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Research article

"They're so cute - I want one!": Determining the role enrichment and signage play in guest perception of primates as pets

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Abstract

"Enrichment" in its simplest definition, is the positive enhancement of an animal's mental and physical needs, making it a critical component of optimal animal care practices. Animals at the Cape May County Zoo are provided environmental enrichment as part of their daily husbandry. In addition to other forms of enrichment, zookeepers provide a variety of environmental enrichment devices (EEDs) in order to attain behavioral goals. For the callitrichid species housed at the zoo, zookeepers offer a wide range of EEDs commonly used at other zoological facilities, including 'toys' often designed for parrots, wild birds, exotic pets, and human toddlers/infants, with the goal in stimulating natural behaviors including foraging, exploration, and play. Zookeepers also provide social enrichment by entering the enclosure with the callitrichids for handfeeding and training. The goal of this study was to determine if the "type" of enrichment provided (i.e. regular toys, human toddler/infant toys, etc.) to the callitrichids or if signage about primates as pets appeared to influence whether zoo guests expressed that they would be suitable/desired pets. A troop of five-related cotton-top tamarins *Saguinus oedipus* were chosen as the focal subjects for this study and data were collected from zoo guests on their perceptions of pet suitability for each enrichment type. In the next stage, data were again collected from guests when a sign with information on 'why primates make unsuitable/undesirable pets' was placed in front of the habitat in lieu of EEDs to investigate the presence of that sign on guest perceptions. Analyses of these data underscored a significant association between enrichment condition and guest perceptions of tamarins as good pets, but results of differences in guest perceptions based on the enrichment condition present were less conclusive. This study nonetheless holds significant value as a pioneering effort in investigating public perceptions about nonhuman primate species (NHPs) in a zoo setting and whether the way they are presented to the public influences their suitability/desirability as domestic pets.

Introduction

Enrichment is an essential part of animal care in zoological facilities. For primates, enrichment is required by both the USDA (United States Department of Agriculture) and by zoological accrediting bodies such as the AZA (Association of Zoos and Aquariums) and ZAA (Zoological Association of America). Enrichment is defined by the AZA (AZA 2018) as "a process to ensure that the behavioral and physical needs of an animal are being met by providing opportunities for species-appropriate behaviors and choices." Enrichment requirements are determined by the behavioral needs of the species, as well as the specific needs of each individual. Environmental enrichment devices (EEDs) are common enrichments designed to elicit a variety of fundamental species-specific behaviors such as foraging/hunting, play, and exploration. It can be difficult to find EEDs designed for callitrichids due to a low number of companies that make toys specifically for zoos and exotic animals. Therefore, zoos often use those designed for other species, such as wild birds, psittacines, and human toddlers/infants (Jaakkola et al. 2023).

Sociality and thus socialization is another critical behavioral stimulation for primates because it is vital to their mental and physical health (Whiten and Waal 2018). In addition to enrichment provided that promotes conspecifics of the group to socialize with one another, zookeepers also 'socialize' with the animals, including one-on-one training sessions and handfeeding. For some species (i.e. Callitrichids, smaller

Strepsirrhines and Catarhines), these interactive sessions can occur within the animals' enclosure without protective contact or barriers.

The Primate Pet Trade:

According to the International Union for Conservation of Nature (IUCN), the pet trade is a predominant factor endangering many non-human primate (NHP) species, from the smallest of primates such as tamarins to many ape species such as gibbons and orangutans (IUCN 2024). Hundreds of thousands of live NHP are traded and imported globally each year (Nijman et al. 2023) thus depleting the wild populations. Thus, the goal of zoological professionals working with and studying NHP is to deter the general public from seeking a primate as a pet as an affective conservation method. This particular strategy was directly addressed by the Association of Zoos & Aquariums (AZA) with the creation of the AZA White Paper in 2015 called Personal Possession of Non-Human Primates (AZA 2015). This research recognized the negative impacts of the pet trade on NHP and how the misrepresentation of NHP in pop culture and/or social media can put NHP's at great risk, by promoting them as suitable/desirable pets, thus further fueling the NHP pet trade and declining conservation status of wild NHP populations. Zoos can have a major effect on how people perceive animals in managed care, as compared to their wild conspecifics (Finley 1988).

