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The psychology of 'regrettable substitutions': Examining consumer judgements of Bisphenol A and its alternatives

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Abstract

Bisphenol A is a chemical used to make certain types of plastics and is found in numerous consumer products. Because scientific studies have raised concerns about Bisphenol A's potential impact on human health, it has been removed from some (but not all) products. What many consumers do not know, however, is that Bisphenol A is often replaced with other, less-studied chemicals whose health implications are virtually unknown. This type of situation is known as a potential 'regrettable substitution', because the substitute material might actually be worse than the material that it replaces. Regrettable substitutions are a common concern among policymakers, and they are a real-world manifestation of the tension that can exist between the desire to avoid risk (known possible consequences that might or might not occur) and ambiguity (second-order uncertainty), which is itself aversive. In this article we examine how people make such trade-offs using the example of Bisphenol A. Using data from Study 1, we show that people have inconsistent preferences toward these alternatives and that choice is largely determined by irrelevant contextual factors such as the order in which the alternatives are evaluated. Using data from Study 2 we further demonstrate that when people are informed of the presence of substitute chemicals, labeling the alternative product as 'free' of Bisphenol A causes them to be significantly more likely to choose the alternative despite its ambiguity. We discuss the relevance of these findings for extant psychological theories as well as their implications for risk, policy and health communication.

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Keywords

risk; Bisphenol A; order effects; risk perception; consumer decisions

Introduction

In this article we examine analyze risk and make choices between Bisphenol A and Bisphenol A alternatives, a situation involving a potential regrettable substitution. Using survey methods, researchers in the USA have shown that attitudes toward Bisphenol A are shaped primarily by news exposure, trust in business and trust in the USA regulator, the Food and Drug Administration. These surveys indicate that more exposure and less trust is associated with more negative views of Bisphenol A (Brewer and Ley 2011). Other researchers have explored the potential for scientific ambiguity to influence Bisphenol A judgements, and found that when people are told ‘there is not enough scientific evidence that Bisphenol A harms human health’ this significantly reduces their support for a Bisphenol A ban (Maxim and Mansier 2014). However, to our knowledge, no research has yet examined how people evaluate the trade-off between the potential risk of Bisphenol A versus the potential risk of other unstudied alternative chemicals and in this article we draw on data from two studies to examine this issue.

The risk of Bisphenol A

Bisphenol A is a monomer found in numerous consumer products. Food that is packaged in containers made with Bisphenol A often has measurable amounts of Bisphenol A in it (Schecter et al. 2010), and Bisphenol A can be found in the bodies of most Americans (Calafat et al. 2008; Carwile et al. 2011; Vandenberg et al. 2010). These facts are potentially concerning, because Bisphenol A is an endocrine disruptor, meaning that it can mimic human hormones such as oestrogen (Vandenberg et al. 2009). Although a large number of scientific studies have attempted to determine whether Bisphenol A is associated with adverse health outcomes (Melnick et al. 2002; Vandenberg et al. 2012; Vom Saal and Hughes 2005), the findings have been ambiguous (Rudel et al. 2011; World Health Organization 2010). Some low dose studies have shown evidence of adverse health outcomes, but others have found no effects at all, and there is considerable controversy over which findings should be weighed more heavily in judgements of Bisphenol A (Melzer and Galloway 2010; Myers et al. 2009a, 2009b).

Such findings and other issues, have fed into a highly contested debate in the USA about the safety of Bisphenol A (Arnich et al. 2011; Birnbaum et al. 2012; Melzer and Galloway 2010; Vogel 2009; World Health Organization 2010). However there is enough scientific evidence to establish the threshold above which exposure to Bisphenol A is harmful to humans. Responding to such evidence, in 2010 the United States Food and Drug Administration issued a statement advising individuals to avoid exposure to Bisphenol A, but it stopped short of banning it (U.S. Food and Drug Administration 2010). In July 2012, the Food and Drug Administration issued new guidance banning the use of Bisphenol A in baby bottles and children’s drinking cups (Tavernise 2012). In 2014 the European Food

Safety Authority took action, recommending that the maximum recommended threshold for exposure should be reduced by 80 per cent. Yet, Bisphenol A is still widely used in a number of other consumer goods, such as canned food (particularly canned tomatoes) and thermal paper used for printing receipts.

As a result of questions surrounding Bisphenol A's safety, some manufacturers in the United States have started making and labeling products as 'BPA-free'. However, products labeled 'BPA-free' usually contain alternative chemicals that perform similar functions but that often have not been subject to nearly as much scientific scrutiny as Bisphenol A (Browning 2011). Such substitution can be referred to as potential 'regrettable substitutions' because a known or probable risk is exchanged for an alternative that might be even worse (Malloy 2012).

Although regrettable substitutions appear to be common in modern life, the way that people judge such trade-offs has rarely, if ever, been directly examined. Ideally, trade-offs involving regrettable substitutions would be based on a degree of certainty, for example evidence that the currently accepted item is dangerous and that that the alternative is more dangerous. In reality, however, this information is not available and there is uncertainty. The evidence of the harm caused by the accepted item is often tenuous or contested (otherwise there would be no controversy about rejecting the item). Moreover, since even less is known about the alternative, there is often no way to estimate the probability that the alternative is more harmful. Hence, in this article we will examine how people make trade-offs under such conditions of uncertainty; specifically, between an option for which there is some evidence, albeit contested, that it causes harm, versus a potential substitute that has no evidence that it does or does not cause harm.

Regrettable substitutions and relevant psychological phenomena

Existing research findings in decision psychology provide a rich backdrop for examining decisions about Bisphenol A, its alternatives, and regrettable substitutions more generally. Although the psychology literature often focuses on simple betting games that have little resemblance to the present judgement context, there are a number of general and well-established psychological phenomena that can shed light on how people make trade-offs between a Bisphenol A and its substitutes. For example, there is substantial evidence that people prefer to maintain the 'status quo' rather than change course (Kahneman et al. 1991; Samuelson and Zeckhauser 1988). The ubiquity of the status quo bias suggests that, when faced with a potential regrettable substitution, people will prefer to stick with the currently in-use item rather than switch to some alternative, especially if the relative benefit of that alternative is uncertain.

