All the Right Moves: Why Motion Increases Appeal of Food Products

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Across two studies, we demonstrate that depictions of food with implied motion enhance food appeal. This effect is mediated by perceived food freshness. We argue that this effect is due to an overextension of a primitive association between motion and freshness. Implications for promoting healthier food consumption are discussed.

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ABSTRACT
In two studies, we demonstrate that depictions of food with implied motion enhance food appeal and taste. These effects are mediated by perceived food freshness. We argue that these effects are due to an overextension of a primitive association between motion and freshness. Implications for promoting healthier food consumption are discussed.

Keywords: food products, freshness, taste, evolutionary psychology, advertising, packaging.

INTRODUCTION
Food advertisements frequently display food products in motion. For example, of all food commercials aired during the Super Bowls of the past three years, 2012-2014, twice as many showed food products in motion (n = 34) as commercials that did not (n = 17). Though such extensive use of motion in advertising may be a matter of professional norms rather than the result of scientific investigation, there may be a good underlying explanation for such norms.

In the current research we propose that motion does indeed increase food appeal, and assert that the reason for this effect is that displaying food in motion enhances its perceived freshness.

BACKGROUND
Food freshness is defined as the level of closeness of a food product to its original state, in terms of distance, time and processing (Péneau, Linke, Escher, & Nuesli, 2009). Freshness is an important attribute in judgment of food quality (Tsios & Heilman, 2005; Curtis & Cowee, 2009) regardless of age, gender or dieting status (Oakes & Slotterback, 2012). The variety of factors that influence choice and consumption of food products, freshness appears as a key driver of consumer evaluations of a broad variety of foods, such as fruits and vegetables (Wandel & Bugge, 1997), eggs (Ness & Gerhardt, 1994), baked foods (Heenan, Hamid, Dufour, Harvey, & Delahunty, 2009), fish and seafood (Hallbrendt, Wang, Fraiz, & O’Dierno, 1995; Lebiedzińska, Kostrzewa, Ryśkiewicz, Zbikowski, & Szefer, 2006), and beef (Bello Acebrón & Calvo Dopico, 2000). Numerous studies have showed that freshness is the leading determinant of food choice, succeeded by taste, brand name, healthy diet, price, family preferences and finally, dietary habits (George, 1993; Lappalainen, Kearney, & Gibney, 1998; Lennermans et al., 1997).

The importance of freshness stems from the fact that it affects several food aspects, such as its expected texture (Fillion & Kilcast, 2000; Szczesniak, 1988) and health outcomes (Wansink & Wright, 2006). There is broad agreement that “freshness” is a crucial determinant of overall food quality (Cardello & Schutz, 2003; Steenkamp & van Trijp, 1996). Because of the significance of freshness to consumers, marketers of food products emphasize both offering and communicating freshness. Cardello and Schutz (2003) argue that a fundamental objective in food production and distribution chain management should be preserving freshness. Recognizing the far reaching impact freshness has on evaluation and choice of food, experts have advocated that freshness is a primary factor in maintaining competitive advantage for food retailers (B. R. Lewis & Bashin, 1988).

Due to its importance, food marketers seek to signal that the food products they promote are fresh by applying a variety of methods including attaching expiration date labels (Wansink & Wright, 2006), and color changing temperature- or time-sensitive freshness indicators (Fortin, Goodwin, & Thomsen, 2009). Understanding the factors that determine consumer judgments of freshness is important for marketers in order to communicate freshness effectively.

Consumer Judgment of Freshness
Consumer evaluation of food freshness is based upon a variety of properties such as color, odor, flavor and texture (Fortin et al., 2009). Before tasting, visual cues are commonly used by consumers to diagnose food freshness (Péneau, Brockhoff, Escher, & Nuesli, 2007). Such cues include perception of color (Glitsch, 2000), luminance (Arce-Lopera, Masuda, Kimura, Wada, & Okajima, 2012; Arce-Lopera, Masuda, Kimura, Wada, & Okajima, 2013), and bruising and glossiness (Péneau et al., 2007; Murakoshi, Masuda, Utsumi, Tsubota, & Wada, 2013).

