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Self-Injurious Behavior in a Captive, Malimprinted *Coragyps atratus*

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ABSTRACT: Lurch is a *Coragyps atratus* who was raised in captivity and imprinted on humans. He was an education animal at the Silver Springs Zoo until its closure. Lurch was moved to the Central Florida Zoo and has been feather picking and self-mutilating since then. Self-injury is not well documented in raptors and few treatments have been explored. It is often caused by stress of some sort and is not seen in the wild. These observations were conducted in order to observe the environmental factors that influenced these behaviors in Lurch. In an attempt to curb his feather picking, Lurch was introduced to a *Polyborus plancus*, and he attacked her. They were separated but housed next to each other. He has been showing signs of aggression towards her thereafter. Lurch was observed in 2019 from January 12 to April 11 in two-hour intervals. Lurch showed no significant change in feather picking with *P. plancus* present. *P. plancus* was moved to a different enclosure on January 29th. There was no significant change in self-injury when courting behaviors were observed on February 14th, 24th, 26th, and March 7th, and no significant change in self-injury with interaction with current enrichment items. There was a significant inverse correlation between keeper presence and self-injury. A blocking vest was introduced on March 24th; a significant decrease in self-injury was observed while wearing the vest. Further testing is needed to determine the reason for the correlation and confirm the decrease due to the blocking vest.

KEYWORDS: feather picking; black vulture; pacing; imprint; imprinting; human imprinted; captive; malimprinted; case study; enrichment; brooding; courting; skin mutilation; self injury; self injurious; self injuring; self harm

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Introduction

The American Black Vulture, *Coragyps atratus* is a well-known but understudied bird with a natural range in the southeast United States, northern South America and throughout Central America. They tend to be found at lower elevations and often roost and nest in woodlands but forage in open areas and along roadsides (Kaufman, 1997). They belong to the family *Cathartidae*, which is composed of New World vultures. *Cathartidae* is characterized by a rudimentary syrinx, which limits their vocalizations to grunts, growls, and hisses. *C. atratus* is diurnal and eat mostly carrion, but will also eat eggs, newborn animals, or scraps from garbage dumps (Kaufman, 1997). The purpose of this observational study is to examine the effects of environmental stimuli on Lurch's self-injurious behavior at the Central Florida Zoo.

C. atratus is highly social and will maintain relationships with parents, siblings, and neighboring "allied families" (Rabenold, 1986). Allied families are neighboring familial groups that have a mutual, positive relationship with each other. They roost communally and show positive interactions with these individuals through allopreening or grooming of another individual, sharing feeding sites, and defending individuals from attacks from other vultures (Rabenold, 1986). It is unknown how *C. atratus* familial groups choose allied familial groups, although it is suspected that these allied familial groups may be distantly related (Rabenold, 1986). Those vultures who have a positive relationship will recruit each other to form foraging parties so as to increase every individual's success at the feeding site; however, other conspecifics with no social relationship tend to be driven from roost sites by aggressive behavior and fights (Buckley, 1999). Lurch, a male *Coragyps atratus*, is a captive specimen, located at the Central Florida Zoo in Sanford, Florida. He was hand-reared at a rehabilitation center and is human imprinted. Imprinting in this case refers to filial imprinting or the process by which a young bird learns of their mother's characteristics and follows her. This allowed Lurch to be unafraid of humans and be trained to be desensitized to disturbances that would ordinarily frighten raptors. However, this can also lead to behavioral problems the raptor would not ordinarily display such as intraspecies and human aggression (Jones, 2001).

C. atratus is strictly monogamous and maintains long-term pair bonds (Buckley, 1999). Males will compete for mates by walking in circles around the female with head lowered and making a hissing sound (Kaufman, 1997).

Mating and courtship take place in February and March (Rabenold, 1986). There is no evidence of successful extrapair mating, or mating outside of the pair bond, in this species (Decker et al, 1993). This may be due to the strong social ties between mates. Another explanation may lie in the fact that *C. atratus* mate and nest separately from the communal roost as any male performing courting behaviors in the communal roost area is attacked by other conspecifics (Rabenold, 1986). Parents will share care of the egg and offspring. Parents will often care for offspring for up to 8 months after fledging, and this has been correlated to higher survivorships of the offspring. Parents will continue to feed their offspring after they leave the nest and defend offspring when they begin feeding on carcasses by threatening other birds who attempt to drive their offspring away (Rabenold, 1986). As the offspring matures, the offspring and parent will mutually defend each other at feeding sites (Rabenold, 1986).

