

Correcting misperceptions about stigmatized ingredients: MSG

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ABSTRACT

Stigmatized ingredients present a problem for manufacturers, as fears surrounding foods limit the range of products the public will accept. Monosodium glutamate (MSG) is a commonly stigmatized ingredient, despite it being consistently deemed safe for human consumption by experts. This study examined three strategies for correcting the stigmatization of MSG. Using three treatments and a control condition, the study compares the effectiveness of different corrective communication strategies using a test-retest design. Results from 1308 participants presents strong evidence that providing factual information in the form of a rational appeal is a highly effective strategy for increasing the willingness and likelihood of consuming MSG. The findings demonstrate that an endorsement from a celebrity (in this research Chef Heston Blumenthal) as a form of emotional appeal is less effective at improving such perceptions. The study also tests for a minority ‘backlash’ effect among some participants, whose misperceptions may strengthen in the face of disconfirming evidence. The implications for improved food labeling and consumer wellbeing are discussed.

KEYWORDS

Stigmatized ingredient, MSG, Corrective communication, Likelihood, Willingness, Misperception.

1. Introduction and background

Consumers avoid an extensive number of food ingredients present in the marketplace for perceived health and safety concerns. Many of these concerns are not based on evidence (Bearth *et al.*, 2014), particularly with regard to the general benefits or detriments of ingredients (Hagemann & Scholderer, 2009; Wansink *et al.*, 2014). Examples of this type of ingredient stigmatization abound including fears regarding permeate in milk products, fluoride in water, animal marrow in gelatin, genetically modified food stuffs, and monosodium glutamate (MSG). The stigmatization of these ingredients unnecessarily limits the scope of products that manufacturers can produce and prevents consumers from making properly informed food choices (Bearth *et al.*, 2014; Frewer *et al.*, 1998).

By definition consumer stigmatization of ingredients does not reflect the views of food risk and safety experts (Savadori *et al.*, 2004). It is an unfortunate truth that consumers tend to be less trusting of the unfamiliar, and are more likely to be influenced by their peers when evaluating the risk of unfamiliar ingredients and food processing standards (Savadori *et al.*, 2004). Attempts to correct misinformation and false beliefs about food are important because these misperceptions are an unnecessary source of anxiety for consumers and can distract them from more important health issues (Bearth *et al.*, 2014). In a broader sense, stigmatization of particular ingredients is also detrimental to food producers and retailers who must now accommodate consumer misperceptions in their production and supply decisions, reducing the efficiency of global food supply chains (Yeung & Morris, 2001). In order to address these issues we must address the question: how can we effectively communicate corrective information to customers about frequently stigmatized ingredients?

The communication of corrective information is thus the focus of this research, and in particular we will consider the case of MSG, a common ingredient that offers substantial flavor with no major health implications. Few studies have focused on something as widespread and important as misperceptions about stigmatized ingredients such as MSG. The lack of such research presents an ideal opportunity to test how false beliefs about stigmatized ingredients in a food like MSG can be corrected.

Consumers' perceptions of stigmatized ingredients are known to influence their purchasing decisions (Wansink *et al.*, 2014; Yeung & Morris, 2001). For example, when deciding between two otherwise identical packets of candy to purchase, a consumer opposed to artificial food coloring is more likely to select the packet that contains candy without artificial colors (Bearth *et al.*, 2014). Similarly, permeate in milk products has attracted negative connotations despite there being no known dangers associated with permeate (Nutrition Australia, 2012). Research suggests that the stigmatization of ingredients is formed and maintained through complex processes, but is commonly based around an initial form of misinformation (Ellen & Bone, 2008). Corrective communications around MSG could thus act through correcting misinformation, using appeals that reflect the processes that form and maintain stigmatization (Wansink *et al.*, 2014).

