

The relationship between age and innovation in the black-capped chickadee, *Poecile atricapillus*

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Introduction

Innovation is a behavioural trait known to be important for resource acquisition. It is defined as “the process that generates in an individual a novel learned behavior that is not simply a consequence of social learning or environmental induction”¹ Alas, little is known about the link between consumer and technical innovation, or the connection between age and innovation. This study examines the correlation between aforementioned traits in black-capped chickadees, *Poecile atricapillus*.

Methodology

To begin, the chickadees were first shaped for 10 minutes to recognize free worms in a hole of a spatial tray. Upon shaping, another 2 worms were placed in the same hole, and the hole was covered with a PomPom. The chickadees were then given 1 hour to find the worms. This procedure was repeated twice in a row. The birds were scored based on which (if any) session they found the hidden worm. This score is a measure of **technical innovation**.

In order to measure food innovation, each bird was subject to 1 hour of food deprivation prior to presentation of 5 novel food items, upon which they had 45 min to eat as many food items as possible. This procedure was conducted for three days with blue seeds, green peas, or yellow corn on different days. An additional 2 mealworms were included in order to confirm hunger motivation. The sum of novel food items eaten represents **consumer innovation**.



Figure 1. A *Poecile atricapillus* removing a PomPom from a spatial tray hole.

Results

Table 1. Data collected from food innovation and technical innovation tasks. N=17. Age was determined by measuring tail feather differences.

Age	# of trial of PomPom Removal	# of novel food Items eaten
Juvenile	1	15
Juvenile	1	5
Juvenile	2	11
Juvenile	2	10
Juvenile	2	9
Juvenile	2	4
Juvenile	never	10
Juvenile	never	6
Juvenile	never	5
Juvenile	never	5
Juvenile	never	5
Adult	1	7
Adult	2	7
Adult	never	6
Adult	never	6
Adult	never	5
Adult	never	0