On close physical examination of a fruit or vegetable, consumers can easily register the food’s color, its shape and smell, as well as physical characteristics such as bruising, to diagnose freshness. In many cases, however, physical conditions may prevent consumers from assessing freshness this way. For instance, food may be distant, presented on a screen, or close but tightly sealed in firm packaging (C. Lewis, 2002). In such cases consumers cannot touch the food, feel its texture, smell or taste it, and cannot examine it closely enough to give reliable, easy to interpret clues to freshness.

Given the importance of freshness, if immediate sensory cues are not available, consumers must rely on alternative diagnostic cues. One factor that may influence the use of such alternative cues to freshness is their accessibility; the cues that are more likely to be utilized by consumers are the more accessible ones (Feldman & Lynch, 1988). Consequently, even in cases where other sensory cues are available, cues that are easier to observe are more likely to be utilized in judgments of freshness. One such cue that people may use to indicate the freshness of food items is motion.

Motion as a Cue for Freshness
The human mind has evolved to deal with primitive environments. Since they have become a part of the constitution of the human brain, the psychological mechanisms that have evolved to cope with primitive environments continue to be applied in a rapidly changing modern environment, extending to settings where they are no longer relevant. Such overextended mechanisms from the primitive environment in which they served humans to modern environments where they no longer serve their original purpose have been labeled ‘evolutionary traps’ (Gates & Gysel, 1978; Schlaepfer, Runge, & Sherman, 2002).

For example, pregnancy sickness has developed as an adaptation to protect the health of the unborn baby by causing aversions to foods that are highest in toxins (Profet, 1995). In a more protected modern environment, pregnancy sickness may be more of discomfort than a protective mechanism. In this and other cases physical and psychological mechanisms that once served people are made irrelevant by current human living conditions, but are still in operation.
This overextension of primitive mechanisms is particularly apparent in the food domain. One example is people’s evolved inclination to perceive sugars and fats as appealing. Living in a primitive environment with limited resources encouraged people to consume as much of such nutrients as one could obtain, as a useful survival strategy (Friedman, 2003; Lev-Ran, 2001). Yet in a modern environment where these nutrients are more easily available, such a tendency might result in health problems related to obesity, such as diabetes, coronary heart disease, and cancer (Kopelman, 2000). The same behaviors that served humanity in primitive environments can be maladaptive in modern society (Berthoud & Morrison, 2008). The ability to automatically associate movement with freshness may be one such mechanism that served humans well in primitive environments. In nature, there is a close association between food movement and freshness. Living animals move, and healthy animals display more motion than do diseased or infected animals. Thus, the motion of animals is associated with meat freshness and quality.

The link between motion and freshness expands to plant-based foods. Live growing edible plants, fruits, and vegetables move as they sway in the wind, fall or are picked from the tree. The instant they are plucked, separated from the ground or from the parent plant, they go through postharvest decay and lose their freshness (Irwine, 2006; Kandasamy, Moitra, & Mukherjee, 2012). Interestingly, even some inanimate foods are fresher when in motion. For instance, running water is fresher than stagnant water because the latter enhances bacterial proliferation (Palmore et al., 2009; Lautenschlager, Boon, Wang, Egli, & Hamnes, 2010), and chemical contamination (Rossignol-Strick, 1987). Motion may also be associated with freshness in food provision by other humans. Items just brought by a hunter or gatherer would tend to be fresher than ones that have been resting in storage. When you see an item being delivered, it tends to be fresher than when you find it resting in a shop.