2. Corrective communication strategies

Corrective communications influence consumers' various perceptions of products, including

those around stigmatized ingredients such as MSG. The communication literature identifies two common strategies relevant to the aims of the present study: communications that employ *emotional* appeals and those that use *rational* appeals (Pallak *et al.*, 1983). While numerous other appeal types have also been considered, much of the literature centers on one or both of these types. The role of rational appeals originates from information-processing models of cognition. These models stipulate that consumers are rational decision-makers, who logically evaluate products on factors such as price and quality (Albers-Miller & Stafford, 1999). Rational appeals use factual information from credible sources to alter the decision-making of consumers by changing the rational evaluation of the factors at play (Braverman, 2008; van Kleef *et al.*, 2009). A rational appeal might include statistical information or facts such as ‘scientific studies have repeatedly shown that the consumption of MSG has no major health implications.’ Theories of rational choice assume that when people are personally invested in an issue, they will allocate more cognitive effort to the choice task making such appeals likely to succeed (Schwarz *et al.*, 2007). Similarly, the theory of planned behavior posits that rational attitude formation is a major determinant of people’s intentions and behavior (Ajzen 1991).

Emotional appeals trigger affective as opposed to rational responses with these responses being characterized as generally either substantively positive or negative (Cox & Cox, 2001). Emotional appeals influence judgment through subjective factors such as the attractiveness of the person providing the information, the use of humor, or inciting fear or jealousy in the audience (Braverman, 2008). Emotional appeals can take the form of testimonials and anecdotes and are often used in political campaigns, public health campaigns, and brand advertising (Braverman, 2008; Cox & Cox, 2001; Jones *et al.*, 2012). Emotional appeals use relatability or ‘self-referencing’ to convince people to receive and integrate corrective information into their memory (Dunlop *et al.*, 2010; Green *et al.*, 2010). Unlike rational appeals, emotional appeals can bypass cognitive scrutiny and illicit affective reactions (Dunlop *et al.*, 2010). An example of an emotional appeal is the statement ‘I never really thought about MSG until my daughter had a reaction to a meal containing it.’ In response to this emotional appeal, a person would empathize with the mother’s feelings, and reflect on their own or their children’s exposure to MSG. In essence, emotional appeals are considered effective because they help people to identify with the issue. Emotional appeals contrast against more rational appeals that can be perceived as abstract and less relevant to the self (Allen & Preiss, 1997).

Both rational and emotional appeals have demonstrated effectiveness in various contexts, though uncertainty remains about which is most effective and the circumstances under which that may change (Cox & Cox, 2001; Green *et al.*, 2010; Piqueras-Fiszman and Jaeger, 2014). For example, in Kazoleas’s (1993) study, factual evidence outperformed emotional anecdotes in convincing respondents of the importance of seatbelt usage. However, the anecdotal account (emotional appeal) was better recalled a fortnight later compared to the rational appeal. In a similar line of research examining genetic modification technology, a meta-analysis encompassing fifteen studies demonstrated rational appeals in the form of statistical evidence are marginally more persuasive compared to emotional appeals (in the form of narratives and anecdotes) (Allen & Preiss, 1997). Although food research has examined food risk perceptions (e.g. Siegrist *et al.*, 2007), only one study has manipulated information and attitudes about stigmatized ingredients like MSG. The only study to modify beliefs about a

stigmatized ingredient is by Wansink and colleagues (2014), whom focused on avoidance of high fructose corn syrup among US mothers. The study showed the provision of factual information improved mothers' 'healthfulness' ratings by increasing their familiarity with the product (Wansink *et al.*, 2014).

Other studies have considered the effect of emotional responses to appeals and how this can sway consumer perceptions and actions. A study about the emotions associated with organic food consumption demonstrated the power of emotions, such as fear, pleasure, safety and guilt, has on swaying consumers' food choices (Aertsens *et al.*, 2009). A study by Olsen and colleagues (2014) also examined the power of fear in assessing the risk of food poisoning in rare hamburger meat consumption. The study demonstrated that salient emotions influence participants' assessment of risk in food (Olsen *et al.*, 2014). The study showed rare-cooked hamburger patties triggered more negative emotions (fear and disgust) in half the participants and those participants were less likely to consume the rare burger. The role of emotions in driving consumption of stigmatized ingredients like MSG are thus likely to be quite high.