However, there may be more to the psychology of regrettable substitutions than a simple status quo bias. For example, one way of understanding regrettable substitutions is that they are a real-world manifestation of the tension that can exist between the desire to avoid risk versus the desire to avoid ambiguity (which is itself aversive; Fox & Tversky, 1995). Ambiguity aversion is one of the most robust and common findings within the judgement and decision making literature (Keren & Gerritsen 1999). For example, people usually prefer gambles with known probabilities over gambles that have vague or unknown chances of winning or losing (Fox & Tversky, 1995; Fox & Weber, 2002). These gambles have obvious parallels to the present considerations, insofar as Bisphenol A has some potential risk associated with it, whereas Bisphenol A alternatives have not been scientifically scrutinised and therefore are analogous to a gamble with an unknown probability of losing. Hence, the ambiguity aversion literature might predict that most people will prefer Bisphenol A to its alternatives, because Bisphenol A is the relatively less ambiguous option.

Furthermore, ambiguity aversion has been shown to be more likely when two bets are evaluated side by side, rather than in isolation (Fox & Tversky, 1995). This joint versus separate evaluation effect (as well as many other findings) has resulted in a wider understanding of ambiguity aversion as being caused by 'comparative ignorance'. That is, when people pick between two bets, they prefer the bet that they feel relatively knowledgeable or competent about (Fox & Tversky, 1995; Fox & Weber, 2002; Heath & Tversky, 1991; Keren & Gerritsen, 1999). Since joint evaluation contexts highlight the relative lack of knowledge about the ambiguous bet, that lack of knowledge becomes more evaluable than what would otherwise be the case (Hsee 1996).

Judgements of Bisphenol A and its alternatives might reveal a relatively straightforward application of the ambiguity aversion effect. The concept of joint versus separate evaluations also has importance here, because it suggests that people's evaluations of Bisphenol A might change when they learn of the existence of substitute chemicals. This issue has considerable practical importance, because usually people evaluate Bisphenol A in isolation, not knowing that their 'BPA-Free' baby bottle or water bottle actually contains substitutes (an issue that we will address using data from Study 2). An ambiguity aversion perspective might predict that when people are informed of the substitute chemical that has never been scientifically scrutinised, their evaluation of Bisphenol A should become more positive because they feel favorably about the fact that there is, in fact, at least some research that tests the safety of Bisphenol A.

However, there is at least one reason to suspect that regrettable substitutions could be a context in which ambiguity aversion might *not* occur (which would be a novel finding in its own right, given the ubiquity of ambiguity aversion effects). In particular, regrettable substitution scenarios involve evaluating two different *degrees* and *types* of ambiguity. For example, even though people have objectively more information about Bisphenol A, the fact that some of that information is the subject of controversy may cause people to evaluate Bisphenol A *as if* they had no information. That is, the presence of scientific controversy may cause people to 'throw the baby out with the bath water', and treat these as two equally negative and ambiguous options. If this were the case, we might expect people to prefer the option that they encounter first (regardless of whether that option was Bisphenol A or a substitute), because their memory for that option and its negative qualities has had more time to fade (Li and Epley 2009). Moreover, if this finding were obtained it would have considerable practical implications for science communication, because it would suggest that scientific findings that are the subject of some controversy might be treated similarly to situations in which there is no scientific evidence at all.

Comment

In this article we are interested in how consumers in the United States grapple with potential regrettable substitution situations; that is trade-offs between options that are known to be somewhat risky (here, Bisphenol A) versus an alternative about which little is known (Bisphenol A substitute). We use data from Study 1, to study whether US consumers are likely to evaluate Bisphenol A differently in isolation versus after having been informed of the existence of another available chemical option. We had two opposing predictions. One possibility is that we would find ambiguity aversion, in which case Bisphenol A would be preferred because it is the less ambiguous option. Another possibility is that we would *not* observe ambiguity aversion, in spite of the fact that there are clear differences in ambiguity between the two options. Instead, the questions surrounding Bisphenol A science might cause people to interpret the information about Bisphenol A as having little informative value, effectively making the choice between two equally negative and ambiguous options. If this were the case, then we would expect people to prefer the option that is presented first (regardless of whether that option is Bisphenol A or substitutes) because when all options are equally negative people tend to prefer the first options that they encounter (Li & Epley, 2009). In Study 2, we further examined whether framing the substitute chemical as 'BPA-free' improves how it is evaluated, even when people know that the alternative product contains a chemical that has not been scientifically scrutinised.

Study 1: Design and findings

Methods

In Study 1, we presented participants with two articles that were ostensibly real newspaper articles, one that described Bisphenol A, and one that described a chemical that is used as a Bisphenol A substitute (see details below). For Bisphenol A, participants were told that there was some evidence that Bisphenol A caused some specific harms, but that this evidence was controversial for a variety of reasons. Participants were additionally told that some information was known with relative certainty, including the fact that 'BPA [Bisphenol A] clearly does not have as significant an impact on health as smoking, eating an unhealthy diet, or living a sedentary lifestyle'. In the case of the alternative chemical (in this case, polyethylene terephthalate, or PET), participants were told that there was no information about its safety or lack therefore, because it had never been scientifically scrutinised. This information was constructed to be a fair representation of the current state of reality when this study was conducted.

Study 1 was designed to establish whether participants evaluated these options differently, and in particular whether they exhibited ambiguity aversion. Following prior research showing ambiguity aversion only in joint evaluation contexts (Fox & Tversky, 1995), we varied the order in which the chemicals were presented, first asking participants to evaluate each chemical in isolation, and then asking them to evaluate both jointly.

With this goal in mind, there was a point of complexity inherent in our research question that is worth addressing at the outset. Specifically, one question is how people judge, jointly versus in isolation, the two different types of risk that are pertinent to Bisphenol A and regrettable substitutions, in this case a well-studied chemical with possible moderate health risks (Bisphenol A) versus a chemical that is virtually unknown with regard to its health effects (Bisphenol A substitute). A separate but related question is how people rate these two types of risk when one type of risk is explicitly replacing the other (that is, when one option is framed as the status quo). The latter question has plenty of practical implications, but given the plethora of research on the status quo bias we believed that the former question was more novel and had more interesting implications for how these two different types of risks are evaluated and compared more generally.

