

Misleading Health Consumers Through Violations of Communicative Norms: A Case Study of Online Diabetes Education



Derek Powell¹, Martin Keil², Dru Brenner¹, Liliana Lim¹,
and Ellen M. Markman¹

¹Department of Psychology, Stanford University, and ²Department of Education, Stanford University

Psychological Science

1–9

© The Author(s) 2018

Reprints and permissions:

sagepub.com/journalsPermissions.nav

DOI: 10.1177/0956797617753393

www.psychologicalscience.org/PS



Abstract

Communication is a cooperative endeavor that goes well beyond decoding sentences' literal meaning. Listeners actively construe the meaning of utterances from both their literal meanings and the pragmatic principles that govern communication. When communicators make pragmatically infelicitous statements, the effects can be similar to paltering—misleading speech that evokes false inferences from true statements. The American Diabetes Association's (ADA's) "Diabetes Myths" website provides a real-world case study in such misleading communications. Calling something a myth implies that it is clearly false. Instead, the ADA's "myths" are false only because of some technicality or uncharitable reading. We compared participants' baseline knowledge of diabetes with that of participants who read either the ADA's myths or the myths rewritten as questions that do not presuppose the statement is false. As predicted, exposure to the ADA's "myths," but not to the rephrased questions, reduced basic knowledge of diabetes. Our findings underscore the need to consider psycholinguistic principles in mass communications.

Keywords

health, psycholinguistics, scientific communication, open data, open materials

Received 5/10/17; Revision accepted 12/18/17

Record numbers of Americans rely on the Internet for health information (Fox & Duggan, 2013). Although researchers have evaluated the accuracy of online health information (Silberg, Lundberg, & Musacchio, 1997; Wilson & Risk, 2002), they have largely neglected to assess how people actually interpret the material. For health websites to communicate effectively, it is crucial that they be informed by insights from psycholinguistics.

Decades of work in psycholinguistics have established that the pragmatics of utterances is fundamental to linguistic communication across a wide range of contexts (see E. Clark, 2004; H. Clark, 1996; Sperber & Wilson, 2005, for reviews). In foundational work, Grice (1975) argued that successful communication is a cooperative endeavor between speakers and listeners. Conversational partners do not simply decode the literal meaning of each other's utterances but instead work to figure out their communicative intent. Grice's cooperative principle of communication specifies maxims by

which conversational partners establish what information is mutually available, what level of detail is expected, how truthful the utterance is, and more. These are not norms of politeness but instead are integral to how communication takes place. If, for example, a shopper asks a salesperson, "Can you tell me how much this costs?" it would be uncooperative for the salesperson to respond "Yes," full stop. The shopper is not asking a literal yes-or-no question about the ability of the salesperson but is using that question as an indirect request (H. Clark, 1979) to discover the item's price. The clerk should address the shopper's communicative intent, not the literal question.

Gricean guidelines for effective communication apply equally to mass communications, such as websites

Corresponding Author:

Derek Powell, Department of Psychology, Stanford University, Jordan Hall, Building 01-420, 450 Serra Mall, Stanford, CA 94305
E-mail: derekpowell@stanford.edu

conveying health information, where authors must act as cooperative speakers and visitors as active listeners. If these guideline are not followed, the effects can be similar to *paltering*¹—the act of deceiving through true statements (Schauer & Zeckhauser, 2009). Often, paltering relies on a victim drawing false inferences from the pragmatics of a speaker's semantically true utterance. Suppose someone is selling a car and a potential buyer asks, "Does this car need any maintenance?" The car is scheduled to need extensive maintenance fairly soon, but a paltering seller might respond, "It's a great car; it's always run beautifully." This statement might be literally true, but it gives the false impression that the car does not need maintenance. As this example illustrates, conversational implicatures can be just as misleading as outright falsehoods (Rogers, Zeckhauser, Gino, Norton, & Schweitzer, 2017).

The risks and consequences of unintentional paltering may be especially severe for well-respected and expert sources of advice. Readers are most likely to trust sources they believe are expert, upstanding, and benevolent (Goldman, 2001; Hendriks, Kienhues, & Bromme, 2015) and to therefore be less critical of their claims. Moreover, pragmatic inferences often depend on what a listener assumes a speaker knows: When speakers are assumed to be highly knowledgeable, stronger pragmatic inferences can be licensed (e.g., Goodman & Stuhlmüller, 2013). Readers likely assume that experts intend to be constructive and helpful, to guide them to take appropriate actions—further licensing strong pragmatic inferences. Compounding these challenges is the fact that experts often struggle to take the perspectives of laypeople (see Nickerson, 1999). This may make it difficult for them to anticipate how laypeople will interpret their communications and what pragmatic inferences people may draw, underscoring the need to raise awareness of these issues among health professionals.

