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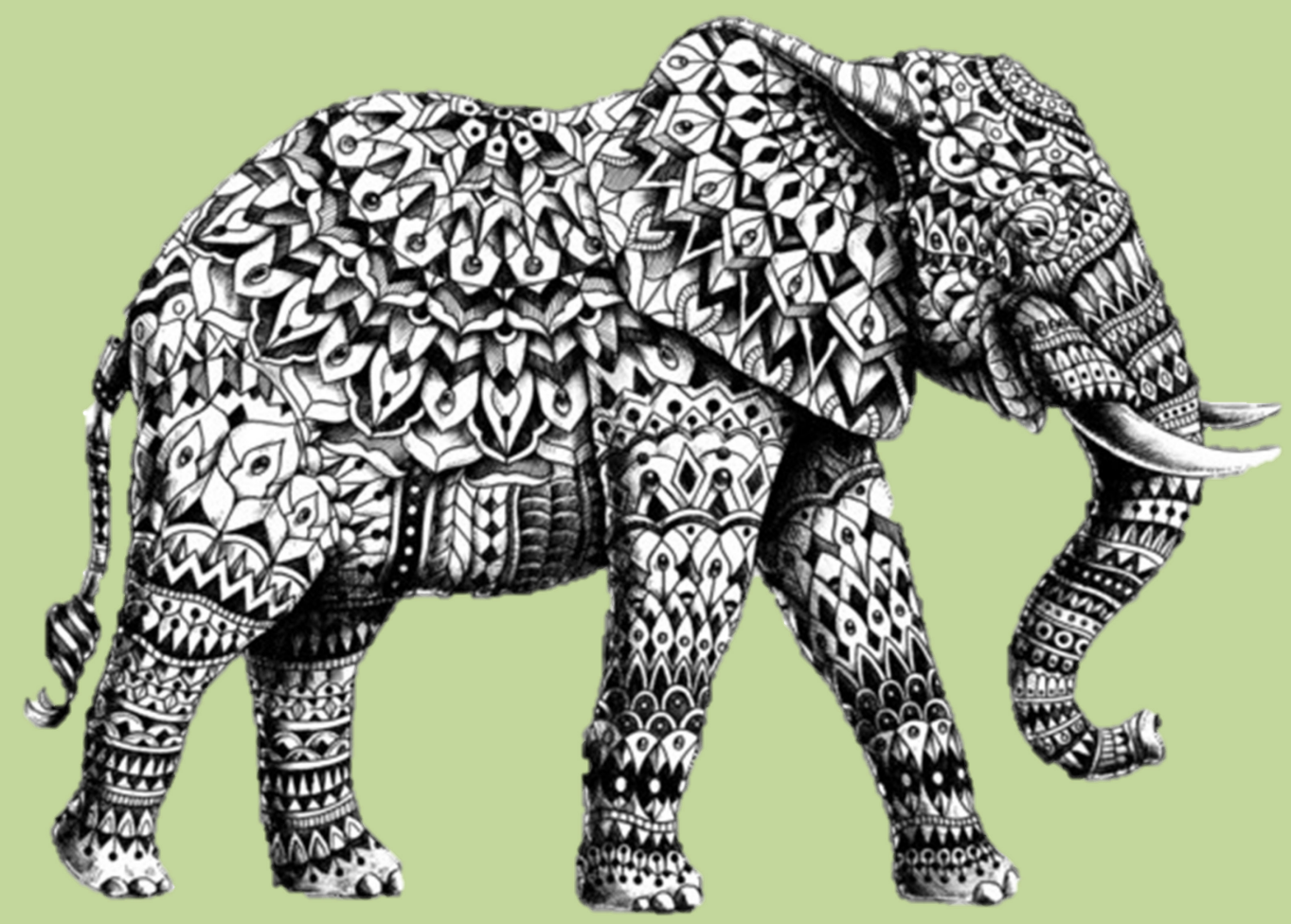