In response to the growing NHP pet trade, the IUCN SSC Primates Section on Human-Primate Interactions published a document called Best Practice Guidelines - Responsible Images of Non-Human Primates (Cheyne et al. 2022). These guidelines are meant to reduce the negative effects of NHP photographs on their welfare. Examples include ensuring a minimum distance of 7 m between a person and a NHP in photographs, not publishing photographs with caregivers holding, handfeeding, or playing with NHP without PPE, and photographing people outside a captive NHP enclosure instead of inside it. Although this document is directed towards digital images shared on the internet (with a heavy concentration on social media), we propose that a zookeeper interacting with a primate during 'free contact' may result in the same representation. 'Free contact' refers to the absence of a barrier between the zookeeper and the animal. In this sense, a guest may develop an idea that perhaps that animal would make a suitable/desirable pet, similar to seeing a photo of a human freely interacting with a NHP on the internet. Additionally, zoo guests may take pictures/videos of zookeepers having 'free contact' with animals and post them on social media platforms, further fueling the false implications of NHP making suitable/desirable pets.

Previous research

Several studies have been completed in attempts to determine if public perception of an animal's welfare changes based on the type of enrichment in the exhibit (Kutska 2009; McPhee et al. 1998; Zazal and Miller 2019). For example, a study conducted at Central Park Zoo surveyed zoo guests' perceptions of a polar bear enclosure based on the presence of natural vs. non-natural enrichment (Kutska 2009). The results of this study suggested that enrichment 'type' does not seem to alter or impact the perception of enclosure quality or animal welfare of zoo guests. Similarly, McPhee (1998) looked at zoo guests' perceptions of animal enrichment and the type of enclosure (an outdoor barren grotto, an outdoor vegetated grotto, an indoor immersion exhibit, and an outdoor traditional cage) and their overall perception of animal welfare. Overall, the EEDs used in these studies seemed to have little to no impact on zoo guest's perceptions of animal enclosure quality or welfare, thus supporting the hypothesis that zoo guests use other ideologies (i.e. personal and/or cultural), influencing their perceptions of what affects the state or pet eligibility of an animal.

Detrimentally, even fewer studies have been conducted on whether enrichment, or certain 'types' of enrichment, in the animal exhibits can alter the idea of whether or not that animal(s) would make a suitable/desirable pet. One such study conducted at Lincoln Park Zoo, examined whether the presence of artificial vs. non-artificial enrichment in a naturalistic enclosure affected the public's perception of chimpanzees as suitable/desirable pets (Jacobson et al. 2017). Jacobson et al., 2017 found that the type of EED in the enclosure did not affect the zoo guests' perceptions about the chimpanzees' behavior, feelings, and suitability/desirability as pets.

In addition to the type of EEDs used in zoo animal exhibits, we also researched the presence of a zookeeper in the habitat (e.g. free contact) with zoo animals and its possible implications influencing zoo guests' perceptions of whether or not it made that animal more desirable as a pet. Ross et al. (2011) determined that zoo guests' who viewed a photograph of a human with a chimpanzee were 35.5% more likely to consider their wild population healthy/stable compared to seeing the same photo of the chimpanzee without the presence of the human. Additionally, it was also found that zoo guests viewing the photograph with the human and chimpanzee together were more likely to think that chimpanzees would be suitable/desirable pets. Leighty (2015) also found that viewing a NHP in an anthropomorphic setting with a human present increased their perception that it would make a good pet.

More scientific studies investigating the overall effects of EEDs and human- animal interactions and their effect on zoo guests' mentality towards exotic/zoo animals as pets is greatly needed in order to fully understand what elements are influencing this human perception of animals as pets. However, after reviewing the recent and relevant literature regarding this topic, we can deduce that human-animal interactions (such as videos/photos of humans and animals interacting; zookeeper, free contact with animals) seems to have more of a positive correlation with zoo guests' expressing the idea of an exotic/zoo animal making a suitable or even desirable pet (Finlay et al. 1988; Ross et al. 2011; Leighty et al. 2015). Conversely, current evidence suggests that the presence of EEDs or certain categories of EEDs in zoo animal enclosures has little not no effect on altering a guests' perception of whether that animal would make a suitable pet or not.