The credibility of the information's source is an important consideration when assessing the validity of risk claims and the affective response to those claims (Frewer *et al.*, 2003). In the context of the present study, we would expect emotions of fear and safety produced by the emotional appeal to influence consumers' attitudes towards consuming MSG in food. MSG is a commonly feared ingredient and the influence of an emotional corrective appeal from a credible individual, such as a respected chef, should reassure the majority of anxious consumers and reduce opposition to the ingredient (Hooton, 2014).

3. The potential backlash

A relevant aspect to this research area is a possible minority effect of communications strategies. Most communications research focuses on shifting the perception or intention of the wider community (Randolph & Viswanath, 2004). Studies in social psychology illustrate that the position of the majority is a powerful force in persuading members of the various minorities to conform (Crano & Chen, 1998; Martin *et al.*, 2002). In the context of MSG, wider acceptance of the ingredient will encourage even more people to accept its use in food production. A minority effect arises when a small group within the wider community experiences the reverse result to the majority. Within the health literature this has been termed a 'backfire effect', but it has not been extensively addressed outside the health context (Nyhan *et al.*, 2014).

A 'backfire' or backlash effect occurs when a person who initially holds a strong negative belief (in this instance about the ingredient MSG), becomes more ardent in that false belief when attempts are made to correct them (Nyhan, 2010). For example, Cox and Cox (2001) observed a backlash effect after positively framed emotional appeals caused participants to report a lower likelihood of seeking out preventative cancer screening (the opposite of the campaign's intention). A minority backlash effect has been observed in the contexts of vaccinations, political opinions (Bullock, 2007; Nyhan & Reifler 2010; Prasad *et al.*, 2009; Redlawsk, 2002), health reform (Nyhan, 2010), and climate change (Hart & Nisbet, 2012).

It is vital to consider such backlash effects, as minority groups within the wider population can be exceptionally vocal and disruptive for organizations. Accidental re-enforcement of false beliefs could damage an organization, which would need to expend

resources to correct the perceptions of the minority group (Crano & Prislin, 2006; Nyhan & Reifler, 2010; Redlawsk *et al.*, 2010). We therefore test for this minority effect when examining the influence of emotional and rational communication appeals on people's misperceptions of the food ingredient MSG.

4. Method

4.1 Instrument

Participants completed a forced-choice test-retest survey that took approximately 20 minutes. The instrument began with distractor questions about participants' willingness and likelihood of owning pets and switching pet food brands. The purpose of these items was to familiarize participants with the terms 'willingness' and 'likelihood' and to reduce participants' attention to their attitudes about MSG. Participants were then asked to rate their willingness and likelihood of consuming food containing MSG in the future. These intention questions were measured using a 9-point Likert scale ranging from extremely unwilling/unlikely to extremely willing/likely. While similar, the measure of 'willingness' to consume MSG captures something 'likelihood' of consuming MSG does not. A consumer can be generally unwilling to consume MSG, but given they may not be highly motivated to avoid it, the likelihood of consuming it (given its presence in many foods) may still be judged as high. This distinction allows us to capture the potential 'unhappy acceptance' of situations where MSG is present in food.

