



Correlates Between Mare-Foal Behavior and Weaning Stress in Domestic Mares and Foals (*Equus caballus*)

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Introduction

- Mare and foal weaning stress is relatively unstudied. One of the most stress-inducing periods for domestic mares and their foals is the process of weaning (1).
- When foals are 4-6 months of age they are physically separated from their mothers in the process of weaning. Foals must be independent of their mother's milk before they can be transferred to new homes.
- A better understanding of factors that reduce stress at weaning could lead to new and improved management practices that will help horse owners ensure the overall physiological health of mares and their foals in the event of weaning.
- Prior research has shown factors determined by the extent of mare-foal relationship may influence stress at weaning (2).
- Here, we examine the extent to which the mare-foal relationship may affect stress during weaning.

Objectives

- To determine if there is a correlation between mare-foal relationship and weaning stress we examined the following before and after weaning:
 - The degree of behavioral synchrony (the proportion of time mares and foals engage in the same behaviors) between mares and foals (2).
 - The distance between mares and foals (2).
 - Fecal cortisol concentrations of foals: fecal cortisol is a demonstrated indicator of the mammalian stress response (3).

Methods

Behavioral Monitoring

- We observed 8 mare-foal pairs; Thoroughbreds (n=4) and Quarter Horses (n=4).
- We recorded both mare and foal behavior as well as the distance (m) between mare-foal pairs every 5 minutes (4).



Hormone Sampling

- We collected fecal samples from mares and foals prior to and after weaning.
- Fecal samples were collected *ad libitum* (4) and were frozen at -20°C on the day of collection.
- We extracted hormones from fecal samples as per the St. Louis Zoo Standard Operating Procedure (5) and assessed cortisol levels via enzyme immunoassay (5).



Conclusions

- The mare-foal relationship did not predict foal stress at weaning.
- At least three possibilities could explain these results:
 - There is no correlation between the mare-foal relationship and stress at weaning.
 - These results could reflect issues with our sampling methods:
 - In other studies fecal samples were collected the day after weaning (1).
 - Most of our samples were collected the day of weaning.
 - Our sample size was relatively small (n=8 foals).
- Behaviorally, foals appeared significantly stressed on weaning day.
- Future studies could:
 - Investigate behavioral correlates before and after weaning.
 - Collect fecal samples the day after weaning.
- These methods could more accurately identify correlates between mare-foal relationships and stress at weaning.

Results

- Foals seemed to exhibit increased cortisol levels during/after weaning, though not significantly so (Linear Mixed Effects Model: estimate = 71.43, SE = 40.69, $t = 1.75$, $P = 0.12$, Figure 1).
- Contrary to our predictions, neither mare-foal proximity, nor the degree of mare-foal behavioral synchrony before weaning predicted foal cortisol levels during/after weaning (Linear Mixed Effects Model, mare-foal proximity: estimate = -29.51, SE = 49.21, $t = -0.60$, $P = 0.58$; mare-foal behavioral synchrony: estimate = 190.34, SE = 405.23, $t = 0.47$, $P = 0.66$; Figures 2 and 3).