Therefore, the purpose of this study was to provide further research investigating if (i) enrichment "type" (i.e., animal versus, human infant-toddler toys) in the callitrichid enclosures seemed to affect guests' perceptions on whether primates would make suitable/desirable pets, (ii) the presence of human-animal interactions (i.e., zookeeper engaging in free contact with animals in exhibit) affected guests' perceptions of whether the callitrichids would make suitable/desirable pets and lastly, (iii) the presence of signage communicating how primates make unsuitable/undesirable pets altered guests' perspective after viewing signage. This research provides critically needed data concerning how zoological facilities and professionals may be unintentionally influencing zoo guests to view or consider animals housed at the facility as suitable/desirable pets, thus contradicting the facility's overall purpose to use the animals as educational ambassadors, representing their wild conspecifics, and promoting the conservation and preservation of wild populations.

Materials and methods

Upon receiving permission from the facility to proceed, we chose a troop of cotton-top tamarins *Saguinus oedipus* for this study. The troop consists of five related individuals, with three males and two females between the ages of one through eight years of age. The

Table 1. Survey questions that were used for analysis in the study.

#	Survey questions
1	Do you have a pet at home? If yes, what kind?
2	For the following statement, please indicate whether you strongly agree, agree, disagree, strongly disagree, or are not sure: A tamarin would make a good pet.
3	What might make a person think that a tamarin would be a good pet?
4	What might make a person think that a tamarin would NOT be a good pet?
5	Do you know what enrichment for animals is?
6	What is one example of enrichment that you see in the area where the tamarins live in this zoo?
7	Did you see or read the signs that are on display near the tamarins?

Table 2. Conditions/Criteria present in tamarin habitat during the study.

Condition	Criteria
No Toys	No manipulable present in exhibit
Human Baby/ Toddler Toys	Eight colorful human baby/toddler toys (i.e. teething rings/plastic toy trucks)
Regular Toys	Eight green, tan, and metal toys (i.e. suet feeders, metal cage feeders)
Zookeeper	Zookeeper present in yard, without Personal Protective Equipment (PPE, i.e. gloves, surgical mask, etc.), feeding or interacting with tamarins
Educational Signage	Large sign stating "Did you just say you want one as a pet? Primates don't make good pets!" and listing examples of reasons not to own one as a pet (Figure 1)

cotton-top tamarins have a large outdoor habitat, approximately 15.2x6.1x4.88m. The yard is attached to a building that serves as an indoor habitat, but the indoor habitat was omitted from the study since it is much smaller than the outdoor habitat and presents more restrictions such as limited viewing of tamarins by guests. And the indoor habitat does not draw guests to the exhibit in the same numbers as when tamarins are in the larger outdoor habitat. The outdoor exhibit is composed of natural foliage and grass substrate. Perching includes both tan-colored ropes and deadfall. The public walkway runs parallel to the habitat and the public viewing area is four feet from the enclosure.

A short 3-to-5-minute survey was created that focused on investigating whether EED 'type' or 'condition' affected zoo guests' perceptions of tamarins as suitable/desirable pets. Surveys were conducted over the months of July and August 2023. Since the zoo is located in an area with a substantial annual surge in summer tourists, these two months were specifically chosen for their higher guest volumes, and greater geographical diversity among zoo guests. A systematic random sampling procedure was employed for the survey. Every fifth guest was selected to participate in the survey. Additionally, only guests approaching from the west side of the exhibit were interviewed to ensure that they had all viewed the same zoo exhibits prior to arriving at the tamarin's exhibit. Guests selected for the survey were either older teenagers (approximately high school aged) or adults. Younger children were not included since their still evolving stages of cognitive development could have introduced more variability into their responses to the survey and thus not reflecting accurately their true opinions and thoughts. In addition, guests who were part of large groups such as summer camps or guided tours were not selected for the survey so that the rest of the group was not held up by one member stopping to answer questions. Participants were told that the survey was to help with our animal care and that responding to it was voluntary. Survey questions were read aloud, one at a time, to the zoo guest by a designated zoo employee/docent. Responses were recorded immediately following the guest's response to each question (Table 1).