As a result in Study 1 we examined how these two types of risk were compared when neither was explicitly presented as a ‘status quo’ option. (Note that in Study 2, we more directly addressed the idea of one chemical replacing the other, while also exploring the implications of framing the alternative as ‘BPA-Free’). In line with our goal, we were careful to not frame either option as being the currently accepted option, so that we could assess participants’ reactions to the different types of risk themselves, rather than their reactions to the status quo. Specifically, participants were told that each of these chemicals was currently used in some products. In the course of the study, participants were asked to rate each chemical on its own, with no knowledge of another option, and then jointly with the other chemical. Hence, we were able to assess how people felt about these risks when evaluating them alone, with no basis for comparison, and also how people felt about these risks when asked to compare and choose between them.

Participants—We selected a stratified random sample of adults age 18 from a panel of Internet users administered by Survey Sampling International during October 2011. These participants were regular internet users who agreed to participate in online surveys in exchange for being entered into both an instant-win contest and a monthly drawing for modest prizes. The subject pool is gathered and maintained by Survey Sampling International.

We administered the study as part of a larger survey about cardiovascular disease. A total of 2278 participants began the combined survey, but 356 dropped out during the initial cardiovascular disease section. There were 1922 participants who began the survey about Bisphenol A, and of these, 125 dropped out prior to completing it. We excluded 59 participants who spent less than 10 seconds or more than 10 minutes reading each article (on average), indicating that they weren’t paying attention or weren’t actually reading. This left a total of 1738 participants (90.4% of those who began the Bisphenol A study).

To ensure moderate demographic diversity (but not representativeness), we drew distinct sub-samples by both age and race, and the number of email invitations in each demographic sub-sample was dynamically adjusted to offset large variations in response rates. Sample demographic characteristics are described in Table 1, first column. The average participant age was 54, and we observed a wide range of educational achievement.

The data collected—We presented participants with two hypothetical news articles each describing chemicals that can be used in the plastic lining of canned food. One article described, as objectively aspossible, the state of the science in 2011 with regard to Bisphenol

A's health effects (see Appendix). The contents were based primarily on the report of the 2010 Joint Food and Agriculture Organization and World Health Organization Expert Meeting on Bisphenol A, as well as our own literature searches. The article highlighted key issues, findings, and controversies, but contained the level of detail that would be expected from a news source such as the Wall Street Journal or the New York Times. A similarly structured article described polyethylene terephthalate (PET), which was also presented as a chemical that can be used in the lining of canned goods (see Appendix). Participants were told that little, if anything, is known about whether described polyethylene terephthalate effects human health, or even how much of this chemical leaches into food and gets into the body.

Design and Procedure—All participants were randomly assigned to read first about just one of the chemicals (either Bisphenol A or polyethylene terephthalate), and then rated their perceived risk of eating from cans lined with plastic that contains that chemical. Approximately half of participants read about and rated Bisphenol A, and the rest read about and rated polyethylene terephthalate. These initial judgments allowed us to compare how Bisphenol A and polyethylene terephthalate are evaluated in isolation.[1] Next, all participants read about the second chemical (whichever they did not read about first) and then rated the riskiness of both Bisphenol A and polyethylene terephthalate in a side-by-side comparison. Finally, to control for participants' preconceived notions about the dangers of Bisphenol A, for half of our participants the articles referred to hypothetical chemicals Plasticising Agent C and Plasticising Agent F (instead of Bisphenol A and polyethylene terephthalate). The resultant study design was a 2 (Chemical order: Bisphenol A first vs. polyethylene terephthalate first) X 2 (Chemical name: Bisphenol A and polyethylene terephthalate vs. Plasticising Agent C and Plasticising Agent F) between-subjects design.

Outcome measures—Participants were first asked to rate the riskiness of eating tomatoes out of cans lined with plastic that contains the first chemical they read about (either Bisphenol A or polyethylene terephthalate) on a 7 point scale that varied from 'Not at all risky' (0) to 'Extremely risky' (6). After reading about both chemicals, they then asked to rate the riskiness of eating tomatoes from cans lined with the second chemical using the same scale, and re-rated the riskiness of eating tomatoes from cans lined with the first chemical. Next, participants were asked to choose between two brands of canned tomatoes, one that uses Bisphenol A plastic and another that uses polyethylene terephthalate plastic.

At the end of the survey participants were asked to record their demographic characteristics, including age, race, ethnicity, gender, and education level. We also asked participants to rate their familiarity with issues surrounding Bisphenol A on a 0–4 (not at all familiar – very familiar) scale. Finally, as a test of Bisphenol A knowledge, we asked participants to consider 6 consumer products (cans, milk jugs, water bottles, baby bottles, grocery bags, and paper receipts) and indicate whether each item contained Bisphenol A (correct answers:

[1]One possible objection to this design is that act of making this initial rating could have influenced participants' later joint ratings. To address this issue, there were two other between-subjects conditions that were exactly the same as the conditions reported here except that participants read about both chemicals prior to making any ratings. The results from those conditions were virtually identical to the results reported here, and so for the sake of brevity we only report the conditions that included both joint and separate rating.

cans, water bottles, baby bottles, paper receipts). These items were used to create a knowledge score that ranged from 0 (no correct responses) to 6 (correct responses for all items).

The study research materials and protocol were approved by the University of Michigan Health Sciences and Behavioral Sciences Institutional Review Boards.

Findings from Study 1

Participants had very little prior knowledge of Bisphenol A. When asked about their familiarity with Bisphenol A, their average rating was 0.88 (SD = 1.19) on a 0–4 scale. Furthermore, participants performed no better than chance at identifying products containing Bisphenol A (average correct = 2.9 out of 6, SD = .93). All results reported below remained unchanged when controlling for familiarity and knowledge. The name of the chemicals (that is Bisphenol A and polyethylene terephthalate versus Plasticising Agent C and Plasticising Agent F) had no effect on judgements or decisions, so all results below collapse across these labels.

Individuals' risk evaluations are often influenced by demographics such as age and gender, and so in the our study we controlled all analyses involving risk perceptions for age, gender, education, and race (all covariates were mean centered). All results and conclusions remained unchanged regardless of whether these covariates were included in the analyses or not.