When Lurch reached maturity, he was housed at the Silver Springs Zoo where he was used as an education animal and flew twice a day. When the zoo closed, Lurch was moved to the Central Florida Zoo where he continued working as an education animal. Lurch was housed on the southeast side of a chain-link enclosure divided in the middle with a sliding chain-link door. The northwest side of the enclosure housed Jeff, a female, a crested caracara, or *Polyborus plancus*, who was a part of the previous study with Lurch. *P. plancus* are native to South and Central America. When feeding, *C. atratus* is subordinate to *P. plancus*. In the previous study, Lurch was taking Gabapentin, a medication for nerve pain which is used by off-label for anxiety, and was found to feather pick less when spending time near Jeff. On January 29, 2019, Jeff was removed due to increased aggression towards her from Lurch, as shown in Fig. 1, and Lurch had access to both sides of the enclosure. The enclosure contains several perches, a carrier filled with straw and mulch bedding materials on a platform, and a water trough. On the northwest side of the enclosure were several commonly traversed pathways, an outdoor perch for a hawk, and several macaw enclosures. The northeast side of the enclosure had a small parking lot blocked by a copse of bamboo that arched over to touch the top of the enclosure. The southwest side of the enclosure had a temporary enclosure that commonly housed hawks and sets of enclosures that housed various macaws and raptors. The southeast side of the enclosure was a building with a lot of keeper traffic as well as trucks and carts passing through this area. Keepers only entered the enclosure to clean and arrange enrichment,

move animal, or for medical care. Enrichment consisting of palm fronds, bamboo, and various toys and balls are moved around and exchanged with each cleaning of the enclosure. Enrichment is an animal husbandry principle that seeks to enhance the quality of animal care by identifying and providing the stimuli necessary for optimal mental and physical well-being. It is meant to increase the quality of life of an animal.

Chronic stress can promote self-injurious behavior such as feather picking and self-mutilation (Almeida et. al., 2018) and causes can range between medical and behavioral (Chitty, 2005). Shortly after moving to the Central Florida Zoo, Lurch began feather picking and skin-mutilation. Feather picking includes “any mutilation of the feathers by the beak” (Lumeij & Hommers, 2007). Feather picking and skin mutilation is not found in the wild (Jones, 2001). Feather-picking and skin mutilation is not well documented in raptors (Jones, 2001). Chitty described two cases of *C. atratus* engaging in feather-picking and skin mutilation (2005). One was diagnosed with an aspergilloma underlying the skin lesion; the other was a behavioral problem due to the bird being bullied and isolated and was not able to be medically controlled. Lurch has had several tests for possible underlying medical conditions including skin scrapes, biopsy, and blood tests and all test results have been negative.

Around the time Lurch began feather picking, Lurch began displaying unwanted behaviors to a particular keeper, such as climbing onto her shoulders and head, flapping his wings in her face, and lunging at the fence to get to her. This keeper no longer works with Lurch and is rarely near his enclosure. According to this keeper, Lurch will display these behaviors even when she is at a distance from the enclosure. The keepers do not know if the feather picking started before or after she stopped working with him. This keeper will be referred to as Keeper A. Lurch has been observed performing courtship behaviors for keepers on many occasions. It is possible Lurch is also sexually imprinted since many human imprinted raptors are also sexually imprinted to humans, being that they often have little experience with other birds. Sexual imprinting is the process through which experiences with parents and siblings early in life influence sexual preferences later in life. Keeper A has also observed Lurch performing courtship behaviors for her.

In a previous study, Kristen L. Morris found that the feather picking behavior was encouraged by attention and suggested that Lurch should be ignored during

the periods of time that he is feather picking (2017). Lurch was later moved to a more secluded area so this could be implemented. Keepers noticed no change in his feather picking and some reported worse injury than previously recorded. In a separate study, Gabapentin, an anti-convulsant and nerve pain medication sometimes used to treat anxiety, had been administered to Lurch to minimize feather picking. While the Gabapentin did not seem to have an effect on the behavior, Lurch seemed to engage in less self-injurious behavior when housed next to Jeff. After the study was concluded, Lurch was taken off Gabapentin and an attempt had been made to house Lurch with Jeff. Lurch attacked her upon first introduction and has been showing aggression towards Jeff since. After the attack Jeff was housed next to Lurch as explained above until she was moved during the observation period on January 29, 2019. Aggression of this kind is common in human imprinted raptors (Jones, 2001), and *C. atratus* compete with *P. plancus* for access to food in the areas where their ranges overlap (Cornell Lab of Ornithology 2019).

