

## **The Fallacy of Generalizing from Egg Salad in False-Belief Research**

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*Geraerts et al. (2008) reported that misleading individuals with false beliefs about having gotten sick on egg salad in childhood can reduce the probability of subsequently consuming egg salad. They concluded that their results “. . . have important implications for people’s food and dieting choices. . .” (p. 752). We argue that their conclusion represents a fundamental generalization problem. We report new findings that, together with other recent studies, data on disgust and the fact that hard boiled eggs produce a chemical associated with rotten food, suggest that Geraerts et al.’s success in reducing individuals’ interest in eating egg salad is likely restricted to less appealing foods that are less frequently consumed. Because of potential applicability of their results to public health and well-being, and the more general applicability of the false-feedback paradigm to legal cases, it is important to accurately limit these conclusions and generalizations.*

### **The Fallacy of Generalizing from Egg Salad in False-Belief Research**

In a recent lead article in the influential journal, *Psychological Science*, Geraerts et al. (2008) reported that misleading individuals with false beliefs about having gotten sick on egg salad in childhood can reduce the probability that they will subsequently consume egg salad. Based on this finding, the authors concluded that the results:

have important implications for people’s food and dieting choices. That is, possibly people could learn to avoid certain foods, and thus have healthier eating habits, by believing

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that they had negative childhood experiences with unhealthy foods. With overweight and obesity having reached epidemic levels around the world . . . , the influence of false beliefs on eating behavior seems an essential topic for future work (p. 752).

Psychologists have long known of the link between beliefs and behavior (e.g., Ajzen, 2005). The new piece in the Geraerts et al.'s study is that they used a false-feedback paradigm to alter individuals' beliefs and subsequently their behavior. In this paradigm, people are misled about the occurrence of a false event from their childhood, and the impact of this false belief on subsequent beliefs, memories, and behavior is assessed. But do Geraerts et al. (2008) actually provide strong evidence for their conclusion that these results have important implications for eating and dieting? Is their suggestion of a possible way to change people's beliefs and even alter their eating behavior warranted given the data they present?

We argue in this article that by choosing egg salad as their single target item (and hard boiled eggs as one target item in a related study by Loftus and colleagues, Bernstein, Laney, Morris & Loftus, 2005a), Geraerts et al. (2008) simply demonstrated that people can be averted to one food with unique features. If this paradigm is going to contribute either to research on the ease of implanting false memories or to research on solving the problems of obesity and being overweight, as suggested by Geraerts et al., it would be at a minimum necessary to demonstrate that people can be averted to more than a single food, and specifically to (1) foods that are not already associated with a disgust reaction, and (2) foods that are enjoyed and consumed regularly.

We note here that we are not directly taking up another issue, which is the advisability of purposely implanting false memories of childhood experiences even if they are shown to be effective in weight control. There are ethical and safety issues regarding implanting false memories—issues that would demand consideration before implementing an intervention using false memories. At the moment, however, these issues may be moot given our primary argument that the findings of Geraerts et al. (2008) have limited generalizability and do not support their broad conclusion.

### **What Is the Evidence That People Are Likely to Have an Aversion to Egg Salad?**

It is well known that people respond with disgust to a remarkably consistent set of stimuli (Curtis, Aunger & Rabie, 2004) and that “core disgust” is specifically associated with oral ingestion of substances such as rotten food that cause illness and infectious diseases (Rozin, Haidt & McCauley, 2000). Indeed, “the Garcia effect” (e.g., see Garcia & Koelling, 1966) refers specifically to the potency of stimuli associated with noxious taste and smell to result in one-trial aversive conditioning. The adaptive nature of disgust is clear.

