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# The Effects of Age, Anxiety, and Family Size on Wing-Tail Flicking in American Crows (*Corvus brachyrhynchos*)

Nicholas Kordic, Dave J. Colucci, Anne B. Clark  
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## Background

- The wary intelligent American crow lives in family groups.<sup>1</sup>
- Historically averse to urban areas, crows are now successful urban birds.<sup>2</sup>
- Urban adaptation => low response to risk - often tested by time to approach novel objects with food.
  - Lacking: behavioral measure of crow emotional response.
- Our study:** measure **wing-tail flicking (WTF)** - a sharp coordinated movement of the wingtips and the tail associated with **unusual or stressful situations** in our crow study population.<sup>3</sup>
- Hypothesis: **Young crows may WTF less frequently than adults** if they are naive to danger.

## Questions

- Does WTFing increase with age?
- Do adults respond more to novel conditions?

## Methods

We selected sites on the territories of 9 crow families where they could feed undisturbed.

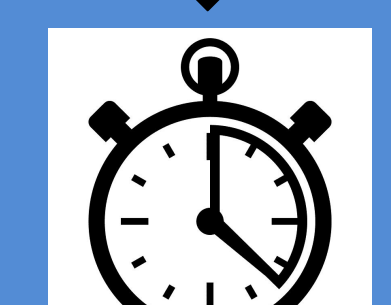


For each family:

- 1 stressful trial with food and a novel object (left)
- 3 baseline trials with food only (right)



Two types of data were collected from the videos using the BORIS ethogram software.



$$\frac{\text{WTFs in each trial}}{\text{The total crow time that all members of each age class spent on screen in each trial}} = \text{WTF / Crow Minute}$$

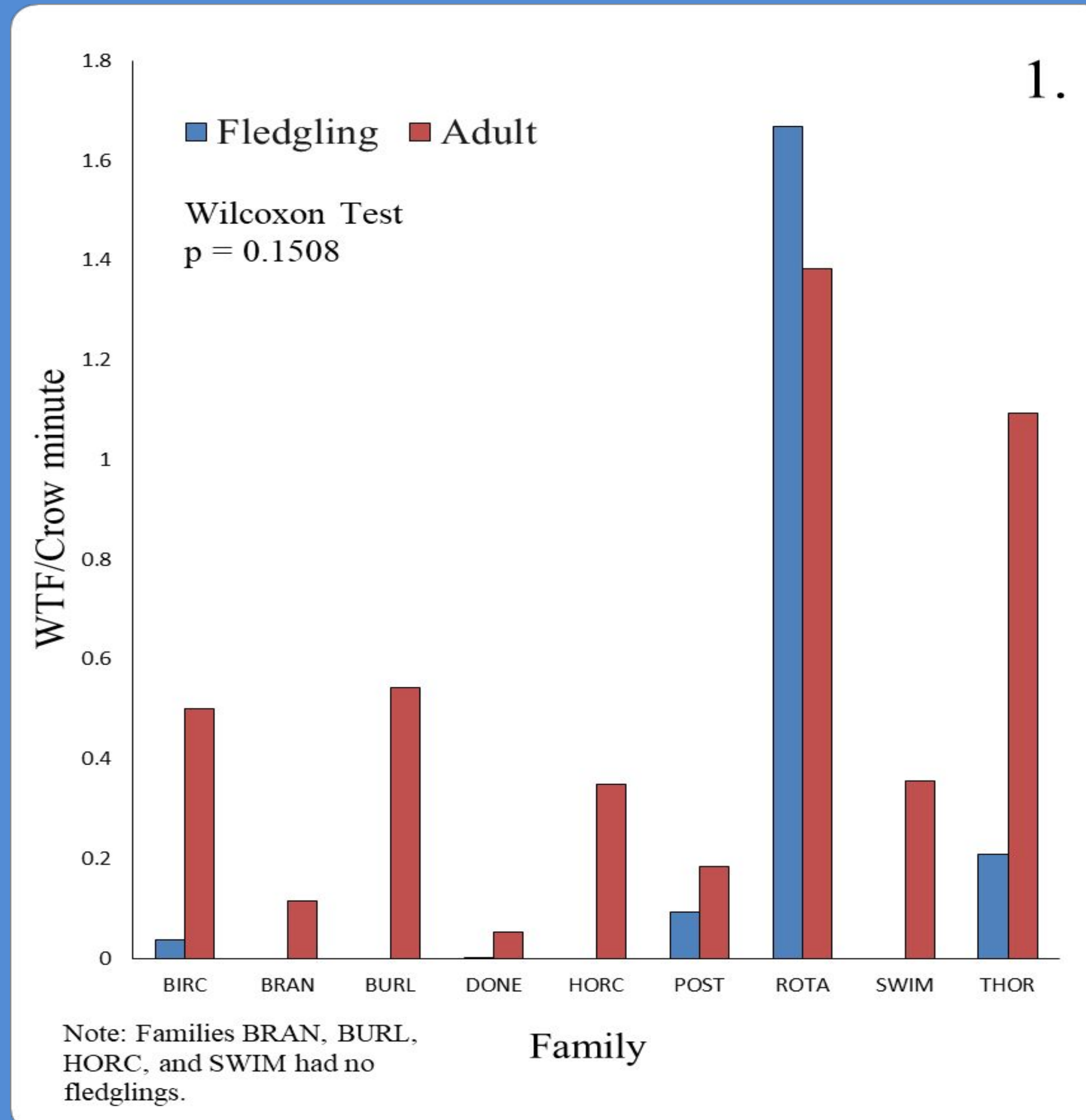
# WTFs in each trial for fledglings (left) and adults (right). Aged by appearance or behavior when not tagged.