Methods and Materials

Observations of Lurch took place one meter from the enclosure on the northeast side (see Figure 1 in Appendix) for 26 days between January 12 and April 11. The observer only moved when Lurch was moved to a temporary enclosure so that his enclosure may be bleached. Behaviors were recorded in 120-second intervals into a journal then copied into a Microsoft Word document. Self-injurious behavior was the primary focus; however, all behaviors were recorded. Each behavior recorded was accompanied by a description of all stimuli occurring at that time. While all stimuli were recorded, the focus was on keeper presence, enrichment, the blocking vest, and Jeff’s presence. Observations occurred two to three times per week depending on weather with observation periods lasting approximately two hours and no observations taken during heavy rain. The observer had no interaction with Lurch, and any attempt by Lurch to get the observer’s attention was ignored. Locations of Lurch were recorded as relative to the observer’s location.

This data was compiled into a Microsoft Excel spreadsheet where each behavior was tallied by 120-second intervals. If more than one behavior occurred in that interval the tally was divided evenly between these behaviors to account for the divided time (i.e., feather picking and pacing in a two-minute interval counts as 0.5 for each, rather than 1). These tallies were used to determine percent of the observed time the behavior was performed

by dividing the number of tallies for that behavior by the total number of tallies for the day to determine the percent of observed time that behavior occurred. This was done to eliminate error generated by the time the keepers are absent or present being unequal and observational time each day not being the same. The t-test was used to test for statistical significance of results. The Welch test was implemented in cases where the number of observations were unequal.

The environmental stimuli that were the focus of this study were keeper presence, enrichment that encouraged interaction, Jeff's presence, courting behaviors, and a blocking vest. Keeper presence is defined as any time in which the keeper can be seen or heard from Lurch's enclosure, including all sounds that would be associated with the keepers like hoses, laughing, cars and golf carts, etc. Enrichment that encouraged interaction is defined as any enrichment that Lurch chose to interact with during the observational time. Jeff's presence is defined as any time Jeff was housed next to Lurch. Courting behaviors are described as having the wings spread with the head down and turning in slow circles on the ground. Feather-picking of the abdomen always takes place with courting behaviors displayed by Lurch. The blocking vest was a small felt vest worn by Lurch that prevented access to the problem areas. Problem Area 1 is the left scapular, clavicle, coracoid, and furcula area as well as the proximal arm with primary damage to skin in the scapular area. Problem Area 2 consisted of a small area on the distal forearm with no damage to skin. Self-injurious behavior is defined as any contact of the beak to the problem areas, including time when access to the actual area is blocked but an attempt is still made to access the area. Feather-picking during courting behaviors is not included as self-injurious behaviors for Lurch and instead will be considered a part of the courting behaviors. Other variables are controlled statistically so as to not interfere with results.

The blocking vest implemented was a small cloth, hourglass-shaped fabric that covers Lurch's scapular and pectoral regions. It is secured with snaps and zip ties as Lurch learned how to undo the buttons during sensitivity training with the vest. The vest does not inhibit natural mobility. Lurch allows keepers to preen under the vest for him. Several training sessions were used to desensitize Lurch to the vest and make wearing the vest less stressful. In the first observed training session, Lurch refused to wear the vest. In the second observed training session, Lurch spent nearly 45% of the time observed attempting to remove the vest. The vest was removed

at night until it was donned to be worn constantly on March 28. Lurch has not been observed attempting to remove the vest after March 28.

Results

Lurch spent an average of 25.15% of the observed time performing self-injurious behavior throughout the course of the study. This percent of time observed ranged from 1.090% to 73.85%. This data is normally distributed according to the Kurtosis test, determined using software. This large range is due to the significant difference of 29.99%, between the average percent of time observed performing self-injurious behavior without the blocking vest vs. with the blocking vest, with a p-value of less than 0.0001 at the 0.05 significance level (see Table 1 in Appendix). This difference is visually represented by Figure 2 (see Appendix). During observation periods where the blocking vest was worn the percent of time observed performing self-injurious behavior did not increase above 10.20% (see Figure 2 in Appendix). During observation periods without the vest the percent of time observed did not decrease below 9.180% (see Figure 2 in Appendix).