Participants were randomly allocated to one of four groups: *4 MSG Facts*, *2 MSG Facts*, *Heston Blumenthal Quote* (a popular celebrity chef) or *control*. These stimuli can be found in the appendix. The *4 MSG Facts* condition was a rational appeal containing four referenced facts from reputable sources about the true nature of MSG (Food and Agriculture Organization of the United Nations, 1995; Food Standards Australia New Zealand, 2013; U.S. Food and Drug Administration, 2012). The *2 MSG Facts* condition contained two of the original four facts about MSG and was incorporated to understand how strong the rational appeal needed to be to correct misperceptions. A review of related literature demonstrates an absence of research into the optimal amount of information to include in rational appeals. The *Heston Blumenthal Quote* condition was an emotional appeal that featured an image of Blumenthal and a quote from him about MSG being safe and an important part of the taste experience. Blumenthal's quote was intended to trigger feelings of reassurance and safety around the stigmatized ingredient of MSG. The control condition contained two facts about the health and lifestyle benefits of owning pets.

Participants were also asked two basic math questions to test their attention to the survey (Ozanne *et al.*, 1992). These math questions involved simple addition and subtraction, such as "(4-1)+5=" Following their exposure to one of the appeals or the control, the survey experiment required participants to complete several distractor tasks to create a time delay between the likelihood and willingness ratings before and after exposure to an appeal. After completing these tasks, participants were again asked to rate their likelihood and willingness to consume MSG in the future. Finally, the instrument required participants to document their actual consumption of MSG, personal demographics, and their health attitudes (Hung &

Labroo, 2011; Rahtz *et al.*, 1989) and behaviors (Jayanti & Burns, 1998; Moorman, 1998).

4.2 *Sample and data preparation*

Participants were sourced through Amazon.com's Mechanical Turk, an online panel provider in the US. Forty three per cent of participants were male, with a sample mean age of 37 years (SD = 13). Respondents were each given 60 (USD) cents for their completion of the study. The sample size was 1,418 people.

Prior to analysis, one participant was removed for reporting an age below 18 years. A further 109 participants were removed from the dataset for providing an incorrect answer to the math problems used to assess their attention to the survey. After data cleaning, the remaining participants' ($n = 1308$) responses were analyzed. Change in willingness and likelihood ratings after the manipulation was calculated by subtracting the rating before from the rating given after exposure to an appeal or the control condition.

4.3 *Data analysis*

The design of the study resulted in two dependent variables needing to be tested to assess whether their means differed across the conditions. A MANOVA was used to test whether the dependent variables of change in participants' willingness and change in likelihood differed by the condition to which a participant was assigned (*4 MSG Facts*, *2 MSG Facts*, *Heston Blumenthal Quote* or control). A MANOVA is an extension of a typical ANOVA to include multiple dependent variables; it is superior to conducting multiple ANOVAs as it protects against Type 1 error. To understand the nature of the differences between conditions a Tukey's B analysis was conducted post hoc. The Tukey's B analysis is a method for showing the post hoc comparisons of the conditions on the dependent variables. The conditions are grouped into subsets that significantly differ, allowing the reader to understand where the significant differences between conditions that were established in the MANOVA actually arise.

The next analysis considered the potential minority backlash effect. This analysis focused on participants who initially had negative perceptions of MSG ($n = 574$) for each appeal type and the control group. If participants' ratings for willingness to consume MSG in the future were initially below the midpoint of 5 on the rating scale, they were classified as having a negative perception of MSG. A MANOVA was run on this subgroup to identify the proportion of participants whom experienced a backlash (became more opposed to MSG), and whether there was a meaningful relationship between experiencing a backlash and the appeal type (condition) participants received.

5. **Results**

5.1 *Manipulation checks*

Prior to the main statistical analyses, manipulation checks were conducted to ensure participants were equally distributed between the conditions (appeal types and control). Participants' results were examined according to the appeal they received. An ANOVA was

then used to examine the distribution of ages between the different appeal and control conditions. A chi-square analysis was also performed to ensure a uniform distribution of both genders between the appeals and control. In both cases there were no significant differences between the groups. Descriptive statistics for age and gender breakdowns are shown in Table 1.

Table 1:
Sample description for each condition.