If health communicators fail to honor cooperative principles, there is a risk that readers will misinterpret communicative intentions and will thereby be misled. As a case study of how health communicators may mislead by unintentionally paltering, we analyzed a prominent link featuring "Diabetes Myths" on the website of the American Diabetes Association (ADA). We argue that the expression of these myths violates the cooperative principle for successful communication. Readers of a respected health website that lists myths likely assume the authors are targeting completely false statements, not statements that are pretty much true, not quite right, or false only because of some technicality or uncharitable reading. In contrast, the ADA characterizes as "myths" many statements that either are largely true or false only because of some technicality.

Labeling partly true statements as "myths" is infelicitous and can mislead readers who seek to use that information to figure out how to improve their health.

The ADA presents 10 "myths" about diabetes. On our reading, 7 of these myths are misleading. Here are analyses of 2 of the "myths" from the ADA's website that illustrate these problems (<http://www.diabetes.org/diabetes-basics/myths/>):

- "Myth: If you are overweight or obese, you will eventually develop type 2 diabetes." Although it is true that being overweight or obese does not guarantee one will develop Type 2 diabetes, calling this statement a myth could lead readers to infer that being overweight or obese is not a significant risk factor for developing Type 2 diabetes.
- "Myth: People with diabetes can't eat sweets or chocolate." If this is a myth, the implied truth is that "people with diabetes *can* eat sweets and chocolate." From this, people could reasonably infer that people with diabetes are free to regularly include sweets and chocolates as part of their diet.

Together, the seven infelicitous myths on the ADA's website could lead people to infer that being overweight is not a significant risk factor for developing diabetes, that people with diabetes can continue eating sweets the way they normally do, that they do not need to improve their diets, that they have a robust immune system, and that nothing much can be done to stop diabetes from progressing. In this way, the ADA's myths webpage could be a real-world demonstration of misinformation through unintentional paltering.

Given that the ADA's "myths" are pragmatically infelicitous, we predicted that they not only will fail to improve people's knowledge about diabetes but will actually mislead people. To test this, we compared people's knowledge of diabetes in five experimental conditions. In the first condition, participants' baseline knowledge was assessed without any new information. In the second condition, we presented the ADA's myths alone and then assessed participants' beliefs. This condition addressed what visitors to the site infer from just reading the myths. In the third condition, we rephrased the myths as questions. For example, instead of presenting the myth, "People with diabetes can't eat sweets or chocolate," we transformed it into a question: "Can people with diabetes eat sweets or chocolate?" Questions do not have the same presuppositions as myths; listeners do not assume that the underlying statement must be false but rather expect to find out what the truth is. A comparison between this condition and the myths condition permits a controlled test of the effects of infelicitous statements by experts. To elaborate on

the myths, the ADA also provides explanations (what they call “facts”) after each myth. In two other conditions, we presented these explanations along with either the myths or reframed questions.

Method

Participants

A total of 250 participants living in the United States were recruited online from Amazon Mechanical Turk (MTurk). A sample size of 50 participants per condition was chosen on the basis of the results of an initial pilot study. All participants were compensated \$1.00, with an additional \$1.00 bonus given to participants in certain conditions. Two participants were excluded from data analyses for failure to pay attention, leaving 248 in the final sample (126 women, 122 men; mean age = 38.5 years).

Of those willing to respond, 5.7% reported being diabetic. Among nondiabetic participants, 13.4% indicated that they are prediabetic and 68% indicated that they have a close family member or friend who is diabetic. In total, 19% of participants have been diagnosed as either diabetic or prediabetic and 68% of participants have someone close to them with diabetes. Compared with nationwide U.S. demographics, participants in this sample are generally more educated (48% hold a bachelor's degree or higher) and have a relatively high income (median income between \$50,000 and \$70,000). Asian participants are overrepresented (8.1%), and Hispanic participants are underrepresented (3.6%) in the sample. Although MTurk participants may not be a representative U.S. sample, they are likely very similar to people who seek health information via the Internet (Huff & Tingley, 2015; Paolacci & Chandler, 2014).

