

Research report

The effect of pistachio shells as a visual cue in reducing caloric consumption

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ABSTRACT

It was hypothesized that pistachio shells left in sight as visual cues of consumption will cause individuals to consume less. A convenience sample of faculty and staff at a mid-western university ($n = 118$) were recruited as subjects for the study. The subjects were told they were going to evaluate a variety of brands of pistachios and were surveyed at the end of each day to determine their fullness and satisfaction. The subjects were offered pistachios on their desks for an 8-h period on two separate days and were able to consume the pistachios at their leisure during that time. Subjects began each day with a sixteen ounce bowl filled with four ounces of pistachios in the shell. They were also provided with a second sixteen ounce bowl, in which they were instructed to place the empty shells from the pistachios they consumed. Every 2 h throughout the day pistachios were added in two ounce increments. In condition one, the shells remained in the bowls until the end of the day, whereas in condition two, the shell bowls were emptied every 2 h throughout the day. In condition one, subjects consumed an average of 216 calories. In condition two, subjects consumed an average of 264 calories, a difference of 48 calories. Subjects in condition one consumed significantly ($p \leq .05$) fewer calories, yet fullness and satisfaction ratings were not significantly ($p \geq .05$) different between conditions. Leaving pistachio shells as a visual cue to consumption may help consumers consume fewer calories. *Learning outcomes:* Individuals will be aware of the impact of visual cues of dietary intake on total food consumption.

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Introduction

Despite the *Healthy People 2010* initiative aimed to reduce the incidence of overweight and obesity to 15% the incidence has increased, with an estimated prevalence of 26.7% (CDC, 2010). Overweight and obesity can be linked to negative dietary behaviors, such as lack of portion control, excess consumption rates and lack of visual cues to eating.

Portion distortion

Portion distortion, or the act of thinking you consume less than you actually do, is prevalent because of increased portion sizes. The portions of various foods may be distorted by the person planning and serving the foods, or by consumer expectations. The American society has steadily increased the acceptable portion sizes of food products and prepackaged items. However, many consumers do not notice the larger serving sizes because of the gradual increase over the years. Consequently, larger portions are now the norm, which are contributing factors to weight gain and obesity (Nielsen

& Popkin, 2003; Smiciklas-Wright, Mitchell, Mickle, Goldman, & Cook, 2003; Wansink, 2007; Young & Nestle, 2002).

Visual cues

Visual cues, or lack there of, also contribute to excess food intake. Many individuals are unaware of the impact that visual cues have on their consumption rates (Rolls, Engell, & Birch, 2000). Wansink (2007) noted that "... people whose leftover chicken wing bones were not bussed from their respective tables consumed significantly less than those whose chicken wing bones were bussed (cleared away)." When a person has a visual cue of the 'leftovers', such as bones, wrappers or nut shells, they can see how many or how much they have eaten, and it can help control portion sizes and consumption. The same concept applies for fast food portions, which have steadily increased in size. A person who refills their soda cup several times during a meal may not notice their overall intake. However, if the empty cups were left on the table, the consumer would be able to see how much they had already consumed, which could reduce or stop excessive intake. Likewise, if consumers compared the size difference of a small and large order of French fries, they could visibly see the increase in food portions that has occurred. When a person has a visual cue of how much they have consumed, it can help them manage portion sizes.

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The purpose of this study was to determine if nut shells, specifically pistachio nut shells, were a visual cue of intake. If pistachio nut shells were a visual cue, did the accumulation of nut shells reduce consumption? The researchers hypothesized that if pistachio nut shells were within sight as a visual cue of intake, caloric consumption would decrease when compared to the removal of pistachio nut shells.

Methods

Upon approval of the research study proposal by the Institutional Review Board, a convenience sample of faculty and staff ($n = 118$) at a small mid-western university were recruited individually as subjects for the study. All participants completed an informed consent. There were 102 female and 16 male participants, including 91 office staff employees, 24 faculty and three who noted that they were “other”. The average age of participants was 47 ± 10.8 years.

Prior to signing the informed consent, the participants were told they were going to evaluate a variety of brands of pistachio nuts. Participants learned that they would be provided with a bowl of pistachio nuts on their desks during a traditional (8:00 am–4:30 pm) work period on two days, which was separated by a day of no pistachio consumption. Participants were told they could consume pistachios at their leisure during the day.

During the study, the participants began each day with a pre-weighed 16-ounce bowl filled with four ounces of pistachios in the shell. Each bowl was numbered for tracking and recording purposes. Participants were also provided with a second 16-ounce bowl, in which they were instructed to place the empty shells from the pistachios they consumed. Using a crossover design, the subjects were randomized into one of two conditions. In condition one, the bowls with pistachio shells were not emptied until the end of the day. In condition two, the bowls with pistachio shells were emptied every 2 h throughout the day. Pistachios were added in two-ounce increments if the amount in the bowl had been reduced to approximately half or less of the starting amount. A research assistant recorded each time two-ounces of pistachios were added to a bowl. Participants were also provided with a survey to assess the taste, texture and quality of the nuts as well as their fullness and satiety at the end of each day. The participants could rank their response to the questions on a scale of 1–3 with 1 being poor, 2 being acceptable and 3 being excellent. At the end of the study the research team debriefed the participants.

