Topic Summary

Parrots are highly intelligent animals displaying numerous different behaviours. These behaviours range from dancing, singing, interacting with conspecifics, flight, or even self harm. Environmental conditions, age, sex, rearing conditions, or relationships with conspecifics easily influence behaviour and create stress. Stress factors cause birds to exhibit those harmful behaviours, including the damaging of their own feathers. When stressed, parrots excessively preen the chest, tail, or neck and this can lead to health problems. This feather damaging behaviour (FDB) is a topic that has become the main theme of several research groups. Groups typically study FDB through experimental, observational or comparative methods as these allow the behaviour to be viewed in several interpretations.

Looking into the internal impact, a study done by Costa et al. (2016) used different rearing conditions as experimental variables to determine if African Grey's (*Psittacus Erithacus*) who were parent-raised (PR) displayed a stress related hormone, corticosterone, differently than those who were hand-raised (HR). They found the HR birds displaying FDB expressed three times the corticosterone than the PR. These results align with Owen & Lane (2006) as they used the same species to study the corticosterone concentrations in the droppings of healthy and FDB birds. FDB birds expressed four times the corticosterone than the healthy ones. These studies suggest there is a significant increase in corticosterone concentrations in FDB parrots. Research by Clubb et al. (2007) expanded the knowledge of internal impacts of FDB by examining the immune system. Using Thyroid Stimulating Hormone and African Grey's, they found the FDB group showed a lower immune response to the induced stress response compared to the healthy birds. These results demonstrate that FDB expands beyond the

endocrine system. The article from de Almeida et al. (2018) used environmental changes to observe changes internally. Using the addition and removal of enrichment to observe changes in corticosterone concentrations in Blue-and-yellow Macaws (*Ara ararauna*), they found after enrichment removal, resting birds had a higher corticosterone concentration and others increased time spent preening. This shows that enrichment is useful in lowering stress and FDB displays.

Environmental changes are useful for observing behavioural changes as demonstrated by Dislich et al. (2017) as they reduced the amount of FDB in a group of Golden Conures (*Guaruba guarouba*). By changing the sex ratio present to be more even, their results indicated a reduced amount of FDB displayed by both male and female parrots. This suggests that the sex of the parrots can serve as an external source of stress. Looking individually, the research done by Cussen & Mench (2015) looked at the personalities of Orange-winged Amazon parrots (*Amazona amazonica*) to determine its impact on stress responses. By adding or removing enrichment, they found that birds with an extraverted personality had overall better feather condition than those considered neurotic. van Zeeland et al. (2013) used individual coping strategies of African Grey's to determine if FDB impacted their reactions to stress events. After exposing FDB and healthy birds to three stress phases, the group found that FDB birds reacted more proactively compared to those without FDB, who responded more reactively. This could imply that FDB helps desensitize parrots to stressful environments and conditions.

Comparative studies prove helpful by evaluating similar behaviour among species and other organisms explaining why parrots preform FDB. A questionnaire-based study done by Ebisawa et al. (2021) asked parrot owners in Japan questions relating to FDB. They found larger

parrots were more likely to display FDB, indicating that larger birds could be more susceptible to FDB. The comparative study done by van Zeeland et al. (2009) compared FDB to hair pulling in humans and feather picking in chickens. Among other factors, they used stress as their main reasoning for these similar behaviours to occur among the groups. This study provided insight into the overall impact, causes, and evidence needed for many other studies to understand what FDB is, what it looks like and why it's important. There is still much unknown about FDB. These studies left suggestions for future research such as the impact of humans on FDB expression (Costa et al., 2016), the influence of species on corticosterone concentrations (Dislich et al., 2017), or generally looking into personality traits (Cussen & Mench, 2015).

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