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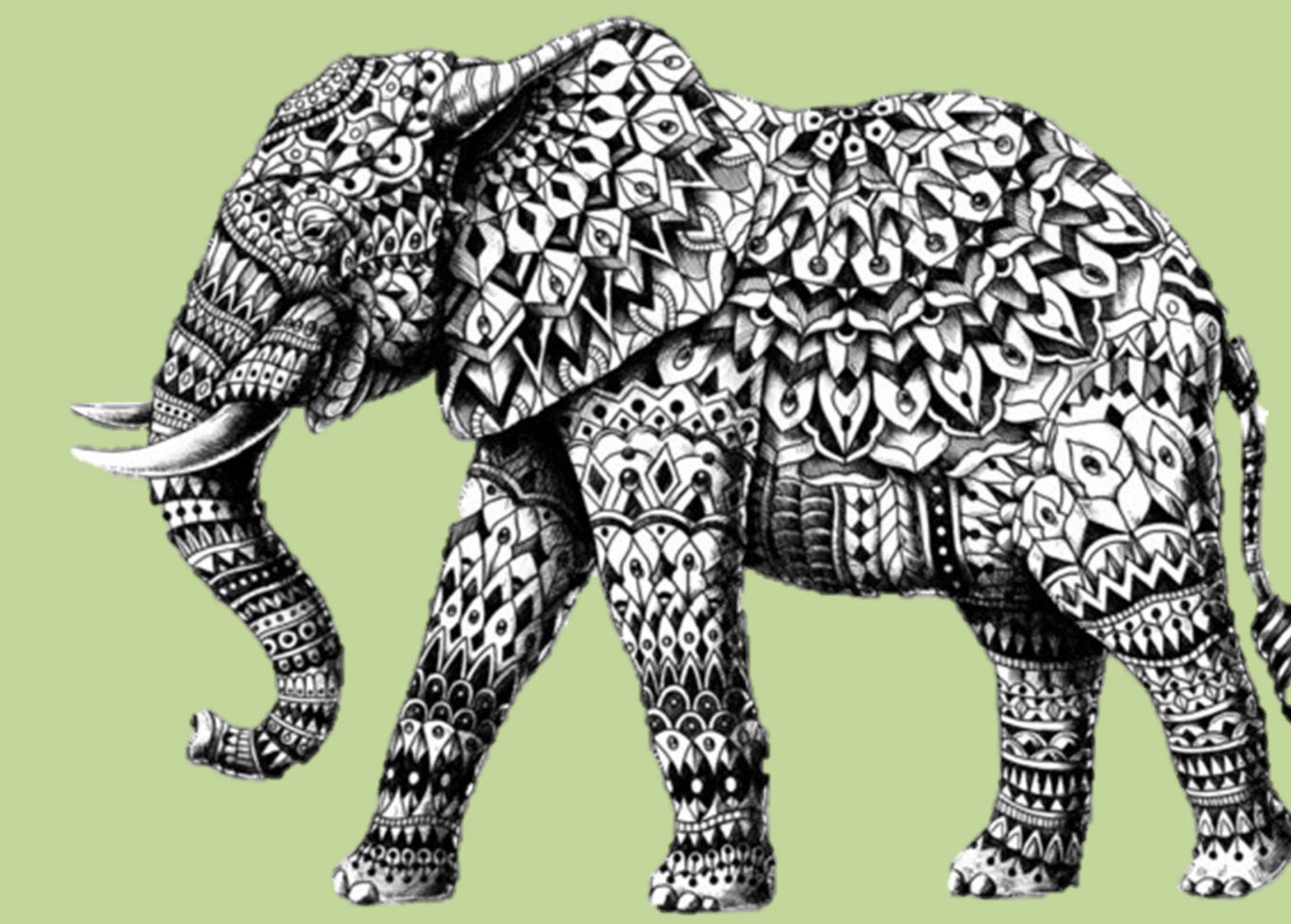
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Influence of Sex and Ambient Temperature on Asian Elephant (*Elephas maximus*) Dusting.



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Introduction

Elephants, like all animals, rely on behavioral adaptations in order to protect themselves from seasonal variations in their environment. Asian elephants (*Elephas maximus*) inhabit tropical biomes known for sustained temperatures above 15.5°C and high humidity (Ciszek 2002). Elephants lack the glands required to produce sweat, and must rely on alternative means to avoid overheating. As a result, elephants perform dusting bathing in order to aid the body cooling process.

Previous studies indicate that elephant dusting behavior can be triggered by several environmental factors including sun intensity (Haltenorth and Diller 1980), skin discomfort (Spearman 1970), and protection from parasites (Barnes 1984). The frequency of dusting performance might also be related to ambient temperature and/or social interactions (Rees 2002). In support of this argument, Shannon and colleagues (2008) found no significant difference in the activity budgets of captive male and female African elephants. For example, if males and females are found to engage in activities, including resting and feeding, at equal rates, then we can assume other self-maintenance behaviors, such as dusting, are also performed at similar rates by male and female elephants. Despite, evidence for sexual segregation between males and females in the wild – solitary adult males and harem-like social groups of females – behavioral performance differences based on sex are not exhibited in captivity.

Hypotheses

- 1) If dusting behavior is related to thermoregulatory processes, then increased environmental temperatures will result in an increased rate and frequency of elephant dusting behavior.
- 2) If dusting behavior is influenced by social interactions, and daily energy budgets are comparably utilized despite sex, then male and female elephants will exhibit dusting behavior at similar rates.

Methods

- Data were collected at the Columbus Zoo and Aquarium from January 2016 through December 2015 between 1100hrs and 1700hrs.
- Subjects included four Asian elephants (*E. maximus*):
 - Two females: one aged ~27 years and one aged ~45 years.
 - Two males: one active breeding male weighing ~15,000lbs and one isolated juvenile aged ~8 years.
- Quantified dusting exhibited by each individual.
- Calculated the overall hourly rate of dusting.
- Recorded the average indoor and outdoor temperature every half hour, and at the time of dusting.
- Data were analyzed using the IBM SPSS Statistics software package (2016)

Works Cited:

