have led to the maintenance of the time of consumption.

The effect ($p<0.05$) of gender on the time of consumption with and without the object was observed, females consumed the concentrate for 20'28" without the objects and for 19'03" with the objects, while males took 23'57" to consume the concentrate without the objects and 24'14" with them. The shorter consumption time presented by the females may suggest a higher reactivity of females over males. The total consumption time for concentrate was according to the observed by Meyer (1995), with a slight variation.

Behavioral observations were evaluated as frequency of the occurrence of the scores for each behavioral variable during the feeding time (Table 3).

For the variable Position of the Eyes, no effect of gender was observed ($p>0.05$), although females showed a predominant average frequency of the score 1 (relaxed eyes), 53.33%, while males showed a predominant average frequency of the score 2 (attentive eyes), 77.76% (Table 3). This could have contributed to the greater consumption time obtained for males, since they were more alert to the environment and less attentive to the food.

Considering the Position of the Ears, it was verified that the males had higher average frequency of the score 1 with 83.33%, which may be a reflection of the greater attention to the environment as observed by the position of the eyes. No gender effect ($p>0.05$) was observed for this variable, since females also showed higher average frequency of the score 1 with 100.00% (Table 3). The fact that the animals did not snort (mean of 99.97%) indicated that they were alert but comfortable with the environment.

No vocalization was observed among the animals, which reiterates the comfort situation presented by the group, as described previously by Calviello (2015), that addressed to equines vocalizing in the presence of threat situations in order to alarm the group.

Table 2. Mean values of the composite score and time without and with the objects in the feeder.

Gender	Composite score (%)	Time without object (min)	Time with object (min)
Female	14.29	20'28" ^{ab}	19'03" ^b
Male	18.37	23'57" ^a	24'14" ^a

Means followed by different letters are significantly different at the 5% level.

Table 3. Mean values of frequency of occurrence of scores of the variables analyzed, by gender.

Variable	Score (%)	Means (%)	Females (%)	Males (%)
Position of the Eyes	1	36.36	53.33	22.22
	2	63.64	46.67	77.76
	3	0.00	0.00	0.00
Position of the Ears	1	99.98	100.00	83.33
	2	0.02	0.00	16.67
	3	0.00	0.00	0.00
Vocalization	1	100.00	100.00	100.00
	2	0.00	0.00	0.00
	3	0.00	0.00	0.00
Snorting	1	0.03	0.00	5.56
	2	99.97	100.00	94.44

Conclusions

Moving objects in the feeder do not increase or decrease consumption time. Females consume the concentrate faster than males, with and without the objects, which show higher reactivity and alertness.

References

- Calviello, RF, Titto, CG, Titto, EAL, Infante, P, Leme, TM, Pereira, AMF (2015). Evaluation of reactivity of horses in the presence of unknown stimulus. *Brazilian Journal of Veterinary Research and Animal Science*, 52(2), 167-172.
- Haenlein, GFW, Holdren, RD, Yoon, YM (1966). Comparative response of horses and sheep to different physical forms of alfalfa hay. *Journal of Animal Science*, 25(3), 740-743.
- Jackson, SA, Rich, VA, Ralston, SL, Anderson, EW (1984). Feeding behavior and feed efficiency in groups of horses as a function of feeding frequency and the use of alfalfa cubes. *J. Anim. Sci*, 59 (Suppl 1), 152.
- Krzak, WE, Gonyou, HW, Lawrence, LM (1991). Wood chewing by stabled horses: diurnal pattern and effects of exercise. *Journal of animal science*, 69(3), 1053-1058.
- Likert, RA (1932). Technique for the Measurement of Attitudes, *Archives of Psychology*, 140, 1-55.
- Meyer, H (1995). Bases anatômicas e fisiológicas. In: *Alimentação de equinos*. São Paulo: Varela, 33- 62.
- NATIONAL RESEARCH COUNCIL et al. NRC, 2007. *Nutrient Requirements of Horses*, 6th revised, Washington DC.
- Ralston, SL (1984). Controls of feeding in horses. *Journal of animal science*, 59(5), 1354-1361.
- Ribeiro, LB, Furtado, CE, Tonello, CL, Barbosa, ED, Brandi, RA (2009). Comportamento e distúrbios alimentares em equinos durante ensaio de metabolismo recebendo volumosos com diferente qualidade nutricional acrescido de probiótico (*saccharomyces cerevisiae*). *Revista da FZVA*, 16(1).
- STATISTICAL ANALYSIS SYSTEM – SAS. OnlineDoc. Version 9.1.3. Cary: SAS Institute, 2004.
- Turner, AS, White, N, Ismay, J (1984). Modified Forssell's operation for cribbiting in the horse. *J Am Vet Med Ass*, 184(3), 309-312.