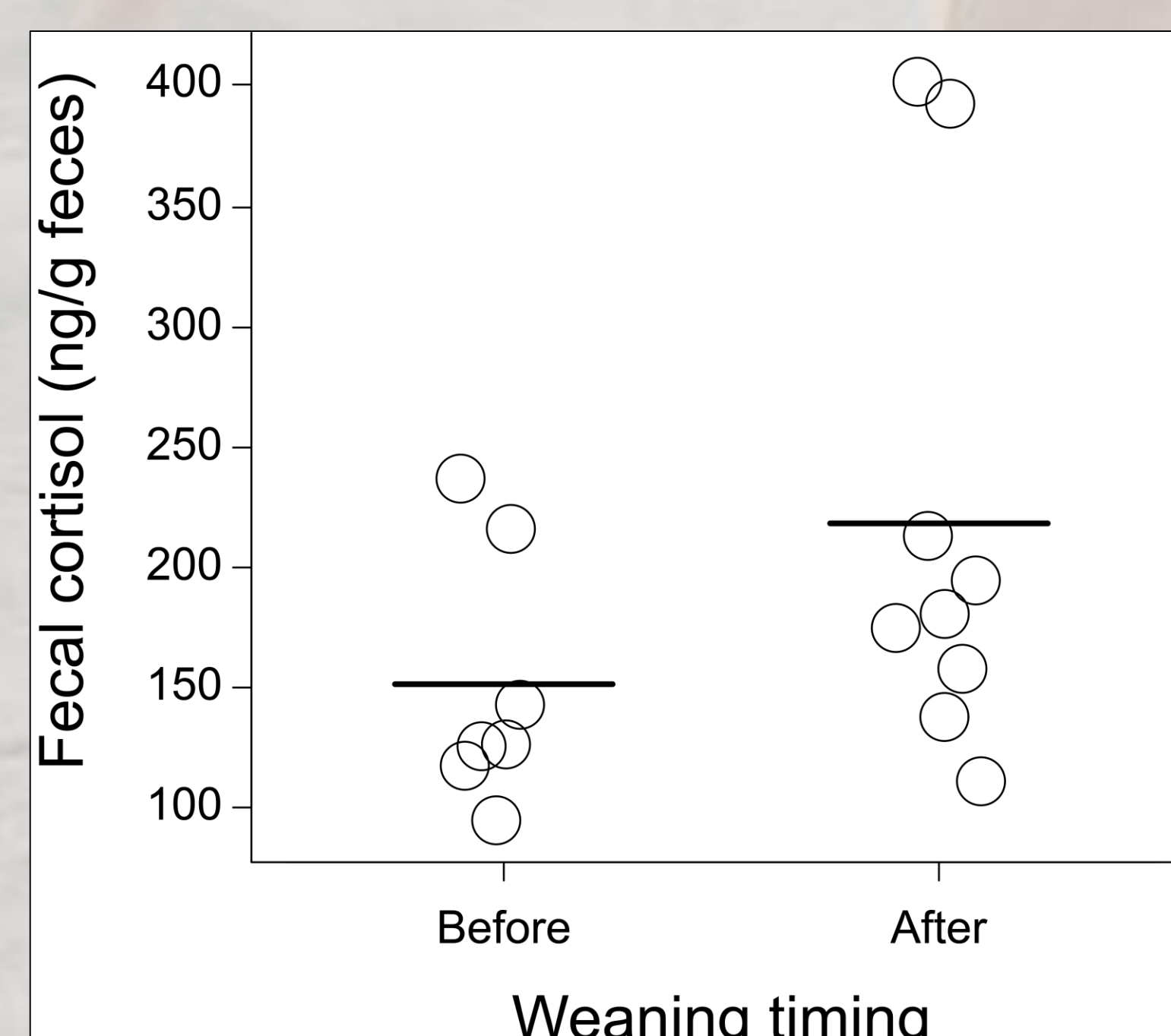


FIGURE 1. Foals seemed to exhibit an increase in cortisol levels during/after weaning, though this effect was not significant ($P = 0.12$).