When evaluated in isolation, average risk ratings for Bisphenol A and polyethylene terephthalate were 3.24 (SD = 1.69) and 3.33 (SD = 1.73), and these risk ratings were not significantly different, $F<1.0$. In contrast, when Bisphenol A and polyethylene terephthalate were rated jointly, there was a significant Chemical (Bisphenol A versus polyethylene terephthalate) X Order (Bisphenol A first versus polyethylene terephthalate first) interaction, $F(1,1577) = 94.38$, $p<.001$, $\eta_p^2=.056$. The means and standard deviations associated with this interaction are displayed in Table 2. When participants were exposed to the Bisphenol A article first, Bisphenol A was seen as less risky than polyethylene terephthalate, $F(1, 782)=42.77$, $p<0.001$, $\eta_p^2=.052$. By contrast, when participants were exposed to the polyethylene terephthalate article first, polyethylene terephthalate was seen as less risky than Bisphenol A, $F(1,793)=56.66$, $p<0.001$, $\eta_p^2=.067$). In other words, participants rated the first chemical as significantly less risky than the second, *regardless of whether the first chemical was Bisphenol A or polyethylene terephthalate*. These differences in joint risk evaluations seemed to be driven primarily by fluctuations in participants' evaluations of Bisphenol A rather than polyethylene terephthalate; that is, participants across the two order conditions evaluated Bisphenol A differently ($F(1,1609)=47.63$, $p<.001$, $\eta_p^2=.029$) but differences in their evaluations of polyethylene terephthalate were statistically significant but relatively small, $F(1,1607)=4.32$, $p=.038$, $\eta_p^2=.003$.

Next we examined decisions to purchase canned food containing Bisphenol A or polyethylene terephthalate. Consistent with the risk evaluations, when forced to choose between buying canned food containing Bisphenol A versus polyethylene terephthalate, participants were significantly more likely to choose the chemical that they read about first,

$\chi^2(1) = 100.05$, $p < .001$. In fact, 59.9% of participants chose cans containing Bisphenol A when they learned about Bisphenol A first, whereas only 35.0% of participants chose Bisphenol A when they learned about it after having read about polyethylene terephthalate. Hence, order of presentation appeared to alter preferences for almost 25% of the sample.

Discussion of the findings of Study 1

When Bisphenol A and polyethylene terephthalate were evaluated separately, there were no differences in perceived risk from the chemicals. By contrast, participants evaluated Bisphenol A and polyethylene terephthalate differently when they were forced to compare the chemicals directly (see Fox & Tversky, 1995). However, we did not find any evidence for ambiguity aversion. Instead, the first chemical was clearly favoured over the second in both risk perception and choice, regardless of whether the first chemical was Bisphenol A or polyethylene terephthalate.

A likely explanation for why participants preferred the first option is that both options were negative. Past research has demonstrated that when all choice options are negative, people tend to prefer the first options that are encountered, presumably because their negative feelings for those options have had more time to fade from memory (Li and Epley 2009). However, the present results are also consistent with the status quo bias; that is, the tendency to stick with the currently accepted or known option (Samuelson and Zeckhauser 1988). In our view, negativity-related primacy effects are a more parsimonious explanation, because in the articles we were careful not to refer to the first chemical as being the status quo (that is it was referred to as one of potentially many kinds of plastics than might be found in cans). Yet regardless of which of these explanations is correct, the present results clearly indicate that when jointly evaluating these two options, people do not show ambiguity aversion but instead prefer the option that they encounter first.

Overall, these findings indicate that participants did not express strong preferences in favour of either Bisphenol A or its alternative, and instead their preferences were influenced by irrelevant contextual factors (that is serial position). This type of order effect, previously documented in other types of consumer choice (Bruine de Bruin and Keren 2003; Bruine de Bruin 2005; Li and Epley 2009) suggests that choices involving this kind of trade-off may be guided less by what people know and more by the order in which they learn it. Notably, it appears that people evaluate a situation in which scientific evidence is tempered by controversy similarly to a situation in which there is no scientific evidence at all.

Study 2: Design and findings

Context

One interesting feature of Study 1 was that the findings were consistent with what the decision making literature might predict, but were inconsistent with real events surrounding Bisphenol A. In the American marketplace, consumers rejected Bisphenol A in favour of Bisphenol A substitutes; substitutions that may one day prove to be regrettable. And yet the results from Study 1 suggested that participants in our study actually preferred Bisphenol A (as it was first, in reality) and rejected the substitutes introduced later.

There is a simple explanation for this apparent inconsistency: Products that contain substitute chemicals are usually labeled 'BPA-Free', with no mention of alternative chemicals. Hence, in real life consumers probably failed to realize that 'BPA-Free' does not mean chemical-free but that instead the product contains a substitute chemical. This in itself would be enough to reverse a strong primacy bias, because the choice is perceived as being between a product that contains something harmful and a product that has had that harmful thing removed. And yet, this issue begs the question: *If* people were informed of the fact that 'BPA-Free' meant that a product contains chemical substitutes, would they still be influenced by the 'BPA-Free' label, and prefer the alternative product as a result? That is, would the observed strong preference for the first chemical (Bisphenol A) over the second (polyethylene terephthalate) be nullified, or even reversed, if the second chemical was framed as being 'free' of the other chemical (for example 'BPA-Free PET')? We designed and undertook the second study to examine this issue.

Methods of Study 2

Participants—We recruited a sample of American adults age 18 and above from Internet users who participate in Amazon's Mechanical Turk (Mturk) marketplace during April 2012. Mturk is a population of internet users who participate in surveys in exchange for small monetary compensation, and has been shown to be a good source for high-quality data (Buhrmester, Kwang & Gosling, 2011). Participants responded to the survey in exchange for a small monetary reward. Of the 816 participants who began the survey, 777 completed the entire survey, a 95% completion rate. Table 1, second column, displays the sample characteristics.

Materials and Procedure—Participants were asked to read the same article participants read in Study 1, but all were asked to read about Bisphenol A first and polyethylene terephthalate second. Moreover, half of participants were randomised to a 'BPA-Free language' condition in which they additionally read a short paragraph after reading the Bisphenol A article, written in the format of a follow-up article. This follow-up article stated:

> Yesterday I wrote about a chemical called BPA that is in the lining of canned food. However, readers reminded me that there is another brand of canned vegetables, Brand Y, which lines their cans with BPA-Free plastic. So, people should know that BPA-Free canned vegetables are an option for most shoppers.

