Do Displays Influence Zoo Guest Reactions to a Mexican Fireleg Tarantula *Brachypelma boehmei*?

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INTRODUCTION

The most prevalent mental disorder worldwide is animal phobias (Polák et al., 2020). Two basic emotions at the foundation of animal phobias are fear (driven by fear of attack) and disgust (driven by fear of disease) (Polák et al., 2020). Polák et al.'s (2020) study analyzing the top 24 phobic animals found spiders to be the overall most phobic animals, as they elicit both fear and disgust. Frynta et al. (2021) state that 2.7 - 6.1% of the global population suffers from arachnophobia, or the fear of spiders. Polák et al. (2022) reveal that up to 34% of United States citizens are arachnophobic. However, spiders present little to no threat of death (at the basis of fear) or disease (the basis of disgust), presenting a unique paradox to scientists (Frynta et al., 2021). Only 0.0005% of the 50,000 spider species can truly harm humans (Crawford, 2022a), and there is no evidence showing that spiders spread disease (Frynta et al., 2021), yet they are the most feared animals on the planet (Polák et al., 2020).

Because fright is so appealing in the entertainment industry, the media does not shy away from sensational portrayals of animals, which often perpetuates their undeserved bad societal perceptions (Polák et al., 2022). This is especially true in the case of spiders, namely tarantulas (family Theraphosidae), the most widely used spiders in film (Neethling, 2016).

Despite none of the nearly 900 species of tarantulas being deadly to humans (Crawford, 2022b), their formidable fangs, hairy bodies, and large size mean they have become typecast as the ultimate scary spider (Neethling, 2016). While many films obviously enhance these spiders' features to make them appear scarier and therefore more entertaining, the falsehoods have blended into reality for many moviegoers, leading to stronger societal dislike of tarantulas and other spiders (Neethling, 2016). Kleinknecht's (1982) research asked participants what the origin was of their fear of tarantulas; 61% reported it was books, movies, and/or television portraying tarantulas causing serious injury or death to humans, while another 34% reported that it was observing someone being hurt or scared by a tarantula or being told by someone (usually family or friends) that tarantulas are dangerous. Participants in Landová et al.'s (2021) study of arthropod fear ranked tarantulas and six other spiders in their top 10 most feared. Clearly, media portrayals and word-of-mouth have a powerful effect on public perception of spiders and tarantulas. Consequently, a cultural stereotype of fear of spiders has been created, providing an explanation for why these overall harmless creatures are so despised (Landová et al., 2021).

Zoos are working hard to change negative perceptions of spiders and highlight the good they do for the natural world. The Ararat Ridge Zoo at the Ark Encounter in Williamstown, Kentucky, is one of those facilities. It is home to several species of tarantulas which act as animal ambassadors. They are used in daily programs and shows to educate guests on the truth about spiders. The zoo's primary goal in presenting tarantulas is to dispel cultural misconceptions about them and encourage people to change their perceptions of them. One of the methods the animal programs team uses to engage guests is through unscheduled random "pop up" encounters with an ambassador animal, like a tarantula, throughout the zoo grounds. One of those ambassador animals is 0.1



four-year-old Mexican fireleg tarantula (Brachypelma boehmei) named Deborah.

According to the International Union for the Conservation of Nature, Mexican fireleg tarantulas are listed as endangered (Fukushima et al., 2019). Today, this spider is only found in a tiny coastal area of Guerrero, Mexico (Fukushima et al., 2019). Since they spend more time out of their burrows than other tarantula species and their colors are stunning, they are highly sought-after pets (Locht et al., 1999). However, this has led to over-collection from the wild, where Locht et al. (1999) reports that they already suffer from a 99% mortality rate before reaching sexual maturity. Urbanization resulting in habitat loss has greatly reduced their range, and many are run over by cars when traveling during mating season (Fukushima et al., 2019). Additionally, because they are coastal, some

populations have been devastated by hurricanes (Fukushima et al., 2019). Despite being listed under Appendix II of the Convention of International Trade in Endangered Species and Mexico requiring permits for collection (Locht et al., 1999), wild populations continue to decline (Fukushima et al., 2019). Unfortunately, because of widespread societal dislike of spiders, raising awareness and support for endangered spiders is difficult (Zsido et al., 2021).

One of the goals of the Ararat Ridge Zoo's pop-up encounters is to raise awareness for endangered spiders like Mexican fireleg tarantulas. Unfortunately, the widespread fear of spiders makes this task difficult. Laypeople get most of their information about the biological world from the media, which usually presents information in narrative, and sometimes sensationalized, form (Dahlstrom,



2014). Guests who show empathy towards animals are more inclined to contribute to their conservation, so more zoological institutions are moving away from strictly scientific wording in their displays in favor of more empathybuilding, narrative wording (Akerman, 2019). Facts alone are often not enough to win people's hearts, especially when presenting less charismatic animals like spiders (Akerman, 2019). If conservationists want their messaging to have long-lasting impacts, they must change perceptions by creating emotional connections with the animals (Akerman, 2019). Although sometimes frowned upon in the scientific community, studies show gentle anthropomorphism is an excellent tool to create empathy for less charismatic animals (Batt, 2009). If biologists can draw similarities between disliked animals and humans, it can make great strides in improving their perceptions (Batt, 2009).

