# Proximate Analysis of Beak Contact Behavior in Parakeets

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## Abstract

After observing grooming and beak contact in parakeets (*Melopsittacus undulatus*), the function of beak contact was speculated. It was hypothesized that beak contact functioned as an affiliative behavior to initiate allogrooming. It was also hypothesized that there was less variation in sex, but more opposite-sex pairings conducted beak contact than same-sex pairings. The function of the beak contact behavior in parakeets was determined using three enclosures at PetSmart and YouTube videos. These enclosures and videos were observed for instances of beak contact and allogrooming, the differences between sex initiating beak contact, and the sexual pairings that participated in beak contact for two days a week. After four weeks, the sex data were analyzed using a two-sample t-test, which determined that beak contact was not limited by sex. The goodness of fit test was used to determine if same-sex pairings differed from opposite-sex pairings. The results indicated that females were critical for beak contact, which was more likely to occur in female-female pairings than male-female pairings. The total number of occurrences for beak contact, allogrooming, and beak contact plus allogrooming indicated that beak contact did not co-occur with allogrooming in parakeets. Therefore, beak contact was not associated with allogrooming or gender.

# Introduction

## *Background*

Parakeets (*Melopsittacus undulatus*) are domesticated birds from Australia that are differentiated by their plumage color. Male and female parakeets have no significant difference in body weight, length, wing length, upper bill length, and lower bill length (Baehaqi et al., 2018). However, females generally have more bodyweight than males to incubate eggs (Baehaqi et al., 2018). Additionally, males have longer body lengths than females (Baehaqi et al., 2018). The most distinctive feature between male and female parakeets is that males have a blue cere and females have a white cere, where the cere is located directly above the beak (Baehaqi et al., 2018). Their cere colors also vary during different age ranges where young males have pink ceres, young females have light-blue ceres, broody males have dark blue ceres, broody females have brown ceres, adult males have purplish-blue ceres, and adult females have white ceres (Figure 1).

Parakeets are social animals that participate in behaviors such as allogrooming, courtship, and companion feeding (Medina-García et al., 2017). Personality and corticosterone stress had a negative, medium-strength influence on parakeets' sociability (Medina-García et al., 2017). However, this relationship was insignificant, so bodily functions did not affect sociability (Medina-García et al., 2017). The variation in social interactions between male parakeets was suggested to be based on the short time of observation--10 minutes for each parakeet for three days (Medina-García et al., 2017).

Allogrooming in parakeets is used to reach places that they usually cannot access themselves, such as their head, neck, and face (Bergman and Reinisch, 2006). Allogrooming can

cause affiliative behaviors, which build relationships and maintain pair bonds (Morrison, 2009; Luescher, 2008). Allogrooming can also be used for social bonding because males groom other males and females groom other females (Luescher, 2008). Similar to allogrooming, beak contact is considered an affiliative behavior (Berger and Bush, 2016). In African grey parrots, beak contact occurs 50% less than singular grooming (Berger and Bush, 2016). More information is needed on the beak contact behavior.

*Question and Hypothesis*

Parakeets participate in both the allogrooming and beak contact behavior when in a social environment. A pilot study was conducted using a kinematic diagram where 25% of grooming occurred after beak contact, 75% of grooming occurred after grooming, and 42% of beak contact occurred after beak contact. Thus, the function of the beak contact behavior was speculated. Since parakeets are unable to groom their face, it was hypothesized that the beak contact behavior leads to allogrooming. However, beak contact can also be influenced by either sex differences and pairings based on sex. In this instance, it was assumed that sex would not determine beak contact, but beak contact would most likely be seen between opposite-sex pairings more than same-sex pairings.

## Methods

The function of beak contact was determined by observing three enclosures with four parakeets each at most, using focal sampling and continuous recording at PetSmart. Each enclosure was observed for five minutes per parakeet twice a week over four weeks. Each parakeet represented one replicate, and a number generator was used to randomize observation

orders for the enclosures and parakeets. The associates at PetSmart and a cere color chart were consulted to determine the sex of the parakeets (Figure 1).