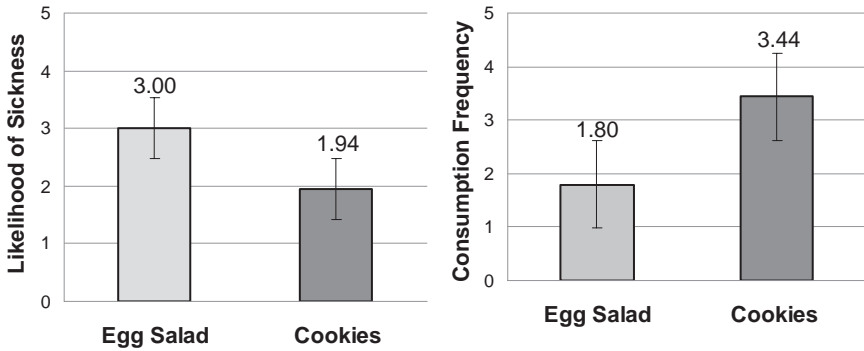
When an egg is boiled, it creates a smell commonly called “rotten-egg-gas.” This smell is triggered by the boiling process and is a property of the egg itself

once it becomes “hard boiled.” This smell occurs because proteins in the egg white that contain sulfur break down during the boiling process and form a gas called hydrogen sulfide. Hydrogen sulfide has an unpleasant smell, the intensity of which is associated with how old the egg is that has been boiled; the older the egg, the stronger the smell, because the bacteria in the egg break down the sulfur-containing proteins. A strong “rotten-egg-gas” smell in fact should signal an aversion to eating the eggs that are more likely to be rotten and cause illness. The strong association of the smell of hydrogen sulfide to boiled eggs, and the fact that this smell is associated with high bacteria levels known to make people sick, makes this food especially vulnerable to a disgust or aversion response.

### **What Is the Evidence That People Are Unlikely to Be Averted to Foods They Enjoy?**

In a previous study, Loftus and colleagues (Bernstein, Laney, Morris & Loftus, 2005b) demonstrated that a minority of people can be misled to believe that as a child they had felt ill after eating strawberry ice cream (a mean increase in ratings of occurrence from 2.49 to 3.0 on a 1–8 scale). However, when the target item was chocolate chip cookies, they were unsuccessful in misleading people to believe that they had gotten ill. This finding is consistent with findings reported by Pezdek, Finger and Hodge (1997) that implausible events are less likely to be planted in memory than plausible events. Bernstein et al. hypothesized that “our false-feedback procedure works better on novel foods than on common foods” (p. 13727), and this conclusion is supported by the fact that their participants reported that they both preferred and were more willing to eat chocolate chip cookies than strawberry ice cream. Thus, providing people with false feedback is not likely to dissuade them from eating foods that they like, especially those consumed more commonly; it is simply not plausible that these foods will make them sick. Although Scoboria, Mazzoni and Josée (2008) found that preference for peach yogurt was reduced by suggesting to people that they had gotten sick as a child eating contaminated peach yogurt, yogurt is a bacteria-rich, sour dairy product that is also vulnerable to spoiling and is not commonly consumed.

We further tested this hypothesis by assessing the extent to which individuals remember experiencing common symptoms of disgust in response to egg salad versus chocolate chip cookies. We had 176 college students complete a five-item food history inventory including two target items, egg salad and chocolate chip cookies. For each food, we first asked them to specify on a 1 (definitely did not happen) to 8 (definitely did happen) scale, whether throughout their life they had ever experienced “gagging, vomiting, feeling queasy, or otherwise getting sick after eating that food.” Consistent with our hypothesis, mean ratings of the likelihood of sickness were significantly higher for egg salad ( $M = 3.00$ ,  $SD = 2.33$ ) than for chocolate chip cookies ( $M = 1.94$ ,  $SD = 1.88$ ),  $t(175) = 5.22$ ,  $p < .001$ ; see Figure 1.



**Fig. 1.** Mean ratings of the likelihood of sickness (left panel) and mean ratings of consumption frequency (right panel) for the two target items, egg salad (light bars) and chocolate chip cookies (dark bars).

We also asked participants to rate how frequently they had consumed each of the five foods in the past 5 years, on a scale from 1 (rarely consumed) to 5 (very frequently consumed). If the false-feedback procedure works on novel foods but not common foods, as suggested by Bernstein et al. (2005b), it is important to compare how frequently individuals consume egg salad, for which false feedback effectively reduced eating interest, versus chocolate chip cookies, for which false feedback was not effective in reducing eating interest. Not surprisingly, mean ratings of consumption frequency were significantly higher for chocolate chip cookies ( $M = 3.44$ ,  $SD = 1.23$ ) than for egg salad ( $M = 1.80$ ,  $SD = .93$ ),  $t(175) = 14.05$ ,  $p < .001$ ; see Figure 1. Overall, there was a significant negative correlation between consumption frequency and ratings of the likelihood of sickness for these two target items,  $r = -.21$ ,  $p < .05$ .