All responses were recorded and analyzed using Microsoft Excel software and SPSS. Means and standard deviation were calculated for calories of pistachios consumed and ratings of taste, texture and quality of pistachios. A paired-sample t -test was used to compare the two groups and all p -values less than 0.05 were considered statistically significant.

Results and discussion

Researchers have documented a difference in outcome of food consumption associated with visual cues. The current study resulted in statistically significant findings, but not all of the results in this study were statistically significant. A paired-sample t -test was conducted on the participants in condition one, where shells remained visible throughout the day, and participants in condition two where shells were removed every 2 h. The results of the t -test were significant $t(1, 67) = 2.656, p = .010$, indicating that when participants could see the shells pile up they ate less pistachios ($M = 1.70$) compared to when shells were not visible ($M = 1.24$). Specifically, in condition one, participants consumed an average of 216 calories from pistachio nuts and in condition two, participants consumed an average of 264 calories from pistachio

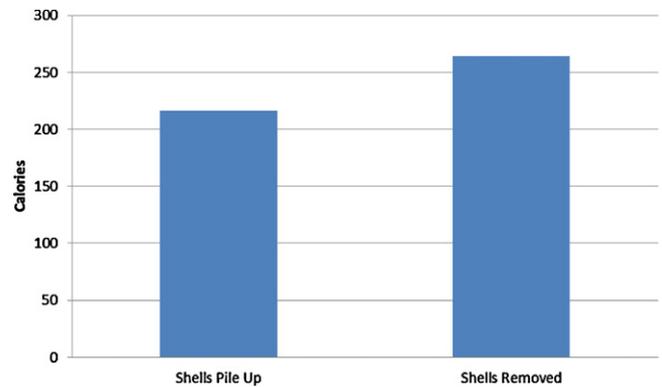


Fig. 1. Calorie content of pistachio consumption when shells remained visible throughout the day, compared to when shells were removed every 2 h.

nuts. Those participants who lacked a visual cue of food consumption ate an additional 48 calories from pistachio nuts during the day compared to those who had the shell visual cue (Fig. 1). Thus, there was a significant decrease ($p < 0.05$) in calorie consumption of 18% when shells remained present.

The findings of this study are similar to and supportive of research by Wansink (2007). In Wansink's article, he explains that when there is a visual cue of food consumption, such as a pile of chicken wing bones, the consumer can visualize how much they have already eaten. This visualization may then minimize or eliminate additional portions and overall consumption.

The researchers of this study found that the subjects' fullness and satisfaction with their portion were acceptable by the participants, and thus not significantly different ($p > 0.05$). As shown in Table 1, the mean rating for taste was 2.52, texture 2.20 and quality 2.23 out of a range of 1–3 when the shells were removed throughout the day. In comparison, the mean rating for taste was 2.41, texture 2.12, and quality 2.24 out of a range of 1–3 when the shells remained present throughout the day. The standard deviation for condition one (where the shells were removed) ranged from 0.60 to 0.68, and for condition two (where the shells remained) ranged from 0.63 to 0.73. Interestingly, “quality” had the highest variability compared to “taste” and “texture”, “taste” had the lowest variability compared to “quality” and “texture”, and “taste” was between the two regardless whether the shells were removed or the shells remained. The findings reflect that on average, the participants found the pistachio nut taste, texture and quality acceptable to their pallet.

Although the sample was small in nature, the results provided valuable information and significant findings. Specifically, a significant decrease in calorie consumption of 18% was identified when pistachio nut shells remained present on the desk of the participants throughout the entire day, compared to when nut shells were routinely removed. However, a small convenience sample of faculty and staff limits the ability to generalize the research findings. None-the-less, this information can be used as a starting point for additional research on visual cues and pistachio nut consumption, as well as consumption of other types of nuts and foods.

Table 1
Rating of nut taste, texture and quality.

Measure	Mean \pm standard deviation	
	Shells removed	Shells remain
Taste	2.52 \pm .60	2.41 \pm .63
Texture	2.20 \pm .67	2.12 \pm .65
Quality	2.23 \pm .68	2.24 \pm .73

Conclusion

The research findings from this study provide important information and contribute to the limited research on visual cues and pistachio nut consumption. Specifically, visual cues may decrease the amount of pistachio nuts consumed, by allowing the consumer to see what they have already eaten. Likewise, leaving pistachio shells as a visual cue may have the added benefit of helping consumers ingest fewer calories.

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