At PetSmart, the parakeet housing for enclosure one had one water bowl, one food bowl with spray millet and premium pellets, three perching bars, two hanging toys, one cuttlebone, and wood pellets for the bedding. Enclosures two and three had four hanging toys, two food bowls with spray millet and premium pellets, one water bowl, one cuttlebone, four perching bars, and wood pellets for the bedding. Enclosure one's dimensions were 16 in x 25 in x 26 in, enclosure two's dimensions were 47 in x 26 in x 23 in, and enclosure three's dimensions were 47 in x 26 in x 25 in.

I analyzed the relationship of beak contact with allogrooming by tracking the number of times parakeets participated in beak contact plus allogrooming, beak contact only, and allogrooming only. The sex of the initiating parakeet and the sexual pairings of those participating in beak contact were recorded based on the beak contact only and beak contact plus allogrooming tally. Allogrooming was characterized by using the beak to connect with the body part (usually head) of another parakeet. Beak contact was characterized by interlocking the beak of one parakeet with another parakeet.

Due to consistent parakeet unavailability at PetSmart, parakeets 14-40 were observed using YouTube. I typed "parakeet aviary" in the search bar on YouTube and selected 13 videos that followed the developed criteria (Table 1). These criteria included the following questions: could I see their cere to determine sex; were the bird's actions visible for at least five minutes; was there more than one bird in the cage; was the video long enough to observe all birds (>20 minutes); and if the video was on a loop, did it restart after 5 minutes. After each video was analyzed for passing these criteria, I started the video from the beginning and observed each bird

for five minutes. Before observation, a random number generator was used to determine the observation order for the parakeets.

Statistical analysis was done using the IBM SPSS Statistics Program (Version 27), a goodness of fit test, and Microsoft Excel. A two-sample t-test was used to determine if beak contact was sex-specific. Microsoft Excel was used to determine if the frequency of beak contact plus allogrooming differed from beak contact only and allogrooming only. A goodness of fit test was used to determine if male-female, male-male, and female-female pairings for beak contact differed.

## Results

On average male parakeets initiated 0.7945 beak contact behaviors, and females initiated 0.8553 beak contact behaviors (Figure 2). However, male and female beak contact occurrences were not significantly different from one another (t=0.125, df=7, p-value=0-904; Figure 2). The goodness of fit test for sexual pairings determined that the observed values for sexual pairings were significantly different from the expected values (t-statistic= 28.514, df=2, critical value= 5.99; Table 2). Male-male pairings for beak contact were observed less than expected (Figure 3). Both the male-female and female-female pairings for beak contact were observed more than expected (Figure 3). Allogrooming only occurred more often overall than beak contact only (Figure 4). Additionally, beak contact only occurred more often overall than beak contact plus allogrooming (Figure 4).

## Discussion

Since male and female beak contact occurrences were not significantly different from one another, the hypothesis that beak contact was not sex-limited was supported. However, both

hypotheses for beak contact initiating allogrooming and beak contact occurring more in opposite-sex pairings than same-sex pairings were rejected. Therefore, beak contact was not associated with allogrooming or gender. Since female-female and male-female observed values were significantly greater than their expected values, females were critical for beak contact occurrence (Table 2). Beak contact was more likely to occur when there were female-female pairings than male-female pairings because female-female pairings had a greater difference between observed and expected values than male-female pairings (Figure 3).

Female parakeets were assumed to be less sociable than males (Abbassi and Burley, 2012). However, there was a greater difference between observed and expected values for female-female beak contact interactions than male-female beak contact interactions. Therefore, female parakeets were more sociable with other females than males in terms of beak contact. Even though male-male beak contact interactions were not observed during this study, it should not be assumed that male-male beak contact interaction does not occur. It was understandable why beak contact and allogrooming were not associated with one another. This was based on the assumption that beak contact would have co-occurred with allogrooming when allogrooming was initially described in parakeets. However, there was no evidence found either during this research or previous research that beak contact occurred simultaneously with allogrooming.