Repeated exposure to cases where motion is tied to freshness may have led to the development of a close mental association between motion and freshness. In time, the link would have become automatic, such that encountering movement would serve as a cue to judgment of freshness and moving food would automatically be seen as fresher. This association could then be used to quickly determine food freshness without close inspection, and would provide an easy, useful way to diagnose freshness. In a sense, movement can serve as a heuristic for a quick and dirty judgment of food freshness by consumers (Chang & Pham, 2013; Kruger, Wirtz, Vän Boven, & Altermatt, 2004; Pham & Avnet, 2009).

In times where humanity was mostly composed of hunter-gatherers, food was only sporadically available and the risk of starvation was ever present. In such an environment the ability to easily distinguish freshness based on immediate cues would have aided survival. The key benefit of an automatic ability to recognize freshness based on movement is its ability to rapidly indicate food freshness even without physical proximity and from afar, when more diagnostic physical cues may not be available.

Today, the connection between movement and freshness may not be as important for survival and food choice, nor as indicative of freshness as it was in a primitive environment. Food production and supply have changed radically in the modern world. Consequently, the evolved ties between food movement and freshness have been mitigated. Nevertheless, given the long history of relevance of movement as a useful cue to freshness, the psychological association of the two should still appear in modern environments, such that observing movement would lead to judgments of increased freshness. Hence, the following hypothesis:

Hypothesis 1: Food that is shown moving will be rated as fresher compared to food shown as still.

Given, the importance of food freshness to consumers (Cardello & Schutz, 2003; Steenkamp & van Trijp, 1996) foods perceived as fresher would also be perceived as more appealing. In other words, seeing food in motion would lead to enhanced judgment of its appeal. This should be mediated by the association between movement and freshness hypothesized above. Therefore, we hypothesize:

Hypothesis 2: Food that is shown moving will be rated as more appealing compared to food shown as still.

Hypothesis 3: The relationship between food motion and food appeal will be mediated by its perceived freshness.

Food-related behaviors such as food evaluation and selection are guided, to a large extent, by the visual system (Laska, Freist, & Krause, 2007; Linné, Barkeling, Rössner, & Rooth, 2002). The sight of food has been found to give rise to cognitive processes and hedonic evaluation of the food (Berthoud & Morrison, 2008; Shin, Zheng, & Berthoud, 2009). Specifically, previous research has found that displaying different food-related visual cues to subjects while experiencing a particular taste stimulus alters its taste evaluation (Ohla, Toepel, Le Coutre, & Hudry, 2012). In other words, seeing food in motion leads to an enhanced judgment of its taste. This should be mediated by the association between movement and freshness hypothesized above. Therefore, we hypothesize:

Hypothesis 4: Food that is shown moving will be rated as tastier compared to food shown as still.

Hypothesis 5: The relationship between food motion and perceived food taste will be mediated by its perceived freshness.

STUDY 1

Overview and Procedure

The main goal of Study 1 was to examine whether food presented in motion is perceived as more appealing than food presented as still, and whether this effect is mediated by the perceived freshness.

Methods

Sixty undergraduate students (60% female), aged 22-31 (mean 26.3 years), students at a private college in Israel, completed the study for course credit. They were shown a picture of a glass of orange juice and asked to evaluate the freshness and appeal of the orange juice presented in the picture on a 9-point Likert scale ranging from 1 (= not fresh/appealing at all) to 9 (= very fresh/appealing). The picture did not reveal any signs indicating the drink manufacturer, its brand name or any other marketing sign.

Participants were randomly divided between two experimental conditions: motion and still. Both conditions were identical except that the picture that was presented to participants in the motion condition displayed juice that was being poured into a glass, while participants in the still condition were exposed to a picture of glass of orange juice.
Results and Discussion

Results indicate that participants in the motion condition rated the orange juice as fresher than participants in the still condition ($M_{motion} = 5.75$, $SD = 1.15$; $M_{still} = 4.98$, $SD = 1.18$; $t(1, 58) = 2.56$, $p < .05$). This indicates that food movement enhances perception of food freshness, supporting H1. In addition, participants in the motion condition rated the orange juice as more appealing than participants in the still condition ($M_{motion} = 5.04$, $SD = 2.59$; $M_{still} = 3.7$, $SD = 2.48$; $t(1, 58) = 2.01$, $p < .05$) supporting H2.