Condition	n	n fem	Mean age	SD age
Control	287	171	36.95	12.73
Emotional (Heston)	298	172	36.98	12.67
Rational (2 Facts)	298	153	37.15	12.03
Rational (4 Facts)	288	173	37.40	12.98

A second phase of manipulation checks evaluated whether there was a significant difference between pre- and post- willingness and likelihood measurements for each condition. For the experiment to be successful, some change in willingness and/or likelihood would need to be observed, irrespective of its direction for the manipulation conditions. A paired samples t-test on the differences was used to assess this. For willingness to consume MSG, the control group showed no significant difference before compared to after the manipulation ($\bar{d} = .007$, $SD = .681$, $t = .175$, $p = .861$). As expected, significant changes were observed for the different appeal conditions: *Heston* ($\bar{d} = .253$, $SD = 1.052$, $t = 4.108$, $p < .000$), *2 MSG Facts* ($\bar{d} = .601$, $SD = 1.576$, $t = 6.580$, $p < .000$) and *4 MSG Facts* ($\bar{d} = .842$, $SD = 1.499$, $t = 9.486$, $p < .000$). Likelihood produced similar results with the control group showing no significant difference ($\bar{d} = -.0391$, $SD = .628$, $t = -1.044$, $p = .297$), whereas the manipulation conditions produced differences as anticipated: *Heston* ($\bar{d} = .198$, $SD = 1.080$, $t = 3.138$, $p = .002$), *2 MSG Facts* ($\bar{d} = .322$, $SD = 1.165$, $t = 4.774$, $p < .000$), and *4 MSG Facts* ($\bar{d} = 0.632$, $SD = 1.359$, $t = 7.847$, $p = .000$). These results provided sufficient evidence that the manipulations influenced participant responses for further analysis to proceed.

5.2 The effects of different appeal types

A MANOVA tested whether the willingness and likelihood of consuming MSG differed between the treatment groups. The results showed the information type (i.e. *Heston Blumenthal Quote*, *2 MSG Facts* or *4 MSG Facts*) affected the two independent variables (willingness $F = 24.496$, $p = .000$; likelihood $F = 18.499$, $p = .000$). A Tukey's B analysis was used to further investigate these differences (see Table 2 and Table 3). For willingness and likelihood, the Tukey's B analysis demonstrated rational appeals are more effective than emotional appeals. Specifically, the *4 MSG Facts* condition was the most effective in correcting misperceptions, followed by *2 MSG Facts* (both rational appeals) and finally the *Heston Blumenthal Quote* (emotional appeal). The likelihood variable showed similar results with the rational appeals

outperforming emotional appeals and 4 *MSG Facts* being the most effective treatment. There was little difference between the outcome of the *Heston Blumenthal Quote* (emotional appeal) and 2 *MSG Facts* rational appeal, indicating that these conditions were approximately equally less effective in correcting misperceptions. As anticipated, the control group showed no statistically significant change for willingness or likelihood ratings.

Table 2

Tukey's B for change in willingness after exposure to condition (subset for alpha = .05)

Condition	1	2	3	4
Control	.0071			
Emotional (Heston)		.2526		
Rational (2 Facts)			.6007	
Rational (4 Facts)				.8421

Table 3

Tukey's B for change in likelihood after exposure to condition (subset for alpha = .05)

Condition	1	2	3
Control	-.0391		
Emotional (Heston)		.1980	
Rational (2 Facts)		.3221	
Rational (4 Facts)			.6316

5.3 *A minority backlash*

The chi-square analysis revealed a small backlash effect for a minority group in both willingness and likelihood ratings. The incidence of a small backlash in beliefs appears in Table 4. There was a higher incidence of backlash for likelihood ratings $\chi^2 (3, N= 568) = 1.73, p>.05$ compared to willingness $\chi^2 (3, N= 568) = 3.42, p>.05$. The results were not statistically significant for either willingness or likelihood of consuming MSG in the future. The result suggests that among participants who initially disliked MSG (pre-test willingness rating below 5), the risk of a backlash effect in communications strategies is negligible.