The massive difference between the average percent of time observed performing self-injurious behavior without the blocking vest vs. with the blocking vest skewed all other results and the days where the vest was worn was omitted from other statistical testing. The average time observed performing self-injurious behavior without the vest is 30.15%, ranging from 9.180% to 73.85% (see Table 1 in Appendix). This data is normally distributed according to the Kurtosis test, determined using software. There is a mild inverse correlation, correlation coefficient of -0.4748, between the percent time observed performing self-injurious behavior and the percent time observed where keepers are present (see Figure 3 in Appendix). This correlation is significant at the 0.05 significance level with a p-value of 0.01647. Keepers were present an average of 55.69% of the time observed, ranging from 5.080% to 98.00% (see Table 2 in Appendix). This data is normally distributed according to the Kurtosis test, determined using software.

When comparing self-injurious behavior during observation periods enrichment is interacted with vs. observation periods where enrichment was ignored, the average difference between the time spent performing self-injurious behavior with these specifications is -4.31%. This is not significant at the 0.05 significance level with a p-value of 0.2514 (see Table 4 in Appendix). Every time Lurch interacted with an enrichment item

it was a green, rubber dog ball with holes, except during one observation period in which it was palm fronds. Enrichment was always present in Lurch's enclosure, except for one day. Lurch interacted with the green ball every time it was in the enclosure, except for the day after there was no enrichment in the enclosure and the day vest training occurred. Interactions with the green ball included chewing, kicking, and carrying as well as mimicking brooding behaviors occurring more than half the time. These behaviors increased during March, the typical brooding season.

Comparing self-injurious behavior during observation periods where courting behaviors occurred vs. when courting behaviors did not occur, the average difference between the time spent performing self-injurious behavior with these specifications is -9.710%. This is not significant at the 0.05 significance level with a p-value of 0.2081 (see Table 5 in Appendix). Courting behaviors started February 14, 2019 and were last observed March 21, 2019. Lurch feather picked from the abdomen every time courting behaviors occurred. This was not included in the percent time observed for self-injurious behavior because it was not from the observed problem areas. If this time were included with the self-injurious behavior, it would make the difference between these observed times decrease.

Self-injurious behavior with Jeff present vs. absent has a difference in the average percent time observed of 0.7600% (see Table 5 in Appendix). This is not significant at the 0.05 significance level with a p-value of 0.9664. Lurch usually showed aggression towards Jeff during the periods when keepers were cleaning Jeff's enclosure, with some exception. Lurch generally ignored Jeff when he was not acting aggressively; however, Jeff became stressed if Lurch perched closely to the dividing fence and would move away and cry out.

Conclusion

The blocking vest had a massive impact on Lurch's self-injurious behavior with a significant difference in the percent of observation time the behavior occurred. Since beginning to wear the blocking vest, the most affected areas have been given time to heal and regrow feathers, preventing possible future medical issues, such as infections. In addition, the healing and growth of feathers can bother some animals and cause them to further irritate the area and prevent healing and regrowth. Allowing these areas to heal may play a role in decreasing the time spent performing self-injurious behavior. Another factor is the massive amount of biting

sandflies and mosquitos in the area which were present every observation period, without feathers to protect the irritated and damaged skin of the problem areas these insects would continue to bite and irritate the area. Covering this area and allowing new feathers to grow in may also have a hand in decreasing the time spent performing self-injurious behaviors. On the other hand, self-injurious behaviors are known to become habitual (e.g. lick granulomas in dogs) and preventing the behavior can break the habit; however, if the cause of the behavior has not been changed or eliminated, the behavior will resume upon removal of the blocking vest (Grindlinger, 1991). The sample size with the blocking vest was small and more observations with the blocking vest would need to be done to confirm that it does indeed decrease the time spent performing self-injurious behaviors. More observations can also be used to determine if the behavior is entirely habitual or if there is still an underlying cause. If the behavior completely stops with the blocking vest and continues to desist after removal of the vest, then the behavior is entirely habitual. If the behavior does not completely desist with the blocking vest worn, then further observations can be done with the vest to determine the cause of the behavior while eliminating other interfering elements, like injuries, insects, and feather regrowth.