Five enrichment types/conditions were presented in the cotton-top tamarin exhibit over the course of the study. These conditions were (i.) no toys, (ii.) human baby/toddler toys, (iii.) regular toys, (iv.) free contact with a zookeeper, and (v.) educational signage about NHP making unsuitable/undesirable pets (Table 2). The fifth condition, educational signage, is also shown in Figure 1.

Figure 1. The "Not a Pet" educational signage was hung near the center of the cotton-top tamarin habitat for the "educational signage" condition.

Table 3. Responses (counts) to "A tamarin would be a good pet" statement by enrichment condition.

Condition	Agree	Unsure	Disagree	Total
No Toys	20	1	72	93
Baby Toys	15	11	73	99
Regular Toys	12	13	83	108
Keeper	22	11	56	89
Not a Pet Sign	9	10	80	99
Total	78	46	364	488

Results

The central question involved responding to the following statement, with possible responses being Strongly Agree, Agree, Unsure, Disagree, Strongly Disagree.

For the statistical analyses of the tamarin making a good pet question, the Strongly Agree and Agree categories were combined, as were the Disagree and Strongly Disagree categories. Of the 488 people surveyed, 15.98% agreed or strongly agreed, 9.42% were unsure, and 74.59% disagreed or strongly disagreed that tamarins would make suitable/desirable pets (Table 3).

Table 4 presents a summary of the data in Table 3, while the display in Figure 2 affords an opportunity to visually analyze the Agree-Unsure-Disagree responses across enrichment conditions.

Following their Agree-Unsure-Disagree reactions to the statement about a tamarin being a good pet, participants were asked why someone would think a tamarin would make a good pet. A majority (52.11%) responded that it was because the monkeys were "cute." Other notable responses were that tamarins are small and entertaining to watch. Participants were then asked why someone would think a tamarin would make an unsuitable/undesirable pet. Close to half (45.49%) thought it was because they were "wild" animals with notable answers being that they would be difficult to care for, that they are endangered, and that they would require too much space.

Approximately 78 percent of the participants indicated that they were pet owners, about 59 percent had heard of enrichment for animals, and about 68 percent generally read the signs in zoos. A cross-tabulation analysis showed that both pet owners and non-owners were largely in agreement (75 percent and 74 percent, respectively) that tamarins do not make good pets. For those who reported hearing of enrichment for animals, about 82 percent did not think tamarins make good pets versus about 64 percent for those who had not heard of enrichment for animals. The percentages for participants who generally read zoo signs about animals versus those who do not read zoo signs and think tamarins make good pets were similar to the enrichment percentages, at 79 and 66, respectively.

To further investigate whether there is an association between a participant's response (Agree/Unsure/Disagree) to the tamarin is a good pet statement and the one of the five enrichment conditions (No Toys, Baby Toys, Regular Toys, Keeper, Not a Pet Sign) that is present at that time, a Chi-square test of independence was employed.

By comparing the observed frequencies of responses (Table 4) with those expected under the assumption of independence (Table 5), the Pearson's Chi-square results in a test statistic of 21.75 with 8 degrees of freedom and a P of 0.0054.

An analysis of the observed values and the expected frequencies for 'Agree' responses shows higher numbers of 'Agrees' than expected for the 'Keeper' and 'No Toys' conditions, lower than expected agreement levels for the 'Regular Toys' and 'Not a Pet Sign' conditions and expected and observed numbers aligned for the 'Baby Toys' condition. For those participants who were Unsure about a tamarin as a good pet, the 'Baby Toys', 'Regular Toys', and Keeper conditions revealed a higher number than expected of

Table 4. Summary of the data in Table 3.

Condition	Agree	Unsure	Disagree
Minimum	9.0	1.0	56.0
First Quartile	12.0	10.0	72.0
Median	15.0	11.0	73.0
Mean	15.6	9.2	72.8
Third Quartile	20.0	11.0	80.0
Maximum	22.0	13.0	83.0
Standard Deviation	5.41	4.71	10.47

Table 5. Expected Frequencies by enrichment condition for responses to 'A tamarin would be a good pet' under the assumption of independence.