Results of mediation analysis support the hypothesis that food freshness perception mediates the relationship between the food motion condition and food appeal. The indirect effect of motion on food appeal via perceived freshness was positive and significant ($a \times b = .86$, $z = 2.31$, $p < .05$). Displaying food in motion had a significant effect on perceived freshness ($a = .87$, $t = 2.86$, $p < .05$). This, in turn, significantly increased food appeal ($b = .99$, $t = 3.76$, $p < .05$). Further, the direct effect of motion on food appeal was positive and significant ($c = 1.34$, $t = 2.01$, $p < .05$). However, when the indirect effect was accounted for, this direct effect became non-significant ($c' = .48$, $t = .74$, $p = .46$). Additionally, a bootstrap analysis (Preacher & Hayes, 2008) with 5,000 resamples revealed that the 95% confidence intervals for the significant indirect effect excluded zero (CI: .23–1.75, $p < .05$). These results support the notion that perceived freshness mediates the effect of motion on food appeal, supporting H1. Thus, it appears that motion led participants to perceive food as fresher, which in turn led to increased appeal of the food.

**STUDY 2**

Overview and Procedure

The objective of Study 2 was threefold: (1) to replicate the results of Study 1 with an additional product category, (2) to examine whether food in motion is also perceived as tastier than still food, and (3) to test whether this effect is mediated by perceived freshness.

Methods

Sixty undergraduate students (49% female) aged 21-29 (mean 25.7 years), from the same population as Study 1, completed the study for course credit. The method of this study was the same used on Study 1 except that the food used was yogurt, and that we also measured participants’ evaluated taste, on a 9-point Likert scale ranging from 1 (= not tasty at all) to 9 (= very tasty).

Results and Discussion

Food appeal

The results of Study 2 echoed those of the Study 1, namely, participants in the motion condition rated the yogurt as fresher than participants in the still condition ($M_{motion} = 6.23$, $SD = 1.37$; $M_{still} = 5.29$, $SD = 1.12$; $t(1, 58) = 2.93$, $p < .05$). Participants in the motion condition also rated the yogurt as more appealing than participants in the still condition ($M_{motion} = 5.93$, $SD = 2.24$; $M_{still} = 4.43$, $SD = 2.25$; $t(1, 58) = 2.58$, $p < .05$).

Mediation analysis supports the hypothesis that food freshness perception mediates the relationship between food motion and food appeal. The indirect effect of motion on food appeal through perceived freshness was positive and significant ($a \times b = 1.26$, $z = 2.79$, $p < .05$). Exposure of participants to food in motion had a significant effect on perceived freshness ($a = .95$, $t = 2.93$, $p < .05$). This, in turn, significantly increased food appeal ($b = 1.33$, $t = 8.37$, $p < .01$). Further, the direct effect of motion on food appeal was positive and significant ($c = 1.5$, $t = 2.58$, $p < .05$). However, when the indirect effect was accounted for, this direct effect became non-significant ($c' = .24$, $t = .56$, $p = .57$). In addition, a bootstrap analysis (Preacher & Hayes, 2008) with 5,000 resamples revealed that the 95% confidence intervals for the significant indirect effect excluded zero (CI: .43–2.13, $p < .05$).

Food taste

Participants in the motion condition rated the yogurt as tastier that participants in the still condition ($M_{motion} = 5.93$, $SD = 1.87$; $M_{still} = 4.83$, $SD = 2.17$; $t(1, 58) = 2.10$, $p < .05$). This indicates that food movement enhances the evaluation of food taste, supporting H2.