The percent of observation time keepers were present is inversely correlated with the percent of observation time Lurch was observed performing self-injurious behaviors. This was found to be statistically significant suggesting a relationship between the two variables. One possible explanation is separation anxiety. In a conversation with veterinarian Shannon Sullivan, DVM., she stated that separation anxiety is a common cause of feather-picking in psittacine birds. Although Lurch is not a psittacine bird, *C. atratus* and psittacine birds are both social with conspecifics in nature; therefore, separation anxiety may be a possible cause and aligns with an earlier study describing Lurch to like being around people (Morris, 2017).

There is no significant difference between the percent of observation time self-injurious behaviors were performed during observation periods were enrichment was interacted with and during observation periods when enrichment was ignored. This suggests that the enrichment that is currently being used with Lurch has no relationship to his self-injurious behaviors. In an experiment with feather picking psittacine birds, enrichment devices designed to increase foraging behaviors, such as pipe feeders, successfully reduced

the amount of feather picking overall and encouraged more natural foraging times and behaviors (Lumeji & Hommers, 2008). This type of enrichment increases cognitive activity. Birds have high cognitive abilities and need stimulation to maintain proper neural function and are more susceptible to stress and boredom with insufficient stimuli for cognition exercise (Almeida et al., 2018). Food-puzzle enrichment was not used with Lurch because keepers have noted that Lurch has no interest in food-based puzzles if he cannot see the food. This may be due to *C. atratus* being primarily vision-based foragers and do not have a well-developed sense of smell like other related species (Buckley, 1999). Training and exercise may offer an alternative to inanimate, food-based puzzles as learning and flight require significant amounts of cognitive activity.

There was no significant change to self-injurious behavior during observation periods where courting behaviors were observed. This suggests there is no relationship to the 'normal' self-injurious behavior, being feather picking and skin mutilation from Problem Area 1 and 2. However, feather picking of the abdomen was observed during and after courtship rituals. Courtship behaviors started and ended during the normal mating period and courtship rituals were the same as they are in the wild except for the feather picking of the abdomen. Human-imprinted raptors tend to see humans as a potential mate if they are not introduced to conspecifics during the critical period, and this makes them unsuited for mating (Jones, 2001). Lurch was not introduced to conspecifics during this critical period and was only exposed to humans. Feather picking during this behavior may be due to sexual frustration (Jones, 2001). Lurch would not be feather picking to create a nest since *C. atratus* do not build nests. Lurch is human imprinted, so introducing a mate would most likely not change this behavior.

There was no significant change to self-injurious behavior during observation periods where Jeff was present vs. when Jeff was absent. In an earlier study it was noted that Lurch performed less self-injurious behavior when perched near Jeff; however, during the study Lurch was taking Gabapentin to potentially stop the self-injurious behavior. Gabapentin causes sedation and is used to lower anxiety (often used in aggressive, fearful cats). The Gabapentin potential influenced this initial interaction. Lurch was taken off Gabapentin before his introduction to Jeff and was not on any medications during this study, so it is likely that this change in self-injurious behaviors when near Jeff is only observable when Lurch is on Gabapentin. Otherwise, Lurch showed no difference

in self-injurious behavior with Jeff present and acted aggressively towards Jeff several times throughout the day and often when keepers were in Jeff's enclosure. This behavior is not uncommon in the wild as *C. atratus* is often aggressive in the defense of allied conspecifics, territory, and food (Rabenold, 1986). As Lurch is human imprinted it is likely that he sees keepers as allied conspecifics and is aggressive in their defense. In the wild, *C. atratus* portray altruism by defending family members. This increases indirect fitness through kin selection and increases direct fitness due to reciprocal altruism (Goodenough et. al, 2010).

In conclusion, there was a significant relationship between the blocking vest and the percent of observation time keepers were present and the percent of observation time self-injurious behavior occurred and there was no significant relationship between interaction with current enrichment types, courting behaviors, and Jeff's presence and the percent of observation time self-injurious behaviors occurred. More observations with the blocking vest are needed to confirm the relationship due to the small sample size as well as to determine the influence of habitual behavior. More observations are needed with the vest to determine the influence of habitual behavior. The blocking vest can also be used to eliminate interfering variables and confirm the relationship between keeper presence and self-injurious behaviors. It was observed by a keeper that Lurch's feather picking has gotten worse since first arriving at the Central Florida Zoo. No feather-picking occurred at the Silver Springs Zoo where Lurch got to fly twice a day. After being moved to the zoo, he initially flew five times a week; and after his removal as an education animal, he had not flown at all. Lack of appropriate exercise is a significant factor in feather-picking (Jones, 2001). Introducing re-training for outdoor flight, and flying Lurch often may potentially influence self-injurious behavior. It would also give Lurch more time with keepers which could also influence the behavior. Training to curb separation anxiety should also be considered and a study that measures self-injurious behavior before, during, and after training could test its effectiveness. Further studies could test for a correlation of human presence and self-injurious behavior in other human-imprinted, social raptors and for the effectiveness of blocking vests or other materials on self-injurious behaviors in other raptors.