Condition	Agree	Unsure	Disagree
No Toys	14.86	8.77	69.37
Baby Toys	15.82	9.33	73.84
Regular Toys	17.26	10.18	80.56
Keeper	14.23	8.39	66.39
Not a Pet Sign	15.82	9.33	73.84

Table 6. OLR Analysis Summary for Condition 1 (Keeper), 2 (No Toys), 3 (Not a Pet Sign), and 4 (Regular Toys).

Condition	Coefficient	Standard Error	t-value	P value	Lower 95% Confidence interval	Upper 95% Confidence interval
1	0.52	0.31	1.68	0.093	-0.087	1.13
2	-0.081	0.34	-0.24	0.81	-0.74	0.58
3	-0.42	0.34	-1.23	0.22	-1.08	0.25
4	-0.19	0.32	-0.60	0.55	-0.82	0.43

Unsure responses. Across all five enrichment conditions, the levels of disagreement are quite consistent with expectations with only the Keeper condition having notably less disagreement between observed and expected values.

To examine more closely which of the five enrichment conditions are associated with higher levels of agreement or disagreement with the statement about tamarins as pets, an ordinal logistic regression (OLR) analysis was conducted. Applying OLR in this study to the four conditions – 'Keeper', 'No Toys', 'Not a Pet Sign', and 'Regular Toys – relative to the Baby Toys condition as a baseline indicates that the Keeper condition seems to correlate with an increase in guests' agreement that tamarins make good pets, as indicated by a coefficient of 0.52 (Table 6).

However, the P of 0.093 suggests that this increase is not statistically significant, prompting the question of whether this effect could be due to chance, or a more profound relationship. The odds ratio of 1.69 implies that the odds increase by 69%, but the confidence interval ranging from 0.92 to 3.10 includes 1, further adding to the mystery of this effect's significance (Table 7).

For the No Toys condition, Tables 6 and 7 show a slight decrease in the odds of guests moving to a higher agreement category, as shown by a negative coefficient of -0.081. However, this effect is not statistically significant, with a P of 0.810, suggesting the need for further investigation. The corresponding odds ratio is 0.92, indicating a minor decrease of about 7.77% in the odds, but the confidence interval (0.48 to 1.78) crosses 1.

For the Not a Pet Sign condition, the analysis in Tables 6 and 7 suggests a decrease in the likelihood of moving to a higher agreement category, with a coefficient of -0.42. This finding is not statistically significant, as indicated by a P of 0.22. The odds ratio of 0.66 translates to a reduction of about 34% in the odds of higher agreement, but the broad confidence interval from 0.34 to 1.28, which includes 1, means we cannot confidently assert the presence of this effect.

Under the Regular Toys condition (Tables 6 and 7), there appears to be a slight negative impact on moving to a higher agreement category, reflected by a coefficient of -0.19. However, this effect lacks statistical significance (P=0.55). The odds ratio of 0.83 suggests a decrease in the odds by 17.32%, but the confidence interval, ranging from 0.44 to 1.54, crosses 1. This indicates that the effect, while potentially negative, is not reliably different from no effect.

A Brant test was used to check the proportional odds assumption in OLR. In Table 8, the omnibus test result (Chi-square=30.2) with a very low P (close to 0) indicates a significant violation of the proportional odds assumption across the model.

Looking specifically at each of the conditions, only 'No Toys' shows a significant result (P<0.001), indicating a violation of the proportional odds assumption for this predictor. This suggests that the effect of the No Toys condition on the likelihood of higher versus lower category responses (agree/unsure, unsure/disagree) varies between different pairs of categories.

Given these results for the No Toys predictor where the assumption fails, a multinomial logistic regression (MLR), which does not assume any order or proportional effects between categories, was conducted. In the MLR analysis, for those guests

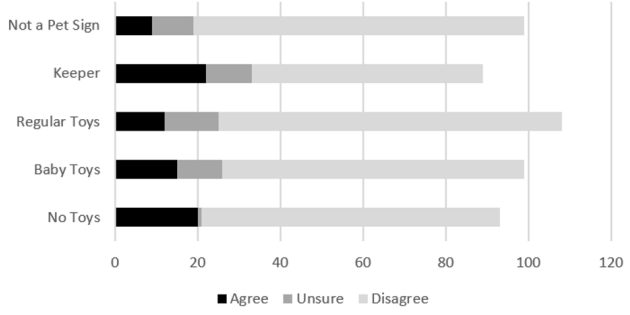

Figure 2. Agree-Unsure-Disagree responses to "A tamarin would be a good pet" statement across enrichment conditions.