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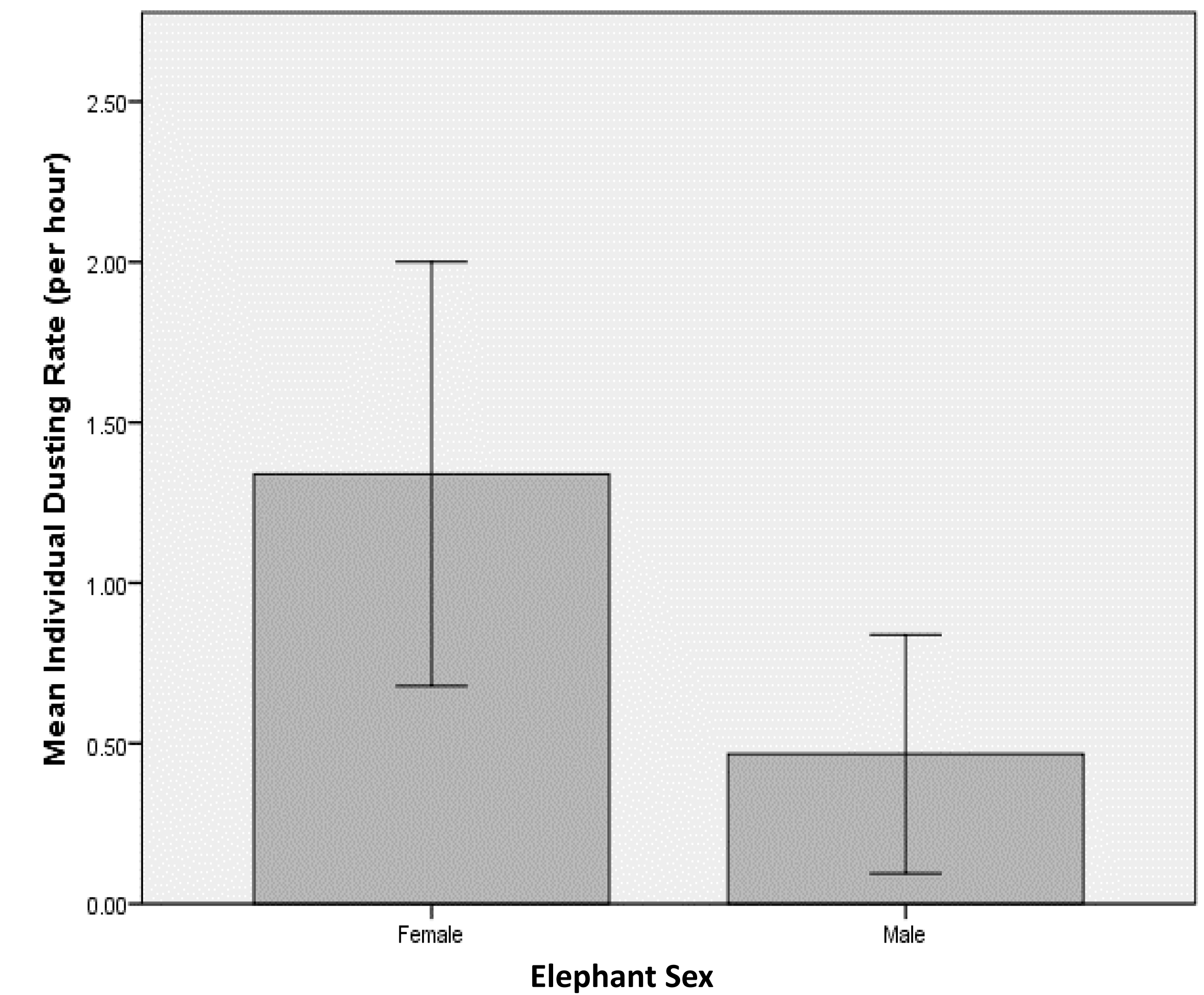
Behavior Demonstration



Images: <https://seaworld.org/en/animal-info/animal-infobooks/elephants/behavior>

Results

Figure 1: Dusting Rates of Male and Female Elephants.



The logistic regression indicated no relationship between temperature and dusting behavior ($p=0.87$), but a significant influence of sex on dusting behavior ($p=0.03$). Females were almost three times as likely to dust compared to males.

Implications and Future Prospects

Previous studies indicate that the performance of certain behaviors is related to sex and body size (Loizi et al. 2009 and Shannon et al. 2008). For example, post-pubescent and adult African elephant males are more likely than females to engage in chemosensory behaviors that could indicate female reproductive receptivity, including investigation of urine and feces. While in captivity, examining chemosensory cues might be valuable to our older male subject who faces a potential reproductive competitor. However, juveniles are more likely to practice competing with other males through object play. Scrutinizing the environment also has benefits that extend to the natural world such as searching for predators. Finally, in the wild, solitary males tend to choose a habitat based on food resource availability to maximize their body size and reproductive fitness. As a result, as body size increases energetic demands also increase – requiring males to spend more time foraging rather than performing other daily activities.

Understanding behavioral adaptations and striving to maintain natural instincts are key to facilitating a healthy captive environment. If we gain a better understanding of the social and environmental factors that influence elephant behavior, perhaps we can better understand the behaviors of this species.

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