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Appendix

Date	With Blocking Vest	Without Blocking Vest
12-Jan-19	32.18%	
15-Jan-19	23.52%	
17-Jan-19	43.75%	
20-Jan-19	24.58%	
22-Jan-19	24.04%	
29-Jan-19	35.56%	
31-Jan-19	14.65%	
3-Feb-19	18.48%	
5-Feb-19	11.50%	
7-Feb-19	42.86%	
12-Feb-19	73.85%	
14-Feb-19	9.18%	
17-Feb-19	53.00%	
19-Feb-19	33.90%	
24-Feb-19	11.21%	
26-Feb-19	31.13%	
3-Mar-19	45.69%	
7-Mar-19	27.12%	
19-Mar-19	20.18%	
21-Mar-19	35.12%	
24-Mar-19		2.68%
26-Mar-19	21.62%	
31-Mar-19		10.20%
4-Apr-19		4.05%
7-Apr-19		1.09%
11-Apr-19		2.77%
Average	30.15%	4.16%
Standard deviation	15.67%	3.16%

Table 1. Self-Injurious Behaviors with Blocking Vest vs. without Blocking Vest

Date	Self-Injurious Behaviors	Keepers Present
12-Jan-19	32.18%	25.29%
15-Jan-19	23.52%	58.82%
17-Jan-19	43.75%	37.50%
20-Jan-19	24.58%	5.08%
22-Jan-19	24.04%	86.53%
29-Jan-19	35.56%	51.11%
31-Jan-19	14.65%	56.90%
3-Feb-19	18.48%	62.31%
5-Feb-19	11.50%	98.00%
7-Feb-19	42.86%	71.43%
12-Feb-19	73.85%	35.38%
14-Feb-19	9.18%	71.43%
17-Feb-19	53.00%	30.00%
19-Feb-19	33.90%	44.07%
24-Feb-19	11.21%	74.14%
26-Feb-19	31.13%	58.49%
3-Mar-19	45.69%	51.72%
7-Mar-19	27.12%	54.24%
19-Mar-19	20.18%	61.40%
21-Mar-19	35.12%	76.19%
26-Mar-19	21.62%	59.46%
Average	30.15%	55.69%
Correlation		-0.474788454

Table 2. Self-Injurious Behaviors vs. Keeper Presence

Date	Enrichment Interaction	No Interaction
12-Jan-19		32.18%
15-Jan-19		23.52%
17-Jan-19	43.75%	
20-Jan-19		24.58%
22-Jan-19		24.04%
29-Jan-19		35.56%
31-Jan-19	14.65%	
3-Feb-19		18.48%
5-Feb-19		11.50%
7-Feb-19		42.86%
12-Feb-19		73.85%
14-Feb-19		9.18%
17-Feb-19		53.00%
19-Feb-19		33.90%
24-Feb-19		11.21%
26-Feb-19		31.13%
3-Mar-19		45.69%
7-Mar-19	27.12%	
19-Mar-19	20.18%	
21-Mar-19	35.12%	
26-Mar-19	21.62%	
Average	27.07%	31.38%
Standard Deviation	10.72%	17.43%

Table 3. Self-Injurious Behaviors during Observation Periods with Enrichment Interaction vs. No Interaction

Date	No Courtship Behaviors	Exhibiting Courtship Behaviors
12-Jan-19	32.18%	
15-Jan-19	23.52%	
17-Jan-19	43.75%	
20-Jan-19	24.58%	
22-Jan-19	24.04%	
29-Jan-19	35.56%	
31-Jan-19	14.65%	
3-Feb-19	18.48%	
5-Feb-19	11.50%	
7-Feb-19	42.86%	
12-Feb-19	73.85%	
14-Feb-19		9.18%
17-Feb-19	53.00%	
19-Feb-19	33.90%	
24-Feb-19		11.21%
26-Feb-19		31.13%
3-Mar-19	45.69%	
7-Mar-19		27.12%
19-Mar-19	20.18%	
21-Mar-19	2.68%	
26-Mar-19	21.62%	
Average	30.71%	19.66%
Standard Deviation	17.37%	11.08%