Materials and design

Each participant was randomly assigned to one of five conditions (a between-subjects design): a no-intervention control condition or one of four different educational-intervention conditions. The educational conditions were based on the list of “diabetes myths” available on the ADA website (<http://www.diabetes.org>). The site lists 10 alleged myths about diabetes along with a brief explanation for each. Seven of these myths appear infelicitous and are reproduced as they appeared at the time of the study in Table 1.

We used the ADA's materials in a factorial design to produce four different educational interventions by (a) including or omitting the facts for each myth and (b) using the original myth language or rephrasing the myths into questions. We thereby created four separate interventions: myths only, questions only, myths plus

facts, and questions plus facts. In the myth conditions, participants were told that they would read some myths about diabetes. In the question conditions, participants were told they would read some common questions people have about diabetes. In all four conditions, participants were told that the information they would read came from the ADA.

To assess the impact of these interventions on participants' diabetes knowledge, we generated 10 true/false items testing knowledge about diabetes that we thought might be undermined by the ADA's myths. We therefore predicted that performance on these items would be reduced after reading the myths. For each item, participants were asked to indicate whether the statement in the question was “definitely true,” “probably true,” “probably false,” or “definitely false.” The correct answers were drawn from the ADA's websites. The statements that participants needed to judge and the ADA's sources for the correct answers are listed in Table 2.

Procedure

After being recruited from MTurk (via TurkPrime; Litman, Robinson, & Abberbock, 2016), participants were directed to a Qualtrics (Provo, UT) survey software website where the study was administered. Each participant was randomly assigned to read one of the four interventions or to a baseline control group with no intervention, for a total of five conditions. Participants assigned to the myths-plus-facts or questions-plus-facts conditions were informed that their participation would take additional time and that they would be compensated an additional \$1.00. After responding to demographic questions, participants advanced to their assigned reading. Once they completed the reading, they were given the diabetes knowledge questionnaire. Participants in the no-intervention control condition advanced directly to the diabetes knowledge questionnaire. Included in the diabetes knowledge questionnaire was an attention-check question that simply asked participants to enter “probably false.”

Results

Two participants were excluded from analyses because they failed the attention-check question, leaving 248 participants in the final analysis. First, we recoded participants' responses as correct and incorrect (binary coding). Figure 1 shows the proportion of correct responses participants gave in each condition.

We first compared each intervention condition with the baseline control condition, which assessed participants' prior knowledge without information from the website. As seen in Figure 1, participants in the baseline

Table 1. Infelicitous Myths and Their Accompanying Facts, as Listed on the American Diabetes Association's (2017a) Website