Table 7. Odds Ratios for Condition 1 (Keeper), 2 (No Toys), 3 (Not a Pet Sign), and 4 (Regular Toys).

Condition	Odds Ratio	Lower 95% Confidence interval	Upper 95% Confidence interval
1	1.69	0.92	3.10
2	0.92	0.48	1.78
3	0.66	0.34	1.28
4	0.83	0.44	1.54

who responded Unsure to the statement about tamarins suitability/desirability as pets, the intercept of -1.89 translates into an odds ratio of 0.15, suggesting a significantly low baseline likelihood of guests being unsure versus disagreeing when no other conditions influence their opinions. This coefficient indicates that guests are unlikely to remain ambivalent in a neutral setting. Similarly, for those guests who responded Agree to that same statement, an intercept of -1.58, with an odds ratio of 0.21, shows that the base odds of agreeing (over disagreeing) are low, meaning that without specific stimuli, guests are generally disinclined to view tamarins as suitable/desirable pets.

For the Keeper condition, the coefficient of 0.65 results in an odds ratio of 1.91, indicating a 91% increase in the likelihood of agreeing over disagreeing. Further, with a smaller coefficient of 0.27 and an odds ratio of 1.30, there is a 30% increase in the odds of being unsure.

When the No Toys condition was analyzed using MLR, the negative coefficient of -2.38 and a very low odds ratio of 0.092 indicate a dramatic decrease of about 90% in the odds of being unsure. Also with the No Toys condition, a positive coefficient of 0.30 with an odds ratio of 1.35 shows a 35% increase in the odds of agreeing that tamarins are suitable/desirable pets.

The MLR analysis revealed a coefficient of -0.60 and an odds ratio of 0.55, reducing the odds of agreement by 45%. It also slightly reduces the odds of being unsure (coefficient of -0.19, OR=0.83), reinforcing the message's effectiveness.

And finally, for Regular Toys a coefficient of -0.35 and an odds ratio of 0.70 decrease the odds of agreement by about 29%. Conversely, a slight increase in being unsure (coefficient of 0.039, OR=1.039) suggests that toys may be a distraction.

Table 8. Results of the Brant test used to check the proportional odds assumption. The Baby Toys condition is the baseline.

Test for	Chi-square	Degrees of Freedom	Probability
Omnibus	30.2	4	0
Keeper condition	0.16	1	0.69
No Toys condition	8.97	1	0
Not a Pet Sign condition	0.27	1	0.60
Regular Toys condition	0.37	1	0.54

Discussion

The results of this survey shed light on zoo guests' perceptions of whether or not primates, specifically cotton-top tamarins, make suitable/desirable pets. It may also help us determine whether or not enrichment and/or educational signage being used by zoological facilities has an effect on zoo guests' perceptions. As a zoological facility that strives to promote the conservation of wild animal populations, it is of utmost importance that ideologies and/or perceptions of animals housed in the zoo that harm their welfare and conservation (specifically with the growing pet trade) are not promoted in any way. If a particular type of enrichment causes zoo guests to apply a positive idealization to owning a primate as a pet, we propose that this form of enrichment needs to be reconsidered, adjusted, or discontinued to ensure its overall effectiveness toward the species' well-being and conservation.

An initial review of the variability of the data in Table 3 revealed that the standard deviation of 5.41 across the Agree responses may suggest that certain enrichment conditions are more conducive to positive perceptions of tamarins as pets than others, while the 4.71 variation among unsure responses may reflect varying degrees of ambivalence. For Disagree responses, the 10.47 standard deviation along with the mean and median of 72.8 and 73, respectively, indicate that while disagreement numbers may vary across conditions, there seems to be a definite lean toward consistent disagreement with the central question across those enrichment conditions (Figure 2).