The total crow time that all members of each age class spent on screen in each trial.

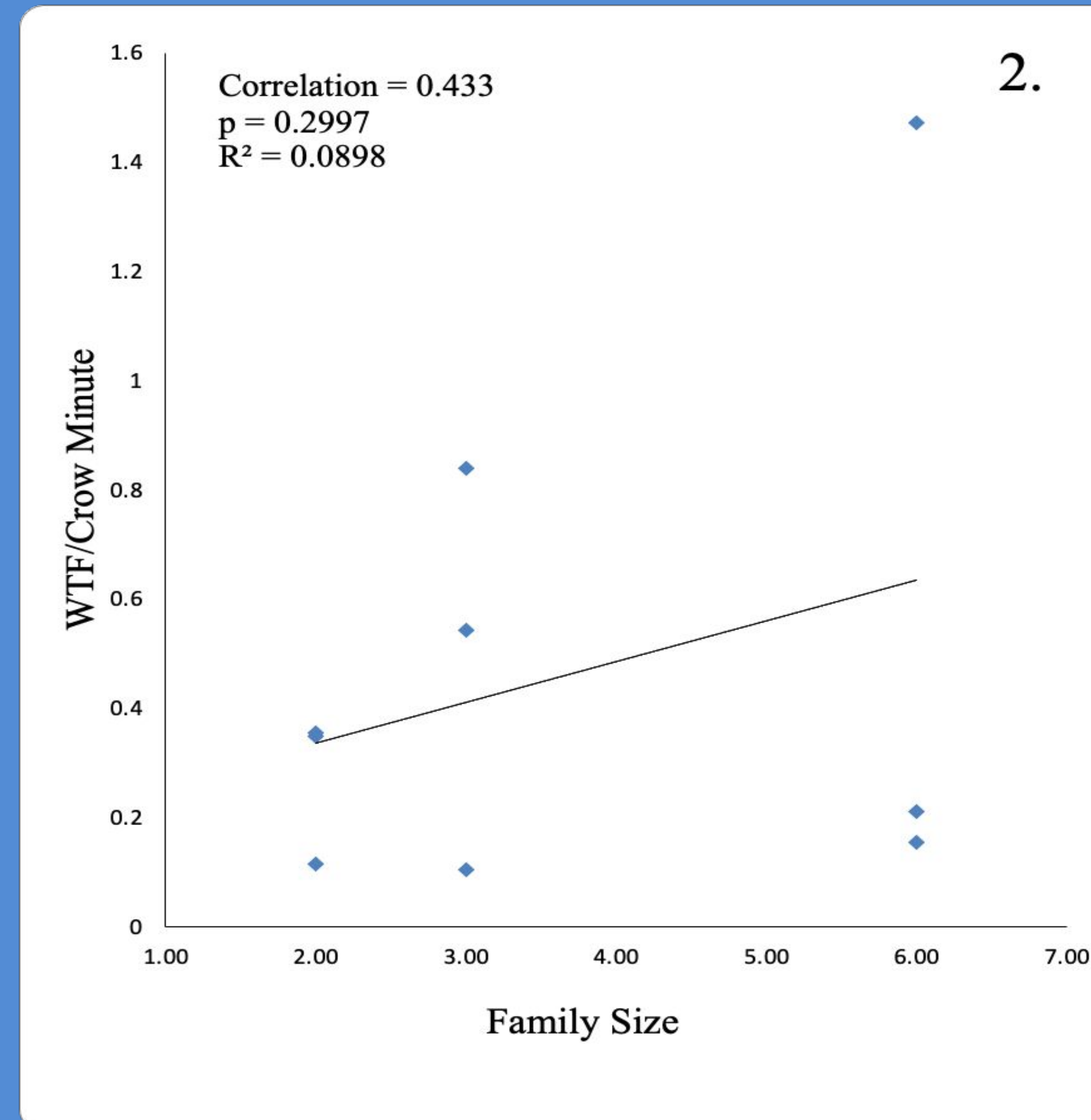
The WTF rate for crows in each age class in each trial. (WTFs & time were combined for the 3 baseline trials)