Myth	Fact
If you are overweight or obese, you will eventually develop type 2 diabetes.	Being overweight is a risk factor for developing this disease, but other risk factors such as family history, ethnicity and age also play a role. Unfortunately, too many people disregard the other risk factors for diabetes and think that weight is the only risk factor for type 2 diabetes. Most overweight people never develop type 2 diabetes, and many people with type 2 diabetes are at a normal weight or only moderately overweight.
Eating too much sugar causes diabetes.	The answer is not so simple. Type 1 diabetes is caused by genetics and unknown factors that trigger the onset of the disease; type 2 diabetes is caused by genetics and lifestyle factors. Being overweight does increase your risk for developing type 2 diabetes, and a diet high in calories from any source contributes to weight gain. Research has shown that drinking sugary drinks is linked to type 2 diabetes. The American Diabetes Association recommends that people should avoid intake of sugar-sweetened beverages to help prevent diabetes. Sugar-sweetened beverages include beverages like: regular soda, fruit punch, fruit drinks, energy drinks, sports drinks, sweet tea, [and] other sugary drinks. These will raise blood glucose and can provide several hundred calories in just one serving! See for yourself: Just one 12-ounce can of regular soda has about 150 calories and 40 grams of carbohydrate. This is the same amount of carbohydrate in 10 teaspoons of sugar! One cup of fruit punch and other sugary fruit drinks have about 100 calories (or more) and 30 grams of carbohydrate.
People with diabetes should eat special diabetic foods.	A healthy meal plan for people with diabetes is generally the same as a healthy eating for anyone – low in saturated and trans fat, moderate in salt and sugar, with meals based on lean protein, non-starchy vegetables, whole grains, healthy fats and fruit. “Diabetic” foods generally offer no special benefit. Most of them still raise blood glucose levels, are usually more expensive and can also have a laxative effect if they contain sugar alcohols.
If you have diabetes, you should only eat small amounts of starchy foods, such as bread, potatoes and pasta.	Starchy foods can be part of a healthy meal plan, but portion size is key. Whole grain breads, cereals, pasta, rice and starchy vegetables like potatoes, yams, peas and corn can be included in your meals and snacks. In addition to these starchy foods, fruits, beans, milk, yogurt, and sweets are also sources of carbohydrate that count in your meal plan. Wondering how much carbohydrate you can have? A place to start is about 45-60 grams of carbohydrate per meal. However, you may need more or less carbohydrate at meals depending on how you manage your diabetes. You and your health care team can figure out the right amount for you. Once you know how much carb to eat at a meal, choose your food and the portion size to match.
People with diabetes can't eat sweets or chocolate.	If eaten as part of a healthy meal plan, or combined with exercise, sweets and desserts can be eaten by people with diabetes. They are no more “off limits” to people with diabetes than they are to people without diabetes. The key to sweets is to have a very small portion and save them for special occasions so you focus your meal on more healthful foods.
People with diabetes are more likely to get colds and other illnesses.	You are no more likely to get a cold or another illness if you have diabetes. However, people with diabetes are advised to get flu shots. This is because any illness can make diabetes more difficult to control, and people with diabetes who do get the flu are more likely than others to go on to develop serious complications.
If you have type 2 diabetes and your doctor says you need to start using insulin, it means you're failing to take care of your diabetes properly.	For most people, type 2 diabetes is a progressive disease. When first diagnosed, many people with type 2 diabetes can keep their blood glucose at a healthy level with oral medications. But over time, the body gradually produces less and less of its own insulin, and eventually oral medications may not be enough to keep blood glucose levels normal. Using insulin to get blood glucose levels to a healthy level is a good thing, not a bad one.

Note: Quotations reflect the text posted on the American Diabetes Association's website on the day we accessed them: July 18, 2017.

condition scored highly (mean proportion correct = .89), indicating a solid grasp of these basic points. As predicted, there was a significant detriment to diabetes knowledge in the myths-only condition: Welch's $t(73) =$

5.27, $p < .001$, $d = 1.09$. In contrast, when the myths were rewritten as questions, in the questions-only condition, performance was as high as baseline, $t(98) = 0.73$, $p = .47$. Including the ADA's facts with the myths

Table 2. Diabetes Knowledge Questions Used in the Present Study and Answer Sources

Statement to judge as true or false	Correct answer
Being overweight significantly increases the likelihood that someone will become diabetic.	Being overweight raises your risk for type 2 diabetes, heart disease and stroke (ADA, 2017e).
Losing weight and improving your diet are among the most important things you can do to prevent and control diabetes.	Eating well to reach or stay at a healthy weight is one of the most important things you can do to lower your risk for type 2 diabetes (ADA, 2017d).
Even losing a modest amount of weight can help prevent or control diabetes.	You don't have to lose a lot of weight to improve your health—even losing 10-15 pounds can make a big difference (ADA, 2017e).
People with diabetes have a compromised immune system and are more likely to have serious infections.	Studies have shown that the white blood cells in people with both type 1 and type 2 diabetes don't function as well in attacking foreign bacteria (Tsai, 2016). People with uncontrolled type 1 or 2 diabetes are more susceptible to infections in the first place because of poor immune function (Neithcott, 2012).
People with diabetes are more likely to suffer serious consequences of a range of diseases including the flu, pneumonia, and periodontal disease.	People with diabetes are at a higher risk for gum disease and other dental problems. Diabetes may weaken your mouth and body's germ-fighting powers and high blood glucose levels can make gum disease worse (ADA, 2017c). People with diabetes are about three times more likely to die with flu and pneumonia (ADA, 2017b).
There is no special diet for people with diabetes, so most can continue eating their usual meals without making substantial changes. ^a	[The recommended diet is] low in saturated and trans fat, moderate in salt and sugar, with meals based on lean protein, non-starchy vegetables, whole grains, healthy fats and fruit (ADA, 2017a).
People with diabetes can include chocolate and other sweet desserts as part of their regular diet just like people without diabetes. ^a	The key to sweets is to have a very small portion and save them for special occasions (ADA, 2017a).
Reducing carbohydrate intake is important for controlling and preventing diabetes.	Counting carbohydrate can help you reach your blood glucose goals and prevent diabetes complications. . . . A general guideline is to have: 45-60 grams of carbohydrate at each meal; 15-20 grams of carbohydrate servings at each snack (ADA, 2009). Starchy foods can be part of a healthy meal plan, but portion size is key (ADA, 2017a).
Lifestyle changes can often let people control their diabetes without medication or with reduced medication.	You can prevent or delay type 2 diabetes by: losing weight, cutting back on calories and saturated fat, increasing your daily physical activity (ADA, 2012).
Many people can prevent or delay Type 2 diabetes by making healthy lifestyle choices.	You can prevent or delay type 2 diabetes by: losing weight, cutting back on calories and saturated fat, increasing your daily physical activity (ADA, 2012).