Mediation analysis supports the hypothesis that perception of food freshness mediates the relationship between food motion and evaluated food taste. The indirect effect of motion on food taste through perceived freshness was positive and significant ($a \times b = 1.11$, $z = 2.77$, $p < .01$). Exposure to food in motion had a significant effect on perceived freshness ($a = .95$, $t = 2.93$, $p < .01$). This, in turn, significantly increased food evaluated taste ($b = 1.17$, $t = 7.87$, $p < .01$). Further, the direct effect of food in motion on food taste was positive and significant ($c = 1.1$, $t = 2.1$, $p < .05$). However, when the indirect effect was accounted for, this direct effect became non-significant ($c' = -.01$, $t = -.14$, $p = .99$). Additionally, a bootstrap analysis (Preacher & Hayes, 2008) with 5,000 resamples revealed that the
95% confidence intervals for the significant indirect effect excluded zero (CI: .37–1.90, p < .05). These results support our prediction that perceived freshness mediates the effect of motion on foods taste, supporting H5. Thus, it appears that motion led participants to perceive food as fresher, which in turn led them to evaluate it as tastier.

GENERAL DISCUSSION

Across two studies, we have demonstrated that people rate food products presented in motion more favorably than the same foods depicted as still. In Study 1 we found that participants rated orange juice that was presented to them in motion (i.e., being poured) as more appealing compared to the same orange juice that was presented still. In Study 2 we demonstrated that this effect of appeal enhancement by motion is generalized to other food types, such as yogurt. Moreover, evaluated food taste also increased under the motion condition. Finally, the results indicate that perceived freshness mediates the effect of food motion on both appeal and taste evaluation, so that the enhancement of both food appeal and evaluated taste is generated by increased food freshness perception.

Contributions

The findings develop our knowledge of the way consumers judge food products. In addition, they contribute to our understanding of how heuristic cues, when used by consumers, may be extended beyond the circumstances where they originally apply. Specifically, the findings contribute to the literature regarding judgments of food freshness and their link to overall food evaluation. In particular, the research advances our knowledge of the way food freshness is assessed. Movement, through its tie with freshness, is a signal that can be linked to increased freshness evaluations.

Finally, the findings expand our comprehension of domains in which behavioral mechanisms evolved by human beings in a primitive environment to better adapt and to survive are overextended in the modern environment. In nature, movement of objects that may be considered as foods (e.g., animals, plants, water) may be related to freshness. Yet this relationship is weaker and frequently does not hold in the modern industrialized world. Accordingly, the association of motion and freshness would have served as a meaningful cue to freshness in primitive environments, but may be not as relevant in a modern environment. Consequently under such settings, where food motion and its freshness are not connected, observed movement of food may be incorrectly used by consumers to attribute freshness to the moving food. For example, implied or actual motion of packaged foods does not meaningfully indicate freshness. Therefore, employing this cue to infer freshness constitutes an overextension of the link between motion and freshness that was relevant in more primitive environments to settings where it may no longer be so.

As part of their efforts to promote food products, marketers take advantage of the existing associations between different cues and food quality – associations that are rooted in primitive human history. Such marketing and sales tactics may include spraying water on fruits and vegetables in the produce section, as this may help enhance display attractiveness, in addition to retaining actual freshness. Genetic engineering and fruit and vegetable producers can also help design foods that display traits such as vibrant colors that are associated with nutrition in nature.

Finally, marketers employ the link between motion and food freshness to enhance the appeal of their products. In fact, marketers may use this link in cases where no tight movement-freshness connection exists, such as processed and boxed foods. The research thus provides a specific explanation and support for the commonly used marketing practice of depicting food in motion in advertisements, on in-store displays and on packaging.

Limitations and Future Research

The research at hand suffers from several limitations. First, we explored the impact of implied motion with only a limited selection of products, orange juice and yogurt, for which freshness has major effects on tastiness. Future research can further generalize the findings to additional foods such as candy, where freshness has lower relevance than it does for dairy products and orange juice. The association of movement and freshness may be found strong and broad enough to lead movement to signal freshness in cases for which freshness is considerably less relevant, such as processed packaged goods.