## Results

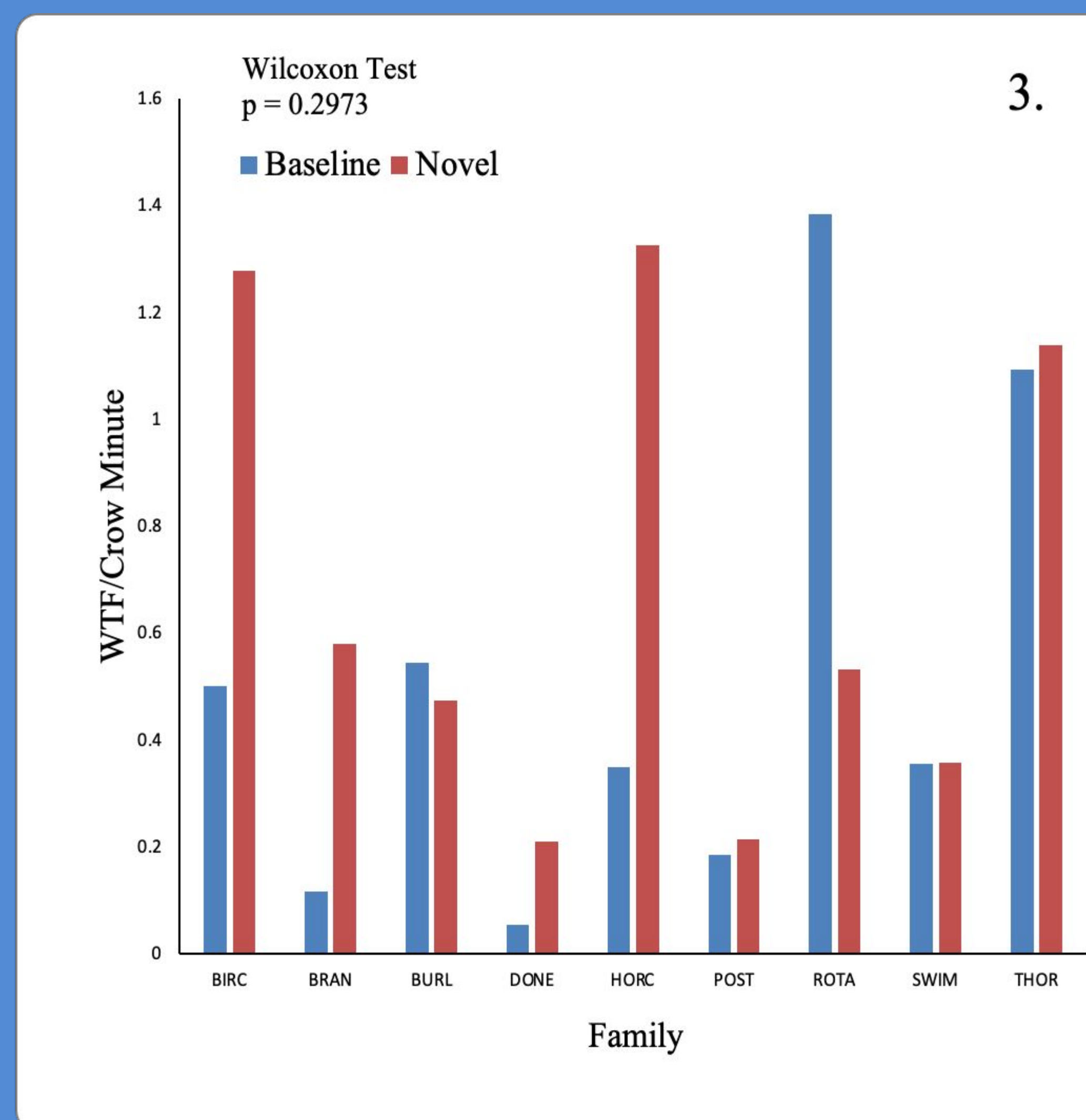
WTF rates tend to increase with age, but between family variation dominates