Then participants read the article describing polyethylene terephthalate, which was exactly the same as the polyethylene terephthalate article in Study 1 except that in this study the article and all subsequent questions referred to polyethylene terephthalate-lined cans as 'BPA-Free' (for example 'BPA-Free cans lined with PET').

After reading about Bisphenol A, all participants were asked to estimate how risky it would feel to eat tomatoes from cans lined with Bisphenol A (question and scale identical to Study 1). Participants in the 'BPA-free' condition were asked four additional questions after reading the brief follow-up article mentioning that a 'BPA-free' alternative existed. They were asked

- whether they would like to have the option of buying canned food packaged in 'BPA-Free' cans (1–7; 'not at all'-'yes, definitely');
- how risky it would feel to eat tomatoes from BPA-Free cans (1–7; 'not at all risky'-'extremely risky');
- how much they would be willing to pay for a BPA-Free product (if the product that contained Bisphenol A cost $1.50);
- how likely is it that they would throw away food they had bought that contained Bisphenol A (1–7; 'not at all likely'-'extremely likely').

After reading about polyethylene terephthalate, participants were asked to rate the riskiness of eating from cans lined with either Bisphenol A or polyethylene terephthalate. The questions and scale were identical to Study 1, except that in the 'BPA-free' condition, polyethylene terephthalate was referred to as being a 'BPA-Free' alternative (as in the following: '*How risky does it feel to eat tomatoes from BPA-Free cans lined with PET?*').

All participants were then asked to make a choice between cans lined with Bisphenol A or polyethylene terephthalate. Again, for the free condition, the 'BPA-Free' language was integrated into the question wording ('*Which would you prefer to buy: BPA-lined cans, or BPA-Free cans lined with PET?*' versus '*Which would you prefer to buy: BPA-lined cans, or PET-lined cans?*').

Participants were asked to report their demographic characteristics and familiarity with Bisphenol A using the same items that were used in Study 1. All study research materials and protocol were approved by the University of Michigan Health Sciences and Behavioral Sciences Institutional Review Boards.

Findings of Study 2

When evaluating Bisphenol A risk in isolation, participants' average rating was 3.48 (SD=1.49; scale=0–6), indicating moderate risk perceptions (as in Study 1). Participants in the free language condition were additionally asked whether they were interested in buying canned food that was 'BPA-Free.' Participants were very interested in having a 'BPA-Free' option (M=5.19 on a 0–6 scale, SD=1.34), they perceived little risk in 'BPA-Free' cans (M=1.13 on a 0–6 scale, SD=1.28), and they were willing to pay an average of 28 cents more for a product packaged in a 'BPA-Free' can (SD=.41). However participants did not express a strong desire to throw away Bisphenol A cans that they had already purchased (M=1.91 on a 0–6 scale, SD=1.98).

Analysis of participants' joint risk evaluations indicated a significant risk judgment (Bisphenol A versus polyethylene terephthalate) X Free language (present vs. absent) interaction, $F(1,765)=7.85$, $p=.005$, $\eta_p^2=.01$ (Table 3; as in Study 1, this analysis was controlled for age, gender, race and education). When the free language was absent, participants thought that Bisphenol A was less risky than polyethylene terephthalate, $F(1,384)=15.18$, $p<.001$, $\eta_p^2=.038$ $p<0.001$, presumably because participants encountered Bisphenol A first. However, when the free language was present, participants thought that the chemicals were equally risky $F<1.0$. The far-right column in Table 3 shows that this change in the relative evaluations of the two chemicals was driven by changes in participants' evaluations of polyethylene terephthalate across the two 'free' label conditions. That is, polyethylene terephthalate was rated as significantly less risky when described as being 'BPA-Free' as opposed to described without that label ($F(1,769)=13.20$, $p<.001$, $\eta_p^2=.017$), whereas there was no difference in evaluations of Bisphenol A across the free language conditions, $F<1.0$.

There was also a significant effect of 'BPA-free' language on choice of cans, $\chi^2(1)=30.40$, $p<.001$. In the absence of any 'BPA-free' language, the majority of participants (59.0%) chose Bisphenol A over polyethylene terephthalate. However, when the 'BPA-free' language was introduced for polyethylene terephthalate, only participants (39.2%) chose Bisphenol A.

Participants reported that they had a moderate level of familiarity with issues surrounding Bisphenol A (M=2.52 on a 1–5 scale, SD = 1.27). However, when trying to identify consumer items that contained Bisphenol A, on average participants performed no better than chance (average correct = 2.09 out of 6, SD = .94). The results reported here remained unchanged when controlling for familiarity and knowledge.

Discussion of findings in Study 2

When participants were presented with a choice between Bisphenol A and polyethylene terephthalate, the majority chose Bisphenol A. This replicated Study 1 insofar as participants tended to prefer the first chemical that they learned about (which in this case was always Bisphenol A). However, when the options were framed as a choice between Bisphenol A and 'BPA-Free' polyethylene terephthalate, this preference reversed and the majority of participants chose polyethylene terephthalate. The risk ratings revealed a similar pattern of results. Since all participants read the same information about Bisphenol A and polyethylene terephthalate, the observed preference for the alternative cannot be explained by ignorance about the substitute chemical (as is the case in real-world Bisphenol A decisions). Instead, the observed effects can only be explained by the fact that the alternative chemical was framed as being 'BPA-Free'.

Discussion

In this article we have examined non-experts' evaluations of Bisphenol A and its alternatives, and their evaluations of risks pertinent to regrettable substitutions more generally. It is important to understanding how people evaluate chemicals that may cause personal and public health risks, and reveal biases that might influence public policy and laws, such as whether Bisphenol A should be banned (and other chemicals accepted), or not. These studies provided insights into these issues. First, the findings demonstrated that, in contrast to what the ambiguity aversion literature might predict, participants did not have strong or stable preferences for the well-studied chemical with possible moderate health risks (Bisphenol A) versus a chemical that is virtually unknown with regard to its health effects (polyethylene terephthalate). Instead, participants evaluated these chemicals similarly in isolation, and showed strong primacy effects when considered jointly, with approximately 60% of participants choosing the option that they encountered first. This primacy effect was reversed, however, by framing the substitute chemical as being 'free' of Bisphenol A.