The objective of this study is to determine which type of Mexican fireleg tarantula "pop up" encounter display at the Ararat Ridge Zoo will elicit more positive reactions towards the spider from Ark Encounter guests: a strictly scientific display, or an anthropomorphic personalized display? Based on Akerman's (2019) research that showed that empathy-based messaging creates positive emotional connections and promotes conservationminded behaviors, the researcher predicted that the anthropomorphic personalized display would generate more positive reactions than the strictly scientific display.

METHODS

This study involves observing Ark Encounter guests at a "pop up" display at the Ararat Ridge Zoo featuring Deborah the Mexican fireleg tarantula. This experiment compares guest reactions to viewing Deborah within two types of displays: one that is scientific, and one that is personalized.



Scientific Display



For these observations, Deborah was displayed in her habitat on a table between the Ararat Ridge Zoo's kangaroo walkabout and the ringtailed lemur exhibit, a high-traffic area that also funnels guests for easy counting. Because her habitat was not manipulated in any way, this project

did not require IACUC approval. If temperatures were below 60°F, a Snugglesafe heat pad was placed against her enclosure for warmth. The project was conducted five days per week for four weeks: two weeks for the scientific display and two weeks for the personalized display. Each of the 20 total

observations took place for 30 minutes between 14:00-15:00, as that hour is usually the busiest and warmest hour in the zoo.

The scientific display was presented from 2 - 15 October 2022. In addition to Deborah's enclosure, four black and white signs were placed on the table: one describing Mexican fireleg tarantula natural history, one discussing their endangered status and threats, one explaining that most spiders are not deadly, and one detailing the benefits of spiders and their venom. Deborah's name was not displayed, and she was not anthropomorphized in any way.

The personalized display was presented from 16 - 29 October 2022. The enclosure, signs, and table were decorated with red, fuchsia, and pink flowers, ribbons, and tulle fabric to enhance her bright coloration and her femininity. Four colorful, personalized signs used gently anthropomorphic language to briefly convey her name and species; that tarantulas cannot kill humans and their venom is used in medicine; that her species is going extinct and asking for help; and that God created spiders and asks humans to be kind to them (the Ark Encounter is a Christian attraction).

Each observational period required two zoo staff. Once the table was set up and the 30-minute timer was started, one person interacted with approaching guests while the other silently recorded each person's initial reactions to the display on an observation sheet. Because the guests were not surveyed in any way, this experiment did not require IRB approval. The recorder tallied the number of positive, neutral, and negative initial reactions expressed by guests. Initial reactions are defined as the first reaction displayed by the guest upon approach. Positive is defined as anything expressing excitement, joy, or wonder. Neutral is defined as no outward emotional response. Negative is defined as anything expressing disgust, fear, or

Figure 2: Percentages of Initial Ararat Ridge Zoo Guest Reactions to a Scientific Display of a Mexican Fireleg Tarantula



Figure 3: Percentages of Initial Ararat Ridge Zoo Guest Reactions to a Scientific Display of a Mexican Fireleg Tarantula



interacting with guests were instructed to answer questions in a gently anthropomorphic manner.

Data were recorded on a Google Sheets spreadsheet. After the observations were completed, totals and percentages for each reaction per display type were calculated. A chi-square test was run on the results to determine whether there was a statistically significant difference between the total number of guest reactions to the scientific display versus the personalized display.

RESULTS

A total of 1,652 guests were observed during this study: 842 during the twoweek scientific display and 810 during the two-week personalized display. Comparisons of initial Ararat Ridge Zoo guest reactions between the scientific and personalized displays of the Mexican fireleg tarantula are reflected in Figure 1.

Guest reactions to the scientific display were only 26.01% positive, while guest reactions to the personalized display were 43.46% positive. Percentages of initial Ararat Ridge Zoo guest reactions to the scientific display are reflected in Figure 2, while percentages of initial Ararat Ridge Zoo guest reactions to the personalized display are reflected in Figure 3.

Additionally, 31.12% of all guests during the entire observation period audibly read the signage of the displays.

hate. Guest reactions were only recorded for those approaching the table. If guests walked by without acknowledging the display, they were not included in the tallies. Additionally, the recorder tallied every time they heard a guest reading

the signs. During the two-week scientific display, the staff interacting with guests were instructed to answer questions as non-anthropomorphically as possible. Deborah's name and personality were not discussed unless asked. During the two-week personalized display, the staff



Figure 1: Comparison of Initial Ararat Ridge Zoo Guest Reactions to a Scientific and Personalized Display of a



To determine statistical significance of initial guest reactions to the scientific display versus the personalized display, the chi-square test used a 95% level of confidence (a = .05). The chi-square statistic is 57.1578 and the *p*-value is 0.00001, making the results significant at p < 0.05.