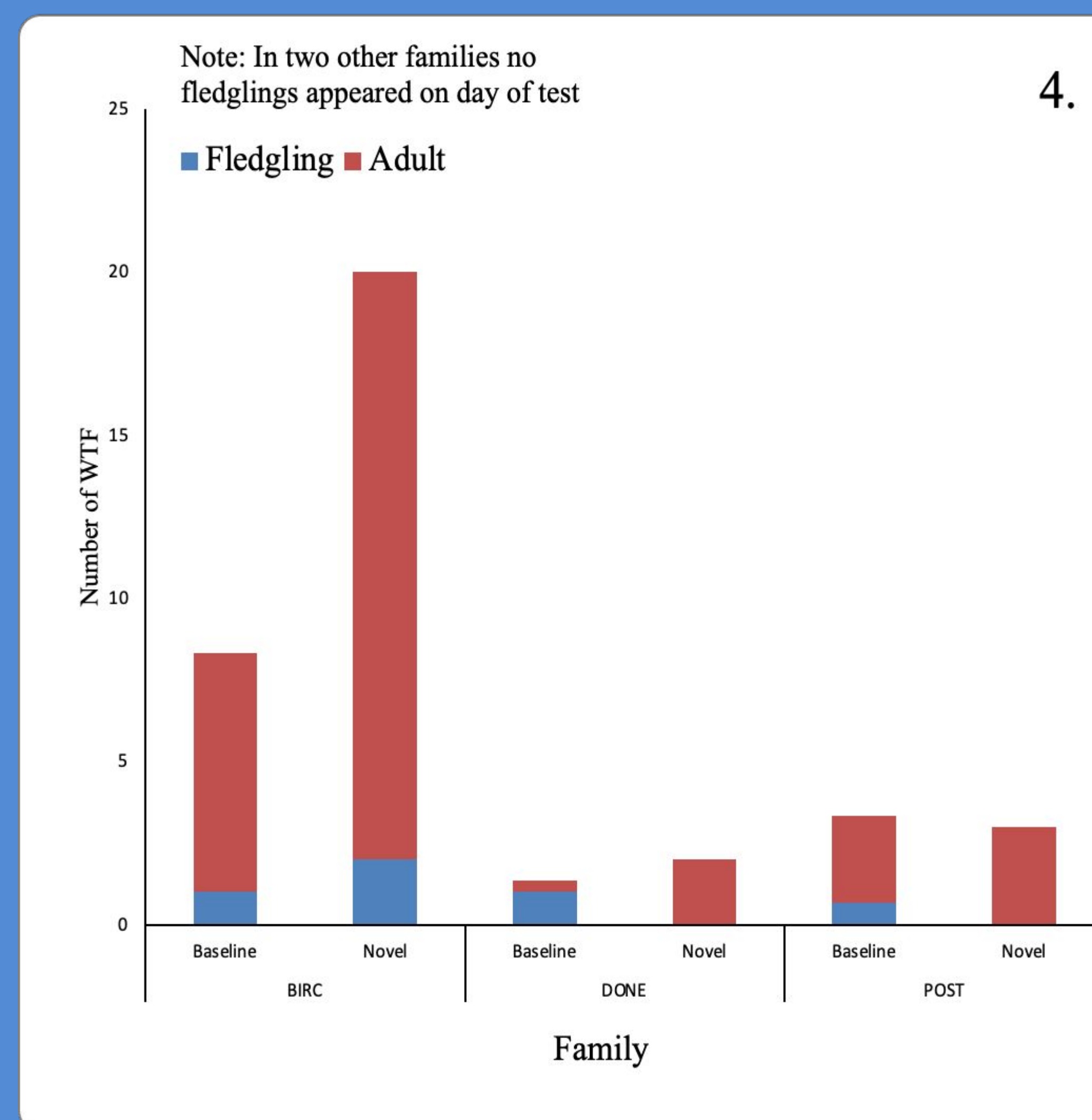
A positive, nonsignificant relationship between family size and WTF rates



Adult crows did not WTF at higher rates in novel object trials



Fledglings account for a smaller share of WTFs in stressful conditions



## Discussion

- WTF rates vary greatly between families (Fig. 1), suggesting that they could be culturally transmitted or the result of shared experiences.
- Adults WTF more than fledglings in 4/5 families (Fig. 1) & the proportion of WTFs performed by fledglings declines in novel trials (Fig. 4).
  - Although these differences are not significant, the trends suggest that fledglings are less sensitive to danger in their environment.
- We found a **nonsignificant, positive relationship between WTF rate and family size** (Fig. 2).
  - WTFs may be socially contagious and spread through a group once any crow displays anxiety.
- In 7/9 families, **adults WTF at higher rates in novel than in baseline trials** (Fig. 3), though the difference was not significant here.
  - WTFs may provide more information about crow anxiety during novelty tests than common metrics like the latency to feed.
- These findings suggest that WTFs may both **express anxiety and signal danger to crows**.

## Future Research

- Do WTFs correlate with behavioral metrics of anxiety such as jumpbacks - a backwards leap away from a stimulus?
  - Quantify jumpbacks in novel and baseline videos to explore this relationship.
- For one family (ROTA), adult WTF rate was lower during the novel trial when none of their fledglings were present.
  - Do adults feel more anxious when fledglings are with them** at the feeding site, especially if there is a novel object present?
- Is WTF rate related to increased cortisol and other stress hormone levels?
  - Do a crow's stress hormone levels confirm that WTFs are a signal of anxiety?
  - Will seeing this movement cause the stress levels of other crows to rise?



## References

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