Critically, participants chose the substitute even though they knew that the 'BPA-Free' option meant accepting another chemical about which little is known, a potential regrettable substitution.

One possible reason for the observed primacy effect is the status quo bias (Samuelson and Zeckhauser 1988). Yet as stated earlier, we believe that this explanation is unlikely because we took pains to frame the choice as between two currently accepted alternatives. Hence, our preferred explanation is that the second option was evaluated more negatively because the negative attributes of that item were viewed most recently, and therefore loomed larger in memory (Li and Epley 2009). Our findings help answer an important question; namely, whether people generally prefer one of these types of risks to the other. The results clearly indicated that a large proportion of people do not strongly differentiate between these two types of risk. Hence, these data suggest that controversial scientific evidence of harm may often be viewed as being no better or worse than having no information at all. This insight could potentially have critical implications for how scientific data and controversies are communicated to the public.

The present research also lends crucial insights into perceptions of chemical substitutions, and the pernicious effects of common labeling practices. Currently, there is no law preventing companies in the United States from labeling products as 'BPA-Free' even when the products contain substitutes that are nearly identical to Bisphenol A (for example Bisphenol F or Bisphenol S). One issue is that consumers do not know that substitute chemicals are being used at all. However, our research clarifies that even if consumers *did* know about the presence of substitute chemicals, the 'BPA-Free' label would still cause more consumers to accept the substitute than what would otherwise be the case. This issue is not merely theoretical, but has considerable implications in light of recent lawsuits against companies that advertise their products as being 'BPA-free' (Hamilton). Our findings indicate that such labels are misleading, and cause some people to accept a substitute chemical that they might otherwise reject.

In modern society, people encounter a plethora of chemicals on a daily basis that may pose health risks, from Bisphenol A in canned tomatoes to the active ingredient in anti-bacterial soap (Halden 2010). Even when researchers study the risks of these chemicals, the research findings themselves may be equivocal, controversial, or simply reveal small and unlikely risks. Consumers must decide, then, whether to expose themselves to that potential risk or to opt for a comparatively unknown alternative that might end up being a regrettable substitution. At the moment, decisions about products using Bisphenol A fall into this category, but many other chemical and product ingredient decisions do too.

Given that such decisions are both common and highly relevant for the practical question of risk management in society, it is unfortunate that the psychology behind such tradeoff decisions between different types of uncertainty has been relatively ignored. Our results suggest that such judgements are not based on stable preferences or well-formed evaluations of risk. Instead, these judgements are unstable and easily influenced by situational factors, such as the order in which information is provided and the labels that are used to refer to these chemicals.

Implications for health, risk and society

There are two broad implications of our findings for how the United States and other societies might better grapple with these difficult judgments involving health risks and potential regrettable substitutions. First, we must acknowledge that our risk perceptions about chemicals like Bisphenol A however genuine they may feel, are less a hard, permanent truth and more a momentary perception. These momentary perceptions are predominantly a reflection of our personal experience and the way the information about that risk has been framed.

Moreover, these flexible perceptions likely influence policy-makers as well as laypeople, and this may partly explain why different countries have had widely varying responses to BPA. For example, one recent article noted that ‘there is considerable inconsistency with respect to perceived risks and policy responses despite access to the same evidence-base’ (Edge & Eyles, 2013). Although cultural values certainly play a role in public policy variations between nations (for example prioritising business and innovation versus the precautionary principle), these policy inconsistencies are to be expected when perceptions of risk are malleable and influenced by irrelevant factors.

Second, current labeling practices should be improved to reduce their potential to bias consumer choices and estimations of health risk. Current labeling practices make consumers believe that they are simply ridding themselves of something bad when they may in fact be consuming a substitute that is equally bad if not worse. Moreover, the present research suggests that consumers’ preferences may still biased by this ‘free’ language even if they are informed of the presence of substitute chemicals. As a result, our research strongly suggests that product labels should not read ‘This container is BPA-Free,’ or even ‘This container is BPA-Free and contains polyethylene terephthalate.’ Instead, it appears that the best labeling practice should avoid the ‘free’ language entirely and instead indicate exactly what was changed and nothing more, specifically ‘This container replaces Bisphenol A with polyethylene terephthalate.’

Limitations and future directions

Although the present findings are revealing, several limitations are worth noting. First, in Study 2 participants in the ‘BPA-Free’ condition were asked questions about their desire for ‘BPA-Free’ products that were not posed to participants in the baseline condition. Hence, our results could have been caused by the ‘free’ label alone, the questions alone, or a combination of both these things. Although this causes a degree of ambiguity with regard to the locus of the observed effects, the findings from Study 2 can nonetheless be attributed to the manipulation causing participants to think about the alternative chemical as being free of Bisphenol A. Moreover, the design of this condition essentially replicated the events of the real world, insofar as consumers were first told of the dangers of Bisphenol A, then they demanded alternatives, and lastly they received the ‘BPA-Free’ options.

A second limitation is that we used two Internet samples that were collections of people who were willing to take Internet surveys in exchange for monetary rewards. Therefore, these data do not necessarily represent how acceptable or unacceptable Bisphenol A is in the general population. However, our samples were considerably more diverse in age, race and education than samples that are typical of many psychology studies.

Finally, our study also presented participants with a hypothetical scenario in order to experimentally identify how specific factors, such as order and labeling, impact judgments of Bisphenol A. Further research is needed to assess to what degree our hypothetical scenarios predict real world behavior. Yet, it is worth noting that our findings, especially from Study 2, were quite consistent with what was observed in the actual American marketplace, insofar as participants preferred a 'BPA-Free' option.

Conclusion

In the present article our aim was to explore how people make trade-offs between Bisphenol A and Bisphenol A substitutes, a topic that has broader implications for decision making in situations that involve potential regrettable substitutions. Currently there is little if any research that addresses this important topic. The present research lent considerable insight into such decisions, but more research is needed to disambiguate the various psychological processes that underlie the observed effects. Other future research could examine the downstream consequences of labels that cause people to be more likely to accept potential regrettable substitutions. We hope that the present studies prove to be generative of future research that ultimately improves how these trade-offs are made and communicated to consumers.

