



Biting versus chewing: Eating style and social aggression in children



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ABSTRACT

Does biting food lead to aggressive behavior? An experimental study is reported where children ages 6–10 ($n = 12$) were served chicken either on-the-bone or pre-cut in bite-size pieces. When children ate on-the-bone chicken, they exhibited more aggressive behavior than pre-cut, boneless chicken. For example, children were more likely to violate the counselor's instructions by leaving the eating area after eating on-the-bone chicken compared to kids who ate pre-cut chicken. These findings suggest a connection between how children eat and how they behave. This could have implications for developmental psychologists as well as for educators and parents.

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1. Introduction

If even a slight relationship between eating and social misbehavior exists, one way to mitigate certain behavioral problems may be to alter the manner in which certain foods are served to children. The nature of eating has changed over the years due to shifts in how humans search for and prepare food, the development of eating utensils, and the foods that are available for consumption (Mintz & Du Bois, 2002). Because of the importance of food as a resource, however, its potential limit can always be a cause for conflict, whether it be five candy bars for six children, crowding in a school lunch line, or the aggression associated with perceived food shortages (McCall & Shields, 2008; Schaller & Lowther, 1969; Williams, Oehlert, Carlis, & Pusey, 2004). There may be a dormant but potentially explosive link between the consumption of some resources and social conflict. In this vein, it may be worth exploring such a link between eating and aggressive behavior.

2. Background

Showing teeth is a common sign of aggression in the animal world. Dogs retract their lips and bare their teeth as a sign that they are willing to fight (Galac & Knol, 1997). The baring of teeth may have similar

meaning in intuitive human behavior. In fact, studies have found that more aggressive children draw stick figures with bigger, more explicit teeth than less aggressive children (Koppitz, 1966).

This is conceptually consistent with findings from the facial feedback hypothesis. (McIntosh, 1996, for a review). Most of the research on facial feedback has involved getting participants to use certain muscles, such as the well-known pencil-holding task (Strack, Martin, & Stepper, 1988). Participants were told to hold a pencil in their teeth (which stimulates smiling) or between their nose and upper lip (which inhibits smiling) while watching cartoons. Those who held the pencil in their teeth perceived themselves as being amused and rated the cartoons funnier than those with the pencil between their nose and upper lip. This study suggests that everyday actions could lead to the use of specific muscles with afferent feedback. Eating corn on-the-cob, for example, is eaten very differently than corn off-the-cob. Humans can only eat corn on-the-cob by biting it, which requires retracting the *m. risorius*—the same muscle used in a grimace of aggression.

This research investigated whether the way in which a child eats food – biting with their front teeth versus chewing pre-cut portions – influences aggressive behavior. More specifically, the research examined aggressive behavior in a within-participant study where chicken that was either on-the-bone or pre-cut into bite-size pieces was served to elementary-aged children. Younger children were chosen because they do not have as high a level of self-control and socialization as teenagers and adults (e.g., Bronson, 2000). Thus, their behavior is more likely to be influenced by the facial feedback process. This research would suggest that the manner in which children eat may subtly influence their subsequent behavior. On a practical level, if certain eating styles are associated with aggression, then cafeterias with children as clientele

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may be able to reduce disruptive behavior by avoiding foods that require those eating styles (Vollmer, Borrero, Lalli, & Daniel, 1999).

3. Study: teeth baring and aggression

3.1. Participants and methods

Participants of this study were 12 children between 6 and 10 years of age (8 female) with an average age of 7.7 years and average Body Mass Index (BMI) of 19.40 (SD 4.64). The children were participants in a 4-H summer camp who lived in the same apartment complex, were highly familiar with each other, and had shared lunch together on at least 15 prior occasions.

The IRB-approved within-participant study took place on two different days, where children were served an afternoon snack of roasted chicken. The way in which the chicken was presented to them was systematically varied. On the first day, half the children ate chicken drumsticks and the other half ate chicken deboned and cut into bite-size pieces. On the second day, the eating conditions were reversed. In both cases, the children ate the chicken using their hands.

3.2. Procedure

The study was conducted on two days (Thursday and the following Tuesday) in a park where the summer program children met for lunch. Both days were sunny, and noontime temperatures were 76 and 97 °F, respectively. On the first day, the children were divided into two groups that were matched in age, gender, and ethnicity. Two rectangular picnic tables, one for each group, were positioned 18 ft apart. The tables were used so that the participants faced the other children within their group. Each table was inside a circle with an eight-foot radius that had been drawn on the grass using flour. The two circles were two feet from each other and were used to determine when the children disobeyed instructions by leaving the circle.