A visual analysis of the Agree-Unsure-Disagree data across enrichment conditions in Figure 2 further confirm the consistently high number of Disagree responses across all conditions. With the exception of the keeper condition, which shows a noticeable decrease, the Disagree responses for the other four conditions are notably consistent in number. For all conditions, the frequencies of both Agree and Unsure responses are lower than Disagree responses. Agree responses show the least variation in frequency, suggesting a relatively stable but low level of agreement regardless of enrichment condition. There is some variation in Agree and Unsure responses across different conditions, with no toys and keeper conditions having higher Agree responses than others. The 'Not a Pet Sign present', while not seeming to alter the frequency of Disagree responses compared to 'No Toys' or 'Regular Toys', does show a reduction in frequency of Agree responses, suggesting a possible impact of explicit messaging on guest perceptions of tamarins as pets (Figure 2).

In examining more closely whether there is an association between guests' opinions of tamarins as suitable pets and the enrichment condition present, the significant Chi-Square test resulted in a rejection of the null hypothesis of no association. This result implies that the presence of different types of enrichment does have an effect on zoo guests' perceptions of tamarins as pets. Further, comparing the expected values with observed frequencies for each of the three possible responses (Agree, Unsure, Disagree) and five enrichment conditions, there were instances of where the observed exceeded the expected, other instances of where the observed fell short of the expected, and still others where the observed and expected are consistent.

When the Keeper, Regular Toys, No Toys, and Sign conditions were each investigated further relative to the baseline Baby Toys condition for responses to the central question using Ordinal Logistic Regression (OLR), the regression coefficients, Ps, odds ratios and associated confidence intervals collectively suggest that while there are some differences with regard to these enrichment conditions, none are statistically significant. However, since a check of the proportional odds assumption for OLR yields a violation for the No Toys condition, Multinomial Logistic Regression (MLR) was conducted to check for significance of conditions.

Although an MLR analysis does not require that the proportional odds assumption be met, it nonetheless suggests potential differences in responses to the central question for different enrichment conditions. For example, when guests viewed a keeper in the habitat with the tamarins, there was a large increase in the likelihood that they would agree with the statement that tamarins would be good pets and also an increase, although smaller than the aforementioned one, in the odds of responding Unsure to the same statement. So, the presence of a keeper seemed to influence guests more toward agreeing with or being unsure of

the statement about tamarins as good pets than if no keeper were present.

Under the No Toys condition, not surprisingly the odds of an Unsure response went way down, suggesting that those guests who may have initially been uncertain in their opinions of tamarins as good pets were swayed toward an opinion as a result of not being distracted by the presence of a keeper, toy, or sign in or at the habitat. However, No Toys also increased the odds of guests agreeing that tamarins make good pets. Perhaps, this may be due to other aspects of the habitat or the tamarins themselves appearing more engaging or appealing when toys, keepers, and warning signs are absent.

The presence of the Not a Pet Sign (Figure 1) at the habitat appears to be an effective messaging tool since the odds of agreement with the statement on tamarins as good pets were reduced by nearly 50%, while at the same time the odds of being unsure for those guests who had no opinion were slightly reduced.

And lastly, while the Regular Toys condition does decrease the odds of agreement with the tamarins are good pets statement it also slightly increases the odds of being unsure for some guests. This suggests that the presence of toys may play at least some role in distracting from the message that tamarins do not make good pets.

The results from these analyses, in particular the Chi-square, underscore a significant association between enrichment condition and guest perceptions of tamarins as good pets, suggesting contexts in which certain conditions can influence guest opinions. The findings from the multinomial logistic regression analysis further suggest that specific enrichment conditions could have some influence on how guests perceive tamarins as pets. These range from the presence of educational signage near the tamarins' habitat as an effective messaging tool against having a tamarin as a pet to guests formulating unintended opinions by observing the physical presence of keepers in the habitat with the tamarins.

We believe this study holds significant value as a pioneering effort in investigating public perceptions about NHP in a zoo setting and if the way they are presented to the public influences their suitability/desirability as domestic pets. By exploring how different conditions influence guest opinions, our research fills a critical gap in the literature and lays the groundwork for future studies in this area.

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