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References

Arnich N, Canivenc-Lavier MC, Kolf-Clauw M, Coffigny H, Cravedi JP, Grob K, et al. Conclusions of the French Food Safety Agency on the toxicity of bisphenol A. International journal of hygiene and environmental health. 2011

Birnbaum LS, Bucher JR, Collman GW, Zeldin DC, Johnson AF, Schug TT, et al. Consortium-based science: the NIEHS's multipronged, collaborative appraoch to assesing the health effects of bisphenol A. Environmental Health Perspectives. 2012; 120:1640–1644. [PubMed: 23052487]

Brewer PR, Ley BL. Multiple exposures: Scientific controversy, the media, and public responses to Bisphenol A. Science Communication. 2011; 33:76–97.

Browning, D. The New York Times. 2011 May 8. Hitting the Bottle.

Bruine de Bruin W. Save the last dance for me: unwanted serial position effects in jury evaluations. Acta Psychologica. 2005; 118:245–260. [PubMed: 15698823]

Bruine de Bruin W, Keren G. Order effects in sequentially judged options due to the direction of comparison. Organizational Behavior and Human Decision Processes. 2003; 92:91–101.

Buhrmester M, Kwang T, Gosling SD. Amazon's Mechanical Turk a new source of inexpensive, yet high-quality data? Perspectives on Psychological Science. 2011; 6:3–5. [PubMed: 26162106]

Calafat AM, Ye X, Wong LY, Reidy JA, Needham LL. Exposure of the US population to bisphenol A and 4-tertiary-octylphenol: 2003–2004. Environmental health perspectives. 2008; 116:39. [PubMed: 18197297]

Carwile JL, Ye X, Zhou X, Calafat AM, Michels KB. Canned soup consumption and urinary bisphenol A: a randomized crossover trial. JAMA: The Journal of the American Medical Association. 2011; 306:2218–2220. [PubMed: 22110104]

Edge S, Eyles J. Message in a bottle: claims disputes and the reconciliation of precaution and weight-of-evidence in the regulation of risks from Bisphenol A in Canada. Health, Risk & Society. 2013; 15(5):432–448.

Fox CR, Tversky A. Ambiguity aversion and comparative ignorance. The Quarterly Journal of Economics. 1995; 110:585–603.

Fox CR, Weber M. Ambiguity aversion, comparative ignorance, and decision context. Organizational Behavior and Human Decision Processes. 2002; 88:476–498.

Halden RU. Plastics and health risks. Annual review of public health. 2010; 31:179–194.

Hamilton, J. [accessed 13 January 2014] BPA-Free Plastics Going On Trial In Texas. NPR.org. Available: http://www.npr.org/blogs/health/2013/07/15/201523240/bpa-free-plastics-going-on-trial-in-texas

Heath C, Tversky A. Preference and belief: Ambiguity and competence in choice under uncertainty. Journal of Risk and Uncertainty. 1991; 4:5–28.

Hsee CK. The evaluability hypothesis: An explanation for preference reversals between joint and separate evaluations of alternatives. Organizational Behavior and Human Decision Processes. 1996; 67:247–257.

Kahneman D, Knetsch JL, Thaler RH. Anomalies: The endowment effect, loss aversion, and status quo bias. The Journal of Economic Perspectives. 1991; 5:193–206.

Keren G, Gerritsen LEM. On the robustness of possible accounts of ambiguity aversion. Acta Psychologica. 1999; 103:149–172.

Li Y, Epley N. When the best appears to be saved for last: Serial position effects on choice. Journal of Behavioral Decision Making. 2009; 22:378–389.

Malloy, T. UCLA Emmett Center on Climate Change and the Environment, Pritzker Policy Brief. 2012. Toxics in Consumer Products: California's Green Chemistry Regulations at a Crossroad; p. 12-15.

Maxim L, Mansier P. How is Scientific Credibility Affected by Communicating Uncertainty? The Case of Endocrine Disrupter Effects on Male Fertility. Human and Ecological Risk Assessment: An International Journal. 2014; 20:201–223. DOI: 10.1080/10807039.2012.719387

Melnick R, Lucier G, Wolfe M, Hall R, Stancel G, Prins G, et al. Summary of the National Toxicology Program's report of the endocrine disruptors low-dose peer review. Environmental health perspectives. 2002; 110:427. [PubMed: 11940462]

Melzer D, Galloway T. Is bisphenol A safe? The New Scientist. 2010; 208:26–27.

Myers JP, Vom Saal FS, Akingbemi BT, Arizono K, Belcher S, Colborn T, et al. Why public health agencies cannot depend on good laboratory practices as a criterion for selecting data: the case of bisphenol A. Environmental Health Perspectives. 2009a; 117:309. [PubMed: 19337501]

Myers JP, Zoeller RT, Vom Saal FS. A clash of old and new scientific concepts in toxicity, with important implications for public health. Environmental health perspectives. 2009b; 117:1652. [PubMed: 20049113]

Rudel RA, Gray JM, Engel CL, Rawsthorne TW, Dodson RE, Ackerman JM, et al. Food Packaging and Bisphenol A and Bis (2-Ethyhexyl) Phthalate Exposure. 2011

Samuelson W, Zeckhauser R. Status quo bias in decision making. Journal of risk and uncertainty. 1988; 1:7–59.

Schecter A, Malik N, Haffner D, Smith S, Harris TR, Paepke O, et al. Bisphenol A (BPA) in US Food. Environmental science & technology. 2010

Tavernise, S. New York Times. 2012. FDA Makes it official: BPA can't be used in baby bottles or cups.