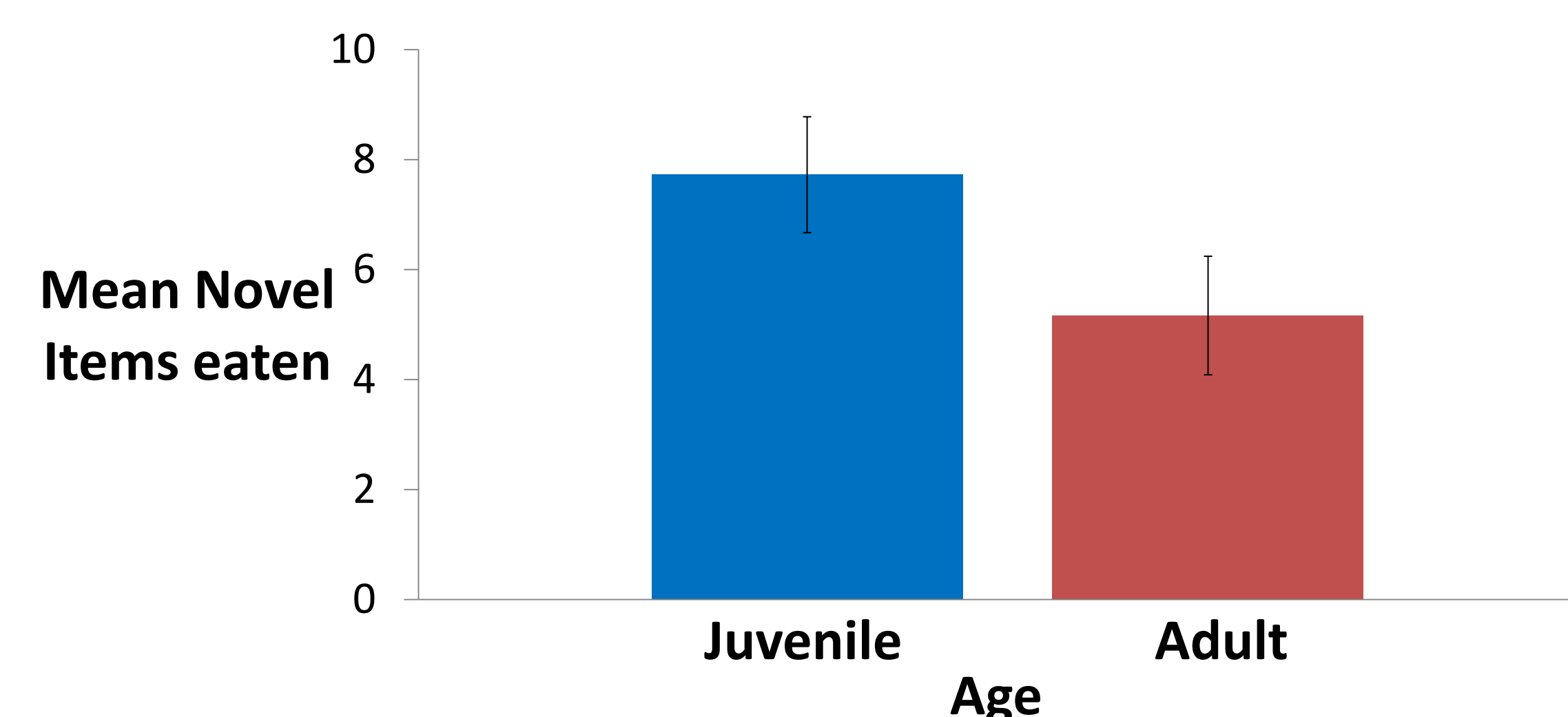


Figure 2. Mean number of novel items eaten grouped by age. n=17. Welch’s two sample t-test used to evaluate if age has an effect on food innovation. $t = -1.7$, $df = 13.1$, $p\text{-value} = 0.11$. The mean innovativeness of juveniles and adults was not significantly different.

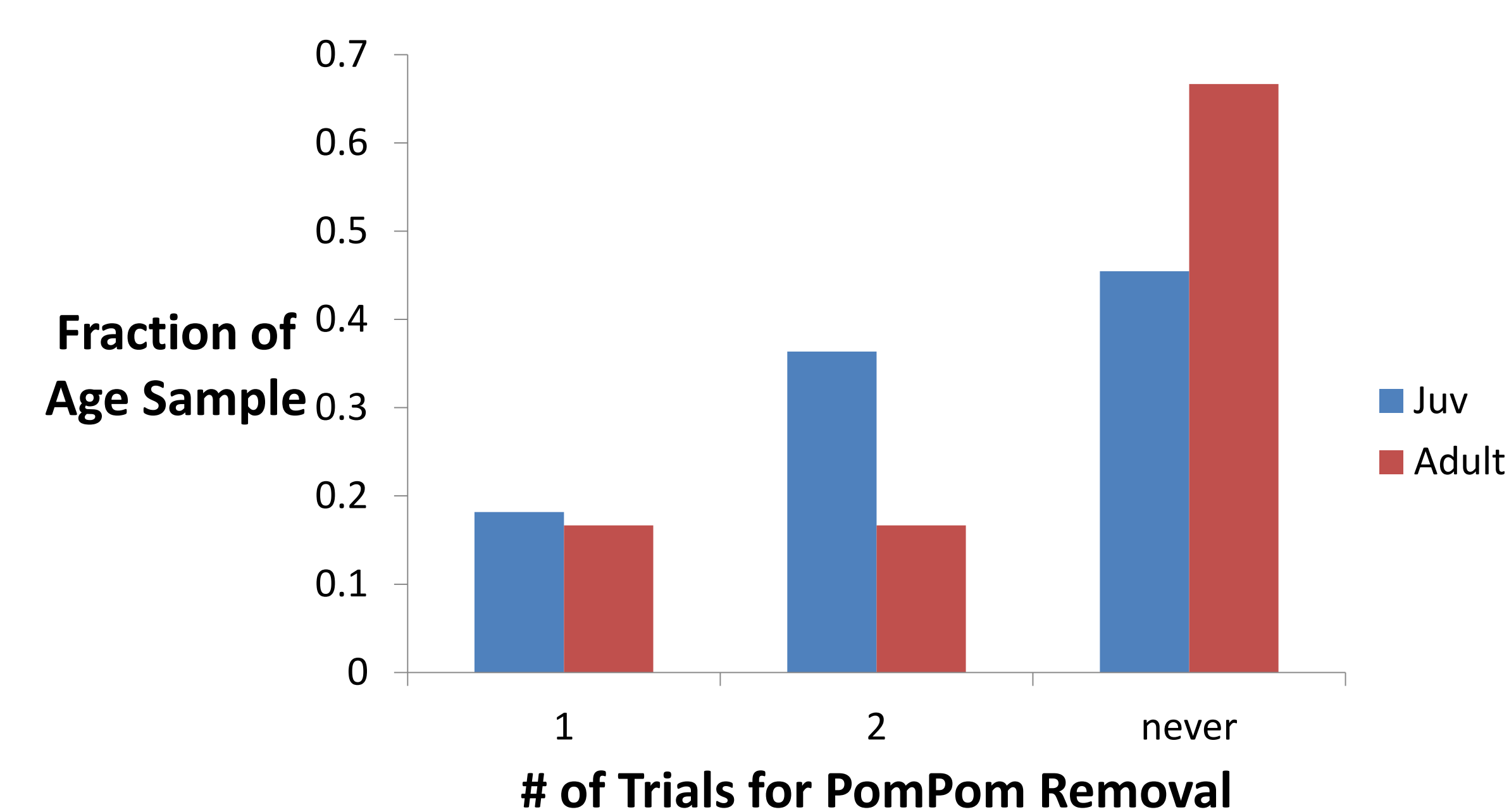


Figure 3. Proportional representation of age differences in number of trials until PomPom (PP) removal. n=17. The number of birds in each age group to score 1, 2, or never for PomPom removal was divided by the total number of birds in their age group (11 juveniles and 6 adults) to obtain the fraction of the age group at a specified score. Pearson’s Chi-squared test was used to evaluate if age has an effect on technical innovation. $\chi^2 = 0.85$, $df = 2$, $p\text{-value} = 0.65$. The association between age and technical innovation is not significant.