Note: Quotations reflect the text posted on the American Diabetes Association's (ADA's) website on the day we accessed them: July 18, 2017.
^aThe correct answer is "false."

or questions the participants read was not beneficial but instead resulted in a decrement in knowledge in both the myths-plus-facts condition, $t(108.3) = 5.97$, $p < .001$, $d = 1.12$, and in the questions-plus-facts condition, $t(88.7) = 6.20$, $p < .001$, $d = 1.26$.

A two-way analysis of variance (ANOVA) examined the effects of myth language and the presence of facts across all intervention conditions. There was a significant interaction between myth language and presence of facts, $F(1, 190) = 12.90$, $p < .001$, $\eta_p^2 = .064$. Neither

main effect was significant ($F_s < 1$). Consistent with the comparisons against baseline, these results suggest that both the presentation of myths and the corresponding facts reduced participants' knowledge of these basic diabetes facts. Comparing the myths-only and myths-plus-facts conditions revealed that the inclusion of facts alongside myths did not mitigate their negative effects on diabetes knowledge, $t(85.2) = -0.32$, $p = .75$. Moreover, comparing the questions condition with the questions-plus-facts condition confirmed that these

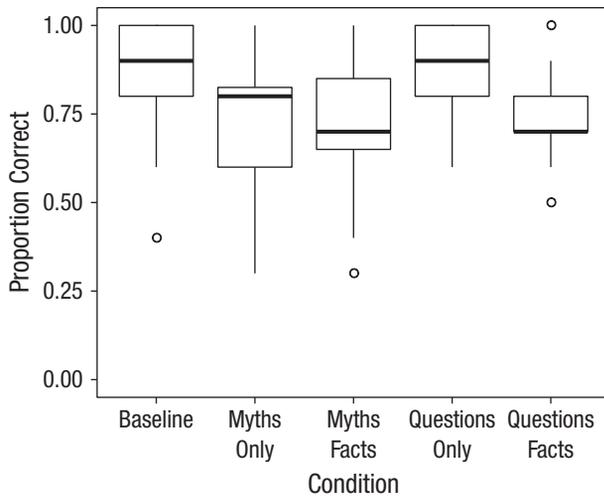


Fig. 1. Proportion of correct responses across the 10 items, separately for each of the five conditions. The box-and-whisker plots indicate the distribution of observed values, labeling the medians (bold lines), upper and lower quartile values (box tops and bottoms), and the maximum and minimum points within 1.5 times the interquartile range (whiskers). Observations lying outside this interval are plotted individually as points.

explanations actually led to confusion even when the myths were rephrased as questions, $t(86) = 5.46$, $p < .001$, $d = 1.15$.

Next, we examined participants' confidence in their correct and incorrect responses, recoded from their scale responses as either high or low. Figure 2 shows participants' average confidence across items in each condition.

Beneficial materials should have increased participants' confidence in their correct answers. Instead, we found that the ADA's myths undermined confidence in

the knowledge that they retained in the myths-only condition, where participants' confidence in their correct answers was reduced relative to the control condition, $t(85.6) = 4.67$, $p < .001$, $d = 0.96$. We then examined the effects on confidence for correct answers across all the conditions. A two-way ANOVA examined the effects of myth language and the presence of facts across all intervention conditions on participants' confidence in correct answers. Confidence in correct answers was lower for interventions without facts, $F(1, 190) = 13.31$, $p = .003$, $\eta_p^2 = .065$. There was no main effect of myths language, $F(1, 190) = 1.16$, $p = .28$, but there was a significant interaction between these two factors, $F(1, 190) = 5.158$, $p = .024$, $\eta_p^2 = .026$, reflecting the larger reduction in confidence observed in the myths-only condition.