DISCUSSION

There was a statistically significant difference in initial Ararat Ridge Zoo guest reactions to a scientific display versus a personalized display of Deborah the Mexican fireleg tarantula. This supports the initial prediction that the personalized display would elicit more positive reactions from Ark Encounter guests than the scientific display. The scientific display had more neutral reactions than positive or negative responses. There was an equal number of positive and negative reactions, but the neutral reactions were nearly double those numbers. The personalized display had more positive reactions than neutral or negative responses. The number of positive reactions was nearly 2.5 times greater than the negative responses. Also, nearly one-third of observed guests audibly read the signs. It is likely that more people read them silently. This is encouraging, as it shows guests are willing to be educated about a typically feared animal.

Spider enthusiasts are fighting against a long history of negative perceptions and portrayals of spiders and the strongest animal phobia in the world (Polak et al., 2020). If they can discover strategies to endear people to spiders, they can create more empathy for their struggles, and hopefully inspire more conservation-minded behaviors (Akerman, 2019). This is especially relevant to facilities advocating for endangered species like Mexican fireleg tarantulas. Akerman's (2019) research explains that zoo guests are more likely to contribute to a species' conservation when faced with messaging that elicits an emotional response. Monroe (2003)



argues that successful behavior campaigns are designed to reduce barriers and make them more easily overcome. A barrier to support for endangered spider species like Mexican fireleg tarantulas is the general public's distaste for spiders. Personalized displays are more engaging and easier for people to comprehend than strictly scientific wording (Dahlstrom, 2014).

Understanding cultural predispositions for emotional reactions towards animals is vital to understanding human dimensions of conservation (Castillo-Huitrón, 2020). Human emotions towards species have a prominent impact on the protection of those species (Zsido et al., 2022). Protection attitudes towards reptiles, amphibians, and invertebrates are milder than towards mammals and birds, but emotional connections can greatly improve these attitudes (Castillo-Huitrón, 2020). According to Zsido et al.'s (2022) research, whether humans develop animal phobias is directly linked to their exposure to nature. Zoos provide a unique opportunity to educate people about wildlife and facilitate their connection to nature, and people are more likely to empathize with species when they feel they have learned something (Clayton et al., 2009). If zoos can harness the feelings of connection people have towards animals during their visits and combine that with information through the personalized displays (like the one used in this experiment), they may influence guest perceptions and behavior towards them (Clayton et al., 2009). Furhman and Ladewig's

(2008) analysis of different types of zoo programming discovered that providing direct contact opportunities in conjunction with engaging educational content is the most ideal strategy for changing behavior. Kleinknecht's (1982) research agrees; when participants were asked what made them overcome their fear of tarantulas, it was largely a combination of education and direct observation of pet tarantulas. Educational programs featuring live animals are more successful in capturing people's attention and creating connections with nature than print or video media featuring animals (Furhman & Ladewig, 2008). Live animal programs not only educate people about wildlife, but also eliminate misconceptions, increase relevance of conservation issues, and create connections with nature (Furhman & Ladewig, 2008), all important when discussing spiders.

A further inquiry inspired by this study is whether similar results would occur if these tarantula displays happened in a random public setting. People visiting zoos likely already appreciate animals to some extent and are expecting to see them, even the less charismatic species. If similar displays were erected in a non-zoo public setting, would these results change? Additionally, do certain spider species elicit more compassion or distaste than others? For example, jumping spiders (family Salticidae) have become quite popular on social media recently, as they are harmless and have a more endearing appearance than other spider kinds. In contrast, tarantulas or tarantula-like spiders are disproportionately used in horror media, so they have a strong association with a disgust and fear response (Polak et al., 2020). Another potential analysis would be to repeat this experiment but focus on the reactions of men versus women, as Polák et al. (2022) reports that arachnophobia is four times more prevalent in women than men

CONCLUSION

The anthropomorphic, personalized display of the Ararat Ridge Zoo's Mexican fireleg tarantula generated significantly more positive reactions from Ark Encounter guests than the strictly scientific display. As a species facing extinction, raising awareness for Mexican fireleg tarantula conservation is an important but difficult task. Scientists must overcome sensationalized media portrayals, myths and folklore, and the fact that spiders are the most feared creatures in the world when garnering support for spider conservation. However, this experiment proves that it is possible to create positive connections between people and spiders by evoking empathy through carefully crafted messaging. Zoos have the unique opportunity to not only provide educational information, but also personalized live animal encounters to refute falsehoods and inspire people to change their perceptions of spiders.

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