This project was limited by the parakeet unavailability at PetSmart, YouTube video angles, length of observations, and data collection. The parakeet unavailability allowed for beak contact to be observed using YouTube videos when it was not observed in the field. However, the YouTube videos were limited by only providing one angle versus observing three angles at PetSmart. There were instances of allogrooming that occurred before and after the 5-minute observations, so the observation time should be extended. The collected data for allogrooming

and beak contact plus allogrooming were limited because they were based on observation day instead of the individual. Therefore, I would suggest choosing places where parakeets can be observed with multiple angles without the risk of being purchased. Additionally, I would suggest watching each parakeet for ten minutes instead of five and recording these data by individuals.

Beak contact and allogrooming were assumed to be separate affiliative behaviors. Additionally, this research determined that the beak contact behavior was more likely to be observed in female-female pairings than male-female pairings. For future research, I would suggest determining why females initiate beak contact more with other females than males. Future research could also look more into the differences in beak contact based on the parakeet's age. I would also suggest conducting an ultimate analysis for beak contact.

## Acknowledgments

I want to thank Dr. Tate Holbrook for his assistance with the methods and data analysis. I want to also thank PetSmart in Brunswick, GA that allowed me to observe their parakeets. Lastly, I want to thank the people that uploaded parakeet videos to YouTube.