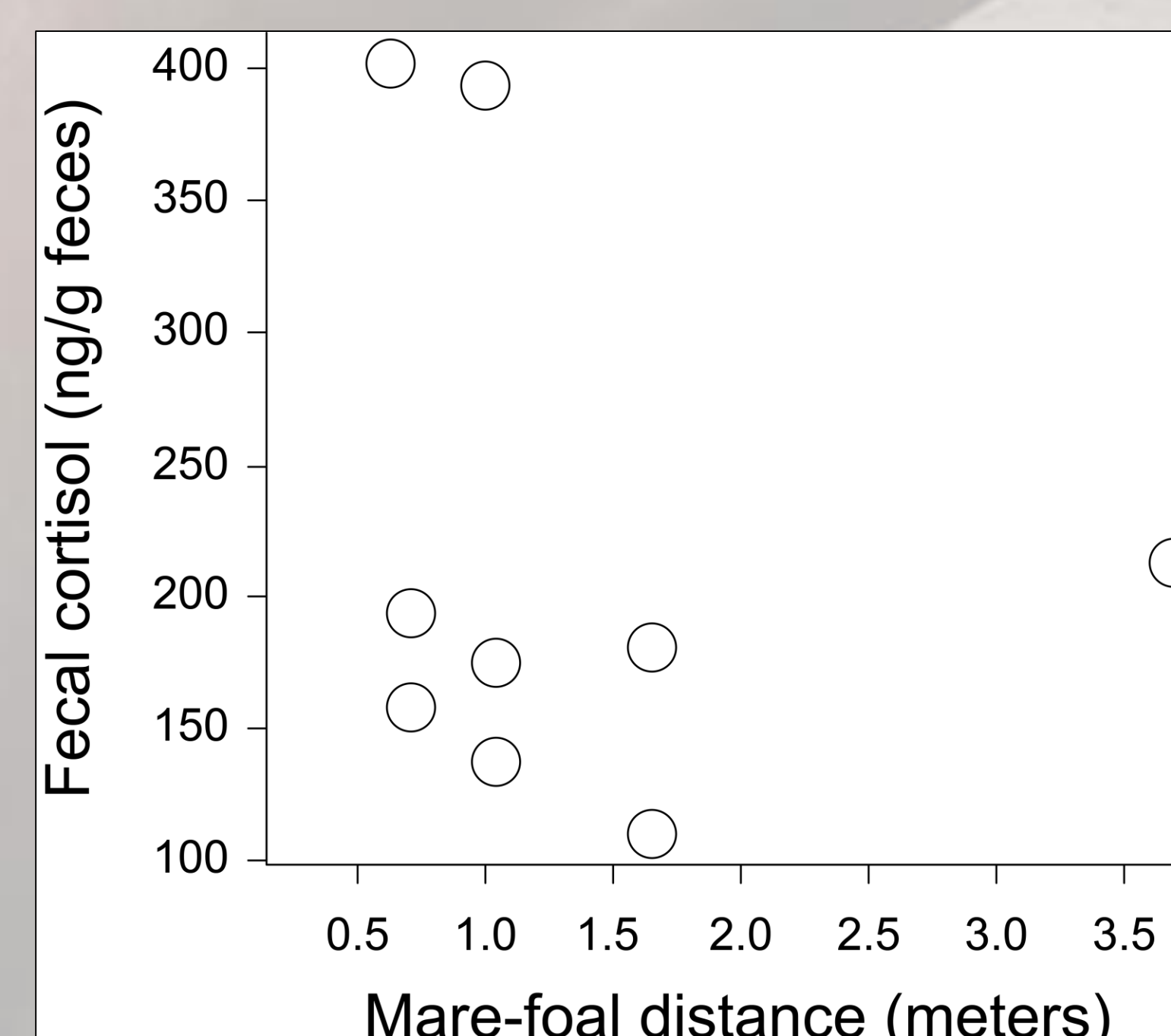


FIGURE 2. Mare-foal proximity before weaning did not predict foal cortisol levels during/after weaning ($P = 0.58$).