Table 4

Incidence of minority backlash effect for the consumption of MSG.

Condition	Willingness	Likelihood
Control	12	16
Emotional (Heston)	8	12
Rational (2 Facts)	7	11
Rational (4 Facts)	6	14

6. Discussion

The purpose of the present study was to test the effectiveness of three different types of appeals in changing participants' perceptions willingness and likelihood to consume MSG, a commonly stigmatized food ingredient. The rational appeals (*2 MSG Facts* and *4 MSG Facts*) were selected as corrective strategies because existing research shows factual information facilitates the correction of misperceptions when cognitive processing is employed (Schwarz *et al.*, 2007). Findings from the present study reinforce that rational appeals are more effective than emotional appeals in increasing willingness and likelihood of consuming MSG, a commonly stigmatized ingredient.

The results specifically demonstrated that rational appeals (*4 MSG Facts* and *2 MSG Facts*) are effective in improving consumption likelihood ratings relative to the control condition. In addition, the results show more factual information (*4 MSG Facts*) is more persuasive than providing less information (*2 MSG Facts*). This finding indicates the volume of corrective facts used influences the appeal's persuasiveness. Parallels can be drawn between our findings and those by Messer and colleagues (2011) whom demonstrated that simply highlighting the benefits of stigmatized ingredients is effective in encouraging consumers to re-examine their food fears.

In addition to this group effect, appeals research has identified a minority backlash effect in the correction of false beliefs in certain contexts (Nyhan *et al.*, 2014). Incidences of backlash have been reported in attempts to correct political beliefs and misperceptions associated with vaccinations (Bullock, 2007; Nyhan *et al.*, 2014; Prasad *et al.*, 2009; Redlawsk, 2002). A minority backlash effect was observed in a small number of cases for reported willingness and likelihood of consuming MSG in the future. However, the effect was not statistically significant and could be treated as negligible for this context. Nevertheless research highlights the potential for communication campaigns to have unintended effects among a minority of people. Other studies have shown such effects. For example, a study by Nyhan *et al* (2013) that was designed to correct a misperception that Barak Obama was of the Muslim faith actually cemented some participants' false beliefs. Our finding provides limited support to existing literature that warns corrective communications campaigns can have such serious unintended consequences (Atkin, 2001).

7. Future research and limitations

Our results show the emotional appeal from celebrity Chef Heston Blumenthal was less effective in improving the likelihood and willingness to consume MSG relative to the more rational appeals. However, it is possible that the effectiveness of the emotional appeal was affected by perceptions of Blumenthal's unconventional character (Hooton, 2014). For example, Blumenthal may have been viewed as less trustworthy because of his unconventional approach to cooking compared to other food personalities with popular followings such as Jamie Oliver (Rayner, 2012) or Rachael Ray (Severson, 2005). Future studies could test

whether the nature of the personality communicating the emotional appeal influences the reception of that appeal. Unfortunately, at this time those particular celebrity chefs have made no statements on this issue that we could identify, making their inclusion in experiments regarding such statements ethically difficult. Should such statements arise it will be possible to undertake experiments that use their representations.

Based on the outcomes of the present study it is tempting to assume factual information will enhance the likelihood and willingness to consume other wrongfully stigmatized ingredients such as permeate in milk and fluoride in water. There is ample scope for future studies to explore whether the present findings for MSG are generalizable to other stigmatized ingredients. Such studies should also test whether a backlash occurs for those stigmatized ingredients and whether a backlash is more prevalent in response to rational or emotional appeals. There is also the opportunity for future research to consider the robustness of rational appeals in correcting other common misperceptions, such as stigmatization around depression or homosexuality. The boundary conditions for the effectiveness of rational appeals in correcting beliefs when stigmatization is present are not well understood at this time.

8. Conclusions and Implications

In the context of MSG, our emotionally driven celebrity endorsement (by Heston Blumenthal) should be avoided as a corrective strategy because it is the least effective method of correcting misperceptions. This aligns with research by van Kleef *et al.*, (2009) which highlighted the importance of credible information sources, concise information and consistent messages in effective food communications.