U.S. Food and Drug Administration. News and Events. U.S. Food and Drug Administration; 2010. Bisphenol A (BPA): Update on BPA for use in food: January 2010. Available: http://www.fda.gov/newsevents/publichealthfocus/ucm064437.htm

Vandenberg LN, Chahoud I, Heindel JJ, Padmanabhan V, Paumgartten FJR, Schoenfelder G. Urinary, circulating, and tissue biomonitoring studies indicate widespread exposure to bisphenol A. Environmental health perspectives. 2010; 118:1055. [PubMed: 20338858]

Vandenberg LN, Colborn T, Hayes TB, Heindel JJ, Jacobs DR, Lee DH, et al. Hormones and endocrine-disrupting chemicals: low-dose effects and nonmonotonic dose responses. Endocrine Reviews. 2012; 33:378–455. [PubMed: 22419778]

Vandenberg LN, Maffini MV, Sonnenschein C, Rubin BS, Soto AM. Bisphenol-A and the great divide: a review of controversies in the field of endocrine disruption. Endocrine Reviews. 2009; 30:75–95. [PubMed: 19074586]

Vogel SA. The Politics of Plastics: The Making and Unmaking of Bisphenol A" Safety. American journal of public health. 2009; 99:S559. [PubMed: 19890158]

Vom Saal FS, Hughes C. An extensive new literature concerning low-dose effects of bisphenol A shows the need for a new risk assessment. Environmental health perspectives. 2005; 113:926. [PubMed: 16079060]

World Health Organization. Joint FAO/WHO Expert Meeting to Review Toxicological and Health Aspects of Bisphenol A: Summary Report. Ottawa, ON: World Health Organization; 2010.

Appendix. Hypothetical articles, Order = BPA first

HEALTH

Chemicals In Your Canned Tomatoes

By JIM ANDERSON

Published: August 30, 2011

All canned foods, including canned tomatoes, are packaged in cans that are lined with plastic. The plastic is put into the cans because it helps to prevent spoilage and the growth of harmful bacteria.

One kind of plastic that is used in cans contains a chemical called bisphenol A or BPA. When BPA gets into the body it mimics certain human hormones, like estrogen (the female sex hormone). Most Americans have detectable levels of BPA in their bodies, probably from eating food packaged in BPA plastics, or from coming into contact with other things that contain BPA plastics.

There is currently a lot of debate about the health effects of BPA. One reason for the debate is that many studies of BPA have been done on animals, not humans, and used doses of BPA that were higher than the levels found in humans. One of the more consistent findings in animal studies is that low doses of BPA can cause changes in breast and prostate glands in developing mice. These changes may make those organs more prone to developing cancer. However, there is no direct evidence that BPA causes cancer.

Other studies have looked at BPA's effect on humans. Scientists have said that BPA may cause heart disease, diabetes, behavior problems, and sexual issues. But these claims are controversial in the scientific community. There is some evidence that BPA is related to small increases in heart disease and signs of diabetes, although the evidence is weak, and not accepted by some experts. There is also some evidence that BPA reduces sperm quality.

Pregnant women who have higher levels of BPA may have children who are slightly more likely to have behavioral and developmental problems.

At this point, the number of studies on BPA is limited, and existing studies often show contradictory findings. The quality of existing research is also inconsistent. It is possible that someday research will clearly link BPA to specific health problems. Because of this possibility, some types of containers are now being made without BPA. For now, it is generally accepted that BPA may slightly raise the risk of certain health problems, but BPA clearly does not have as significant an impact on health as smoking, eating an unhealthy diet, or living a sedentary lifestyle.

Chemicals in Your Canned Tomatoes.

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Most consumers are familiar with the two major brands of canned vegetables, Brand X and Brand Y. Both get high ratings from consumer organizations and cost the same in most stores. However, these brands use different types of plastic in their cans.

Brand X uses cans that are lined with BPA plastic. Brand Y also lines their cans with plastic, but instead of using BPA in their cans, Brand Y uses a different, alternative chemical called polyethylene terephthalate, or PET, that has not been well-studied.

Currently, nothing is known for sure about how PET affects human or animal health. We don’t know how or whether it affects human biology. We don’t know how much of this chemical gets into foods from the plastic. We don’t know how much exposure to this chemical is safe for humans. And we don’t know what kinds of health effects, if any, this chemical has on humans or animals.

PET may be safe. But it is possible that in the future we will find out that this chemical is actually dangerous to humans. It will take years of research to find out what effects, if any, this chemical has on human health.

Table 1

Sample characteristics, Studies 1 and 2.

Characteristic	Study 1	Study 2
Age	M = 54 (SD = 10)	M = 32 (SD = 11)
Gender		
Men	49% (879)	46% (357)
Women	51% (859)	54% (420)
Race		
Caucasian	77% (1340)	84% (654)
African-American	14% (239)	9% (71)
Native American	2% (31)	2% (16)
Asian	3% (49)	6% (46)
Pacific Islander	0.2% (3)	0.5% (4)
Other/mixed race	2% (34)	2% (14)
Hispanic ethnicity (any race)	7% (124)	6% (44)
Arabic ethnicity (any race)	2% (35)	2% (17)
Education		
HS diploma or less	23% (381)	13% (102)
Some college/trade school	42% (727)	44% (342)
Bachelor’s degree or more	34% (562)	43% (332)
Not reported	0.2% (5)	0.1% (1)

Table 2

Study 1, mean (SD) joint risk evaluations of Bisphenol A and PET, by order in which articles appeared

	Bisphenol A First	**PET First**	**Difference**	**F statistic**
Perceived risk of Bisphenol A	3.33 (1.67)	3.88 (1.70)	−0.55***	$F(1,1609)=47.63$, $p<.001$, $\eta_p^2=.029$
Perceived risk of PET	3.66 (1.68)	3.51 (1.72)	0.15	$F(1,1607)=4.32$, $p=.38$, $\eta_p^2=.003$
Difference	−0.33***	0.37***		
F statistic	$F(1, 782)=42.77$, $p<0.001$, $\eta_p^2=.052$	$F(1,793)=56.66$, $p<0.001$, $\eta_p^2=.067$		

Table 3

Mean (SD) joint risk evaluations of Bisphenol A and PET, by presence or absence of "free" language

	"Free" language absent	**"Free" language present**	**Difference**	**F statistic**
Perceived risk of Bisphenol A	3.29 (1.51)	3.21 (1.63)	.08	F<1.0
Perceived risk of PET	3.64 (1.56)	3.23 (1.55)	.41	$F(1,769)=13.20$, $p<.001$, $\eta_p^2=.017$
Difference	−0.35	−0.02		
F statistic	$F(1,384)=15.18$, $p<.001$, $\eta_p^2=.038$	F<1.0		