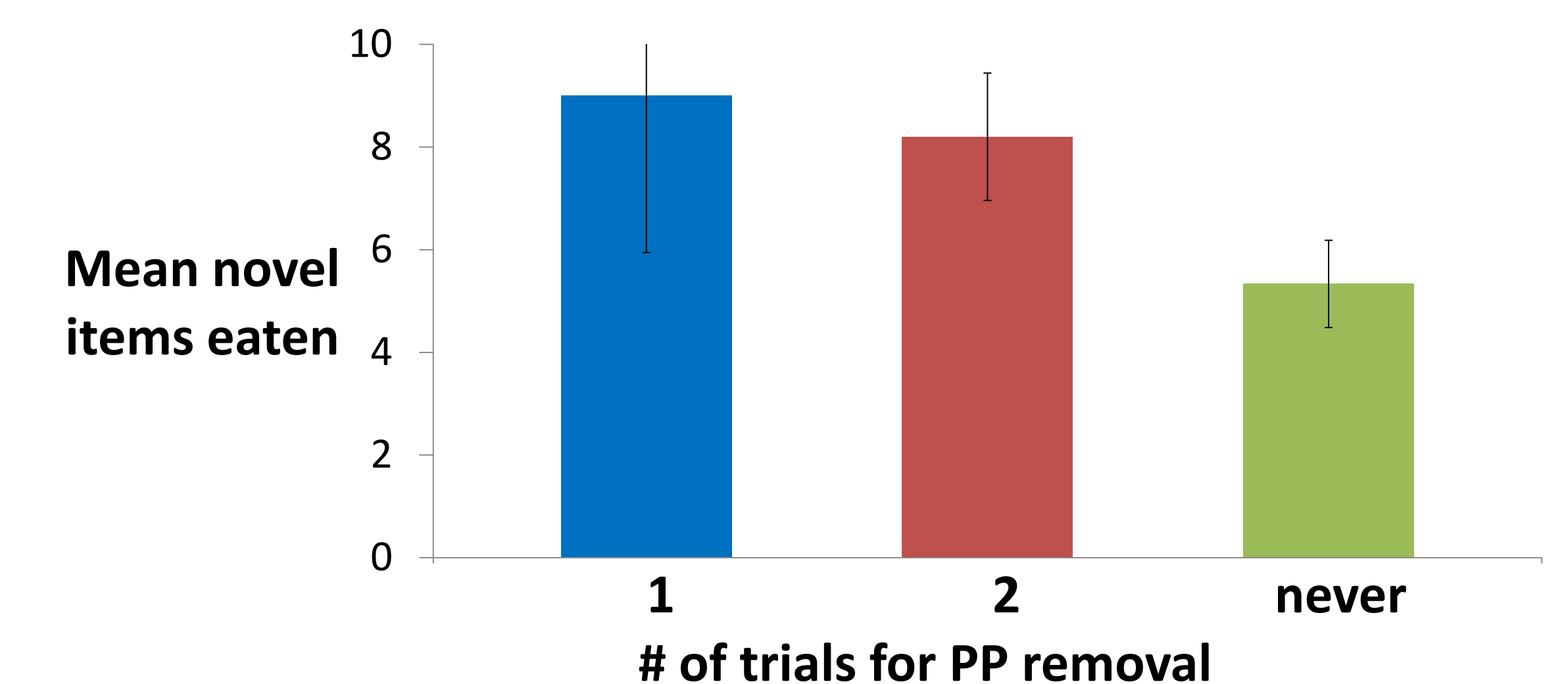


Figure 4. Mean number of novel items eaten grouped by number of trials until PomPom (PP) removal. n=17. An ANOVA test was used to evaluate if technical innovation determines food innovation. $F = 2.20$, $d.f. = 2, 14$, $p = 0.15$. The association between technical innovation and consumer innovation is not significant.

Conclusion

The lack of a significant relationship between age and innovation may suggest that innovation is constant across the lifespan of black-capped chickadees.

Although all tests turned out to be non-significant, it would be worthwhile to conduct further studies with a larger sample to determine if younger chickadees are more willing to try novel foods and if this willingness translates to technical innovation. The results of such a study may have wide-ranging implications regarding how the aging process affects innovation – both consumer and technical.

Bibliography

¹ Schaik. 2007. “Animal innovation defined and operationalized.” Behav Brain sci. 30(4): 393–432. (March 16, 2014)

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