In one condition, the chicken was in drumstick form, and in the second condition, the chicken had been cut into pieces about 2 cm long. Both conditions presented the same amount of chicken. The chicken was put into see-through plastic containers labeled with each child's name. Before receiving the chicken, the children were asked not to share it, and they were instructed to leave what they did not eat in the container and close its lid. The children were given a polystyrene foam plate in addition to the container of chicken and were asked to put the plate inside the container once they finished eating. The plate was intentionally too big to fit into the container, but the researchers did not provide instructions or suggestions about how to make the plate fit inside the container.

Once done eating, the children had to go to one of their counselors and ask for instructions before they could leave the circle. The same two counselors, both female undergraduate students, were not part of the research team and were blind to the purpose of the study and the treatment condition of each child on each day. They were asked to stand at the edge of each of the circles (where the two circles met) and to interact with each other. Upon request by the children to leave the circles, the counselors were instructed to tell each child, "No, you will have to wait a few minutes," and subsequently rate the aggressiveness of each child's response. After everyone finished eating, the children were told they could leave the circle and continue with their afternoon activities.

All activity was videotaped by three cameras. The first camera focused on one table, while the second focused on the other table. They were positioned to achieve overlapping fields of recording. The third camera filmed the general activity of both tables and their corresponding circles.

3.3. Measures

In addition to ratings of the counselor, aggression was measured by ratings of two on-site coders and six videotape coders. The two counselors were asked to jointly rate how aggressive each child was (1 = not very aggressive; 9 = aggressive) based on how they asked for permission to leave the circle and how they reacted when told they had to wait. The two on-site coders counted the number of times children left the circle for the 'On-Bone' condition ($\alpha = .95$) and for the 'Pre-Cut' condition ($\alpha = .80$).

In addition, six trained coders examined the video recordings and scored each participant in each condition on three different characteristics – aggression, compliance, and atypical behavior – on 9-point scales (1 = strongly disagree, 9 = strongly agree). Aggression was coded based on whether or not children showed aggressive behavior when they were folding the plate (e.g., tearing, smashing). Compliance was coded based on how well children followed the instruction of the counselors. Finally, atypical behavior was coded when children behaved strangely, such as standing on the table and jumping from the chair. The average coefficient alpha varied across the three variables they rated: aggressiveness ($\alpha = .95$ 'On-Bone' condition, $\alpha = .80$ 'Pre-Cut' condition, respectively), compliance ($\alpha = .83$ and $\alpha = .77$), and typicality of behavior ($\alpha = .90$ and $\alpha = .96$).

3.4. Statistical analysis

A series of paired-sample *t* tests were conducted to examine if the ratings of aggression were different depending on the on-the-bone versus pre-cut conditions. All analyses were performed using SPSS statistical software (version 11.0, SPSS Inc, Chicago, Ill). A *p* value of 0.05 was considered statistically significant.

3.5. Results

Ratings of two on-site coders revealed that when eating chicken on-the-bone, the children left their circles more frequently, despite numerous reminders not to do so (1.33 vs. 0.57 times; $t = 2.32$; $p = 0.04$). These results were paralleled by behavior towards the counselors. When children ate chicken on-the-bone, they were rated by their counselors as more aggressive than they were on days when they ate pre-cut chicken (4.33 vs. 2.25; $t = 3.12$; $p = 0.01$).

The averages of the six coders' ratings also indicated similar behavioral trends. When children ate chicken on-the-bone, they were perceived as more aggressive (5.43 vs. 3.88; $t = 2.598$; $p = 0.03$) and less compliant (4.38 vs. 6.21; $t = -4.69$; $p < 0.01$). Additionally, their behavior activity level was perceived as more atypical (5.10 vs. 3.34; $t = 3.82$; $p < 0.01$) than when they ate pre-cut chicken.

Thus, these findings were consistent across most behaviors and ratings of behavior, supporting the hypothesis that children who needed to bite chicken with their front teeth would exhibit more aggressive and noncompliant behavior than those given deboned chicken that only needed to be chewed (see Table 1).

4. Discussion

This study sought to determine whether the manner in which children eat has consequences for their subsequent behavior. In a within-participant study of three unrelated groups of variables, we found that children behaved more aggressively after eating chicken on-the-bone than they did after eating pre-cut chicken pieces. More specifically, children were more likely to violate the counselor's instructions by leaving the eating area after eating on-the-bone chicken. Furthermore, children who ate on-the-bone chicken were more likely to be coded as aggressive by those counselors. In addition, the six coders of videotaped behavior indicated that children who ate on-the-bone chicken tended

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