Consistent with earlier studies (e.g. Cox & Cox, 2001; Hallman, 2003; Messer *et al.*, 2011), the present research illustrates that consumers' perceptions are able to be influenced and that stigmatized ingredients like MSG need not simply be avoided by manufacturers. Food manufacturers can place corrective information about the true nature of MSG in their advertising and on their food products to educate consumers, rather than allowing incorrect beliefs to pervade. The present study shows that this is possible through the provision of credible rational information. The reduction in ambiguity about the benefits and risks of MSG will help diversify consumption habits, and will allow consumers to be more open to foods they previously perceived as unhealthy or harmful.

Communicating accurate health information to customers is a crucial and complex consideration in designing marketing strategies. While representing a challenge to manufacturers and retailers, challenging inaccurate beliefs will open consumers up to new experiences and strengthen the food supply chain.

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Appendix

Element^	Stimulus Text*
Fact 1 (rational)	<p>Moderate intake of MSG does not cause health problems</p> <p>Many people believe that the intake of MSG will increase the risk of some health problems, such as asthma or obesity. However, these claims were based on an experiment of MSG intake in rats (Olney 1969) and research with humans shows that MSG is not related to asthma or obesity (Samuels 2010; Shi et al. 2012). Neither does MSG cause glutamate to accumulate in the blood, which means that long-term MSG intake is safe (Tanphaichitr, Leelahagul & Suwan 2000). Unlike some foods (e.g., peanuts), or substances (e.g., sulphites), there is no scientific evidence that MSG causes any serious adverse reactions. Consequently, the U.S. Food and Drug Administration (FDA) and Food Standards Australia New Zealand both consider the addition of MSG to foods to be “generally recognized as safe” (FDA, 2014; FSANZ, 2013).</p>
Fact 2 (rational)	<p>What causes Chinese meal syndrome?</p> <p>The apparent negative impact of eating MSG (e.g. Chinese meal syndrome) is actually caused by other ingredients. The nutritional content of ‘traditional’ food patterns includes high levels of carbohydrates and vegetables (Shi et al, 2012). Chinese food, with or without MSG, contains high levels of both fat and sodium, for example, an average serving of Kung Pao chicken contains around 76g of fat and a dish of lo mein noodles contains around 3460mg of sodium (salt). Consuming a lot of salt is likely to cause thirst, and large quantities of fat can cause an upset stomach (Freeman 2006). The symptoms of Chinese meal syndrome attributed to MSG, can actually be attributed to the ingredients commonly found in ‘traditional’ food.</p>
Fact 3 (rational)	<p>MSG is better than the alternatives</p> <p>MSG benefits your health as it replaces ingredients that have been proven to be bad for you. For example, MSG can decrease the amount of salt needed in cooking. Salt is a proven risk factor for high blood pressure, heart diseases and stroke (Yamaguchi & Takahashi 1984). People who have eaten MSG in chicken broth get less energy from high fat and sugary snacks (Imada et al. 2014).</p>
Fact 4 (rational)	<p>MSG is already in many healthy foods.</p> <p>The U.S. Food and Drug Administration states that the glutamate in MSG is chemically indistinguishable from glutamate present in food proteins (FDA, 2014). This is because MSG occurs naturally in many foods, including tomatoes, cheeses, meat, fish, vegetables and mushrooms. Even breast milk contains glutamate. People around the world have eaten glutamate rich foods throughout history (FDA 2014; FSANZ 2013).</p>
Quote	<p>The biggest old wives tale is that MSG is bad for you. That is complete and</p>

(emotional) utter nonsense... Glutamate is actually a really important element of taste.
[quote shown with a labelled photograph of the chef, Heston Blumenthal]

^ Text for control condition available upon request

*All stimuli were shown with their bibliographic references below them.