Together, these results suggest that the results reported by Geraerts et al. (2008) are likely restricted to foods that share the characteristics of the target item used in their study. The findings of Geraerts et al. (2008) seem especially unlikely to generalize to (1) foods that are not already associated with a disgust reaction, and (2) foods that people are more likely to enjoy and consume regularly. Even within the constraints of research on obesity and being overweight, there are serious limitations in this research. For most people, eating a single food like egg salad is not a significant barrier between their current and their ideal weight. In other words, limitations in the generalizability of these findings markedly diminish the implications of this research for general obesity reduction policies.

### What Are the Implications for False-Memory Research?

These findings raise broader concerns about the applicability of false-memory research across both target items as well as behaviors. The origin of use of the term

“false memory” by experimental psychologists can be traced to a symposium at the 1992 meeting of the American Psychological Society on the topic, “Remembering ‘Repressed’ Abuse: Initial Research, Theoretical Analysis and Evaluation of the Claims.” Elizabeth Loftus served as the symposium discussant and presented her research on planting in adults, false childhood memories for being lost in a mall. She then drew generalizations from this research to the real-world issue of assessing whether memories for incidents of childhood sexual abuse may be suggestively planted and thus be “false memories.”

This symposium was followed by a lead article in *American Psychologist* by Loftus (1993) titled “The Reality of Repressed Memory.” This is a highly cited article; according to the Social Sciences Citation Index, there have been more than 500 published citations of this article. In both the symposium and the subsequent article, the interest was on false memories for childhood sexual abuse. The False Memory Syndrome Foundation, which coined the phrase “false-memory syndrome,” was founded in the same year. This group offers resources to individuals accused—principally by their children—of perpetrating child sexual abuse. The generalization of false-memory research to real-world cases of childhood sexual abuse is also encouraged by Geraerts et al. (2008):

Studies on false memories and beliefs, for example, have compellingly shown that misleading information can lead to the creation of recollections of entire events that have not occurred. . . . Salient real-life examples of misremembering the past are cases in which people have falsely recovered memories of childhood sexual abuse often instigated by suggestive therapeutic techniques (p. 749).

In light of the limitations found in the findings of Geraerts et al. (2008), the issue of generalizability warrants reexamination in this and all false-memory research. Unfortunately, there have been and will continue to be individuals quick to draw the link between any false-memory research findings and the ease of planting false memories for childhood sexual abuse. Generalizations to memory for childhood sexual abuse in particular should be made cautiously, because (1) implausible events are less likely to be planted in memory than plausible events (Pezdek et al., 1997), and (2) the large majority of individuals find it implausible that they themselves could have been a victim of childhood sexual abuse and forgotten the abuse (Pezdek & Blandón-Gitlin, 2009).

## Conclusions

The new findings reported here, together with those of Bernstein et al. (2005b), data on disgust (Curtis, Aunger & Rabie, 2004), and the fact that hard boiled eggs produce a chemical associated with rotten food, suggest many reasons to be skeptical about the generalizability of the findings of Geraerts et al. (2008). Their success in reducing individuals’ interest in eating egg salad may well be restricted to foods that are relatively less appealing and less frequently consumed

and to foods likely to produce chemicals associated with bacterial infestations. Because of the potential applicability of their results to public health and well-being associated with issues of obesity, and the more general applicability of the false-feedback paradigm to relevant legal cases typically involving childhood sexual abuse, it is critically important for researchers to conduct additional research that addresses the concerns identified here and correctly qualifies the conclusions and generalizations to guide practitioners and policy makers. Implanting a memory of being made sick by egg salad is not likely to be indicative of the ease of implanting a less plausible memory, and conclusions about the ease of implanting a less plausible memory are not likely to follow from the Geraerts et al. (2008) study that used an idiosyncratic target item.

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