Table 4. Self-Injurious Behaviors during Observation Periods with Courting Behaviors vs. No Courting Behaviors

<i>Date</i>	<i>Jeff Present</i>	<i>Jeff Absent</i>
12-Jan-19	32.18%	
15-Jan-19	23.52%	
17-Jan-19	43.75%	
20-Jan-19	24.58%	
22-Jan-19	24.04%	
29-Jan-19	37.10%	32.14%
31-Jan-19		14.65%
3-Feb-19		18.48%
5-Feb-19		11.50%
7-Feb-19		42.86%
12-Feb-19		73.85%
14-Feb-19		9.18%
17-Feb-19		53.00%
19-Feb-19		33.90%
24-Feb-19		11.21%
26-Feb-19		31.13%
3-Mar-19		45.69%
7-Mar-19		27.12%
19-Mar-19		20.18%
21-Mar-19		35.12%
26-Mar-19		21.62%
<i>Average</i>	<i>30.86%</i>	<i>30.10%</i>
<i>Standard Deviation</i>	<i>8.33%</i>	<i>17.48%</i>

Table 5. Self-Injurious Behavior during Observation Periods where Jeff is Present vs. Absent

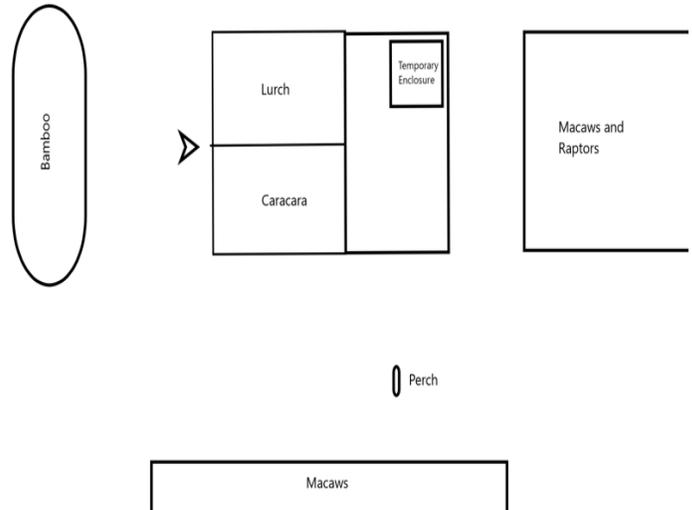


Figure 1. A diagram of the location of the study before Caracara was removed. The arrow represents the location of the observer. Not to scale.