Future research should examine the mechanisms that drive the phenomenon reported in the current paper. For example, research can explore whether the effect of food motion of consumer judgment of appeal and taste is enhanced by strengthening the tie between motion and the mediating variable – freshness. An additional research direction is to explore whether motion which is more peripheral to the food product also impels similar effects on consumer evaluation as does motion of the food itself.

Finally, research could explore the impact that other cues associated with food freshness may have on product appeal and taste, and whether these could prompt similar effects. For instance, images of plant-based foods (e.g., herbs, vegetables, fruits) depicting food source elements such as stem, leaf, or the plants from which the foods come may help enhance perception of freshness. Likewise, colors that are associated with lively natural environments may also communicate freshness and consequently enhance product appeal and expected taste.

Marketing Implications

Our research offers a new approach for promoting healthier food consumption. Marketers and retailers can employ motion to encourage eating of healthy foods in retail settings, canteens, cafeterias and other settings where food choices are made. For example, in order to promote the appeal of fruits and vegetables in school cafeterias, these foods can be displayed with implied motion.

Marketers can use actual depiction of motion rather than implied motion, by running videos depicting food in motion on screens in retail settings. This may further help motion not only promote perception of product freshness, attractiveness, and evaluated food taste, but draw consumer attention in a heavily cluttered marketing environment where many other food products compete for consumer attention.

Finally, in order to prevent undesirable enhanced children’s perception of harmful food appeal, government, policy makers, and other regulating agencies should consider restricting marketers from using advertisements presenting such foods in motion. In practice, as a promotional strategy, most food advertisements that target children apply animation (Page & Brewster, 2007). Accordingly, such messages are likely to depict these food products in motion. The resulting effect may be enhanced food appeal, which may be inadvisable for foods high in fat, salt, or sugar. In fact advertising of such foods have been banned from children’s television programming altogether by policymakers in the UK (Office of Communications, 2006).
## Table 1: Summary of Results

<table>
<thead>
<tr>
<th>Study</th>
<th>Conditions</th>
<th>DV</th>
<th>IV</th>
<th>Mediator</th>
<th>Test</th>
<th>Results</th>
<th>Conclusion</th>
</tr>
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<tbody>
<tr>
<td>Study 1</td>
<td>1) juice is poured (motion) &lt;br&gt;2) juice is in glass (still)</td>
<td>Food appeal</td>
<td>Food motion</td>
<td>Food perceived freshness</td>
<td>bootstrap mediation test</td>
<td>1) Food motion enhances perception of food freshness ($M_{motion} = 5.75$, $SD = 1.15$; $M_{still} = 4.98$, $SD = 1.18$; $t(1, 58) = 2.56, p &lt; .05$). &lt;br&gt;2) Food motion enhances food appeal ($M_{motion} = 5.04$, $SD = 2.59$; $M_{still} = 3.7$, $SD = 2.48$); $t(1, 58) = 2.01, p &lt; .05$)</td>
<td>Perceived food freshness mediates the effect of motion on food appeal.</td>
</tr>
<tr>
<td>Study 2</td>
<td>1) yogurt is poured (motion) &lt;br&gt;2) yogurt is in glass (still)</td>
<td>Food perceived taste</td>
<td>Food motion</td>
<td>Food perceived freshness</td>
<td>bootstrap mediation test</td>
<td>1) Results of Study 1 were replicated with a different food type &lt;br&gt;2) Food motion enhances perception of food taste ($M_{motion} = 5.93$, $SD = 1.87$; $M_{still} = 4.83$, $SD = 2.17$; $t(1, 58) = 2.10, p &lt; .05$). &lt;br&gt;3) Significant mediation (CI: .23–1.75, $p &lt; .05$)</td>
<td>Perceived food freshness mediates the effect of motion on perceived taste.</td>
</tr>
</tbody>
</table>

## REFERENCES