## Figures and tables


**Figure 1:** Cere color chart to determine sex in parakeets.

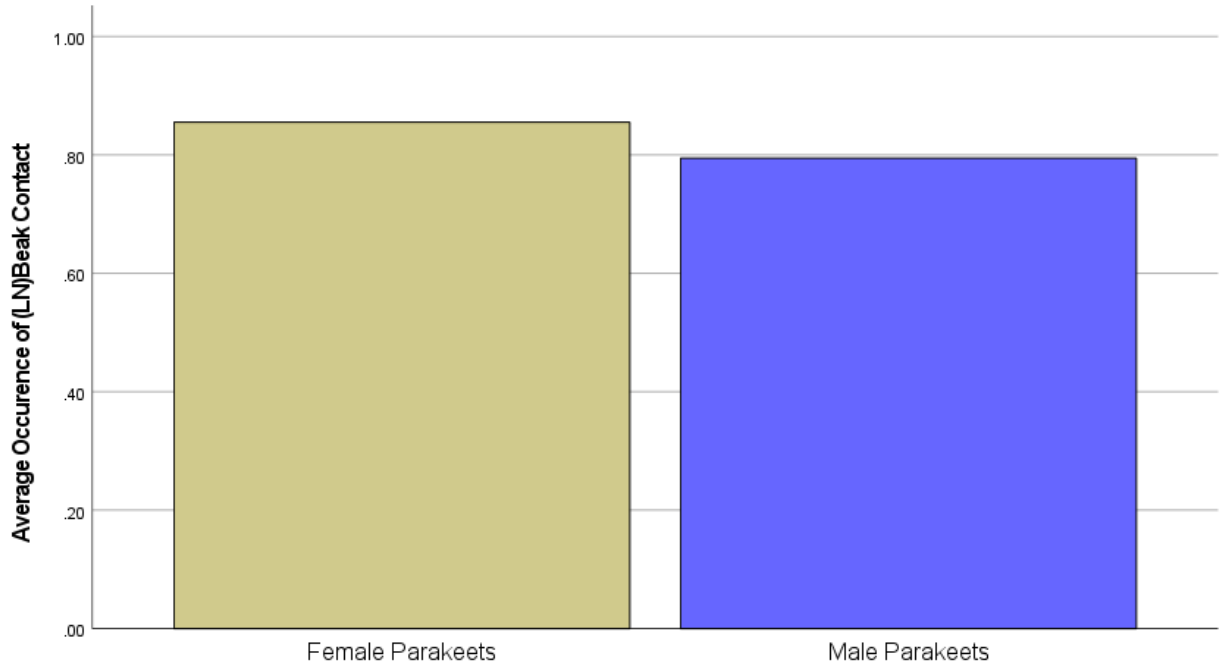


**Figure 2**: Bar graph from SPSS displaying average occurrence of beak contact in male and female parakeets. Values for beak contact occurrences had to be transformed into the natural log to satisfy the normality assumption for the two-sample t-test. Male and female beak contact occurrences were not significantly different from one another (t=0.125, df=7, p-value=0-904).

**Table 1**: List of parakeet numbers and video names used for research observation. Videos came from YouTube and were listed under the "parakeet aviary" search.

| Parakeet number | Video name |
|---|---|
| 14,15, and 16 | Over 12 hours of Budgies Best Playing and Singing and talking Help lonely Budgies to chirp |

| | |
|---|---|
| 17 and 18 | 1 hour of Budgies—Beryl and Moon First time outside |
| 19 and 20 | Over 2 hours of Budgies chirping—For your lonely parakeets and budgies while at work |
| 21 and 22 | A Day of a Budgie, Budgie Videos, Enjoy! |
| 23 and 24 | 2 hours budgies chirping parakeet sounds—Play for your budgie or parakeet |
| 25 and 26 | 6 Hrs of chirping Budgies/Parakeets sounds NEW//Lemon and Lola keep your birds company |
| 27 and 28 | Lonely Parakeets//Help the budgies chirp and sing |
| 29 and 30 | Budgie sounds 2 hours/Help lonely Budgies to chirp |
| 31 and 31 | The BEST PARAKEETS SOUNDS 3 Hours for your birds to listen to |
| 33 and 34 | Parakeets Budgie Talking Chirping Noise Playing Birds |
| 35 and 36 | Budgie (love bird's) Sounds and Playing 1st Time Access Nest Pot |
| 37 and 38 | 1 hour of Budgie Best Friends Talking, Playing, and Singing—Mango and Chutney |

| | |
|---|---|
| 39 and 40 | Most Popular---2 Hours Budgie Sounds for lonely Parakeets—Lemon and Lola |

**Table 2**: Goodness of fit test for sexual pairings. Expected values were determined by counting the number of possible interactions for each enclosure or video based on the number of females and/or males that were present, then dividing each category (M x M, M x F, and F x F) by the total possible interations. The previous fraction was then multipled by the total observed interations. It was determined that there was a difference between observed and expected values (t-statistic= 28.514, df=2, critical value= 5.99).

| | M x M | M x F | F x F | Row Total |
|---|---|---|---|---|
| Observed | 0 | 12 | 12 | 24 |
| Expected | $\frac{10}{27} * 24 = 8.9$ | $\frac{13}{27} * 24 = 11.6$ | $\frac{4}{27} * 24 = 3.6$ | |
| Test-statistic | $\frac{(0-8.9)^2}{8.9} = 8.9$ | $\frac{(12-11.6)^2}{11.6} =$ 0.014 | $\frac{(12-3.6)^2}{3.6} = 19.6$ | $X^2 = 28.514$ |