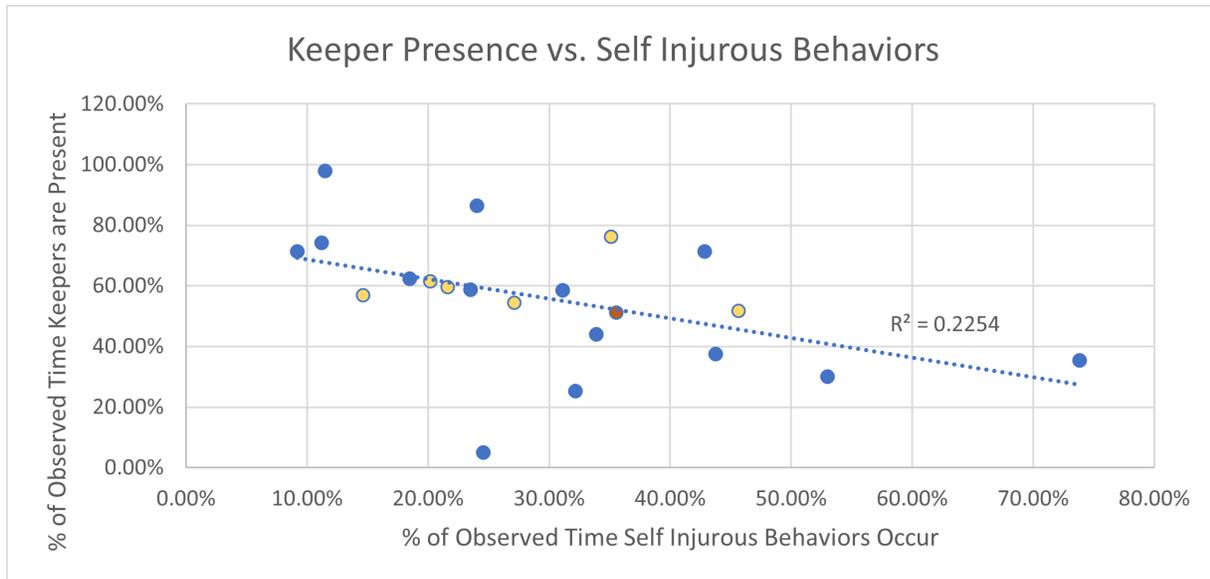


Figure 2. This graph shows the correlation between the percent of observed time a keeper was present and the percent of observed time self-injurious behavior was observed. The yellow dots represent days that the green ball was present. The orange dot represents the day Jeff was removed from the adjacent enclosure. Days where Lurch wore the blocking vest are omitted

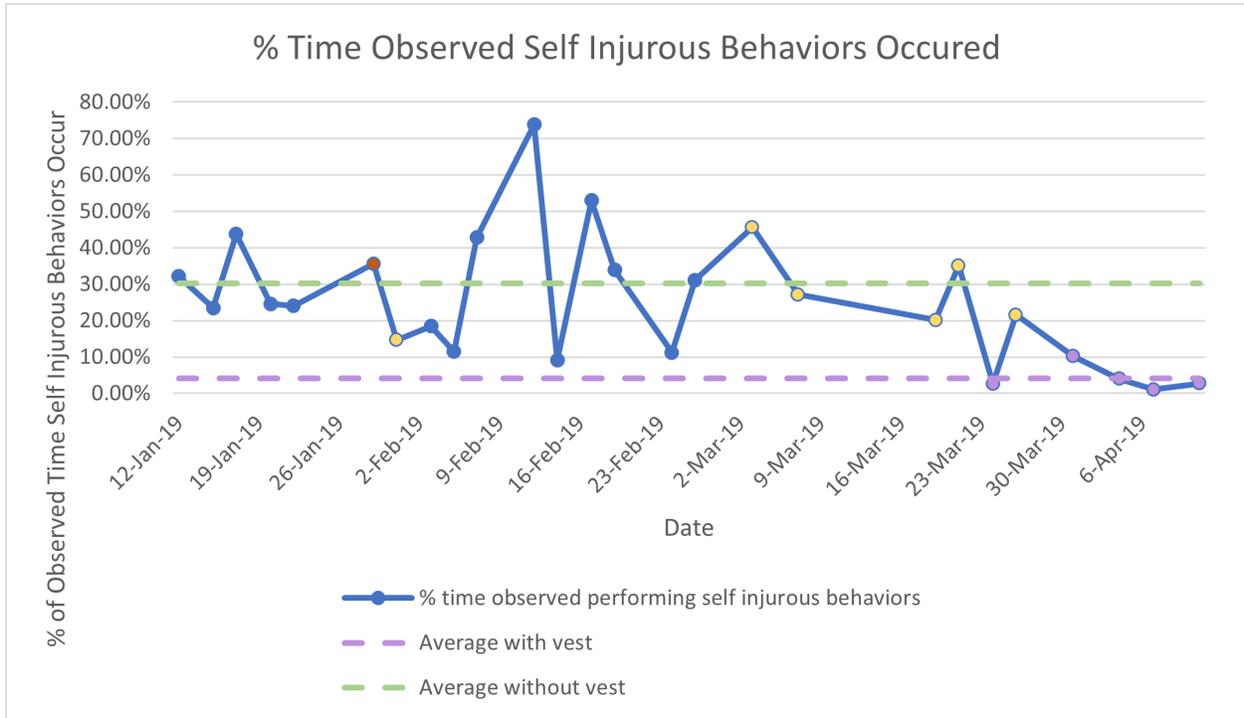


Figure 3. This graph shows percent of observed time self-injurious behaviors occurred over the time observed. The yellow dots represent the days that the green ball was present. The orange dot represents the day Jeff was removed from the adjacent enclosure. Purple dots represent days where Lurch was both wearing the blocking vest and the green ball was present.