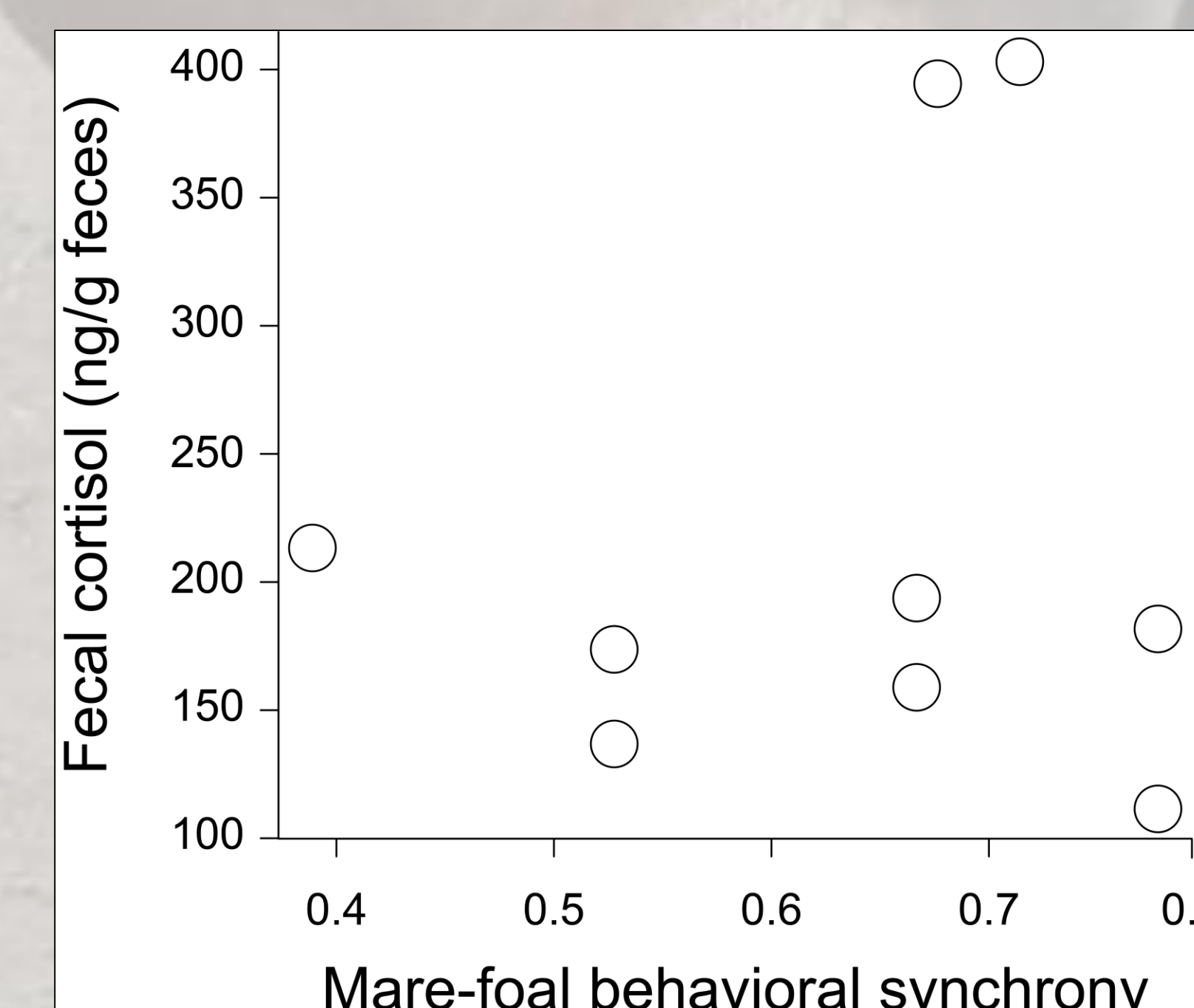


FIGURE 3. The degree of mare-foal behavioral synchrony before weaning did not predict foal cortisol levels during/after weaning ($P = 0.66$).

Science With Practice Impacts

- The program encouraged consistent reflection and analysis of my progress.
- Participation assured that I met critical deadlines and was thorough in my work.
- The program aided me in developing a professional relationship with a mentor and learning how to effectively communicate and work together towards a common goal.



References

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