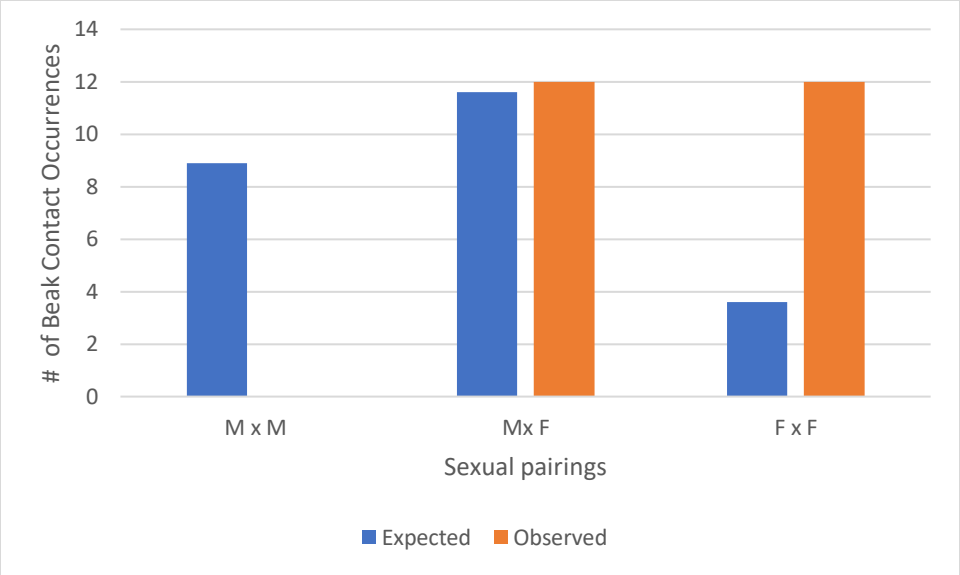


**Figure 3:** Bar graph from Microsoft Excel showing expected and observed values for sexual pairings—male-male, female-female, and male-female. Since female-female and male-female observed values were significantly greater than their expected values, females were critical for beak contact occurrence. Additionally, female-female pairings had a greater difference between observed and expected values than male-female pairings. Therefore, beak contact was more likely to occur when there were female-female pairings than male-female pairings.

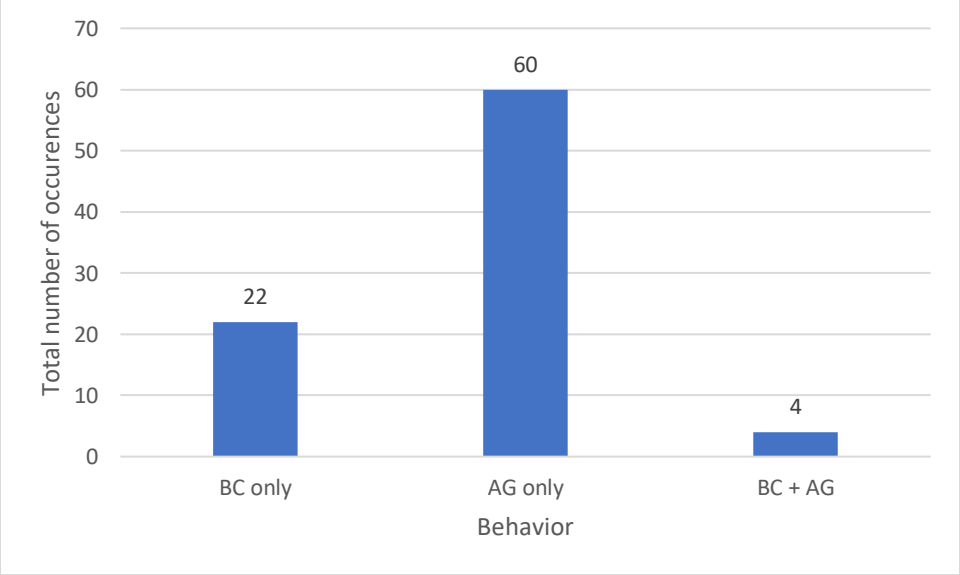

**Figure 4**: Bar graph from Microsoft Excel showing the total number of occurrences for beak contact only, allogrooming only, and beak contact plus allogrooming. Allogrooming only occurred more often over the four weeks than beak contact only. Additionally, beak contact only occurred more often over the four weeks than beak contact plus allogrooming.

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