These results suggest that the ADA's explanatory facts may have buffered against a loss of confidence in correct responses. However, this potential benefit is undercut by the facts' effect on incorrect answers. If the explanatory "facts" from the website had been truly beneficial, they *should have reduced* participants' confidence in their incorrect answers. Instead, the opposite occurred. Participants actually became more confident in their incorrect responses following the myths-plus-facts interventions, $t(72.6) = -4.71$, $p < .001$, $d = 1.02$, and questions-plus-facts interventions, $t(69.6) = -3.00$, $p = .004$, $d = 0.70$, compared with the baseline condition. Consistent with this, a two-way ANOVA across intervention conditions revealed a significant main effect of the presence of explanations, $F(1, 162) = 14.41$, $p < .001$, $\eta_p^2 = .082$, and no other significant effects ($ps > .20$). The presence of facts inflated confidence in

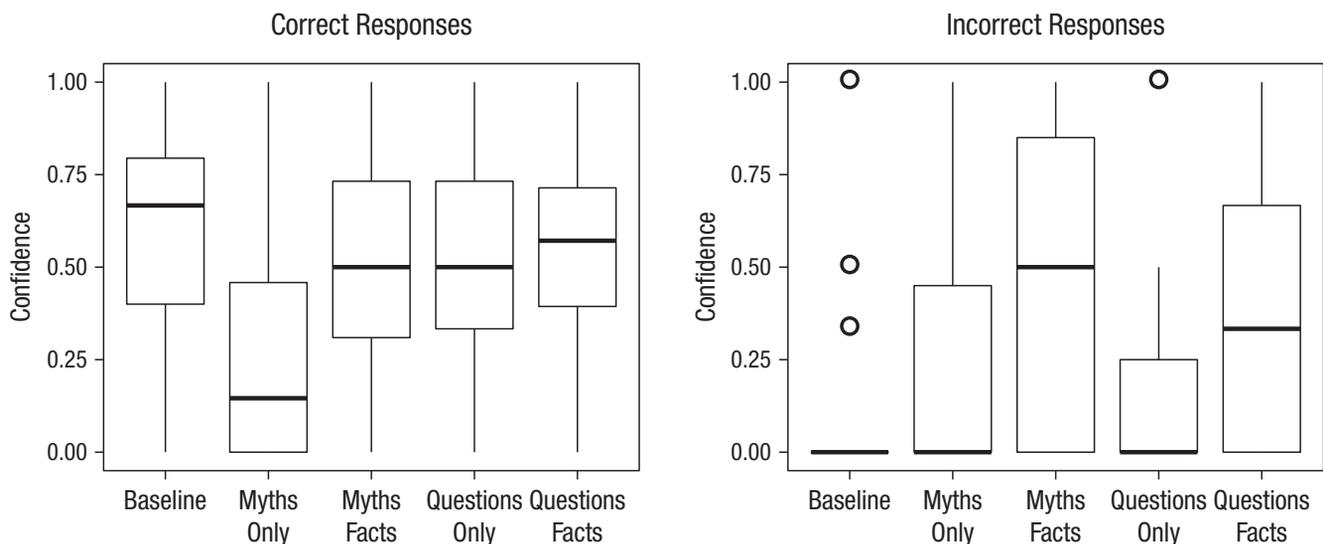


Fig. 2. Proportion of highly confident responses, separately for correct (left graph) and incorrect (right graph) responses. The box-and-whisker plots indicate the distribution of observed values, labeling the medians (bold lines), upper and lower quartile values (box tops and bottoms), and the maximum and minimum points within 1.5 times the interquartile range (whiskers). Observations lying outside this interval are plotted individually as points.

incorrect responses, indicating that the ADA's facts generated additional confusion about basic diabetes knowledge.

Discussion

After examining the myths presented on the ADA website, we concluded that many were pragmatically infelicitous and likely to confuse or mislead readers. According to the cooperative principles that govern communication, if an expert describes something as a myth, people will assume the myth is robustly false, but the ADA's myths were either at least partly true or only technically false. In a controlled experiment, we found that these "diabetes myths" misled participants, reducing the knowledge that the myths addressed. Participants who read the myths performed worse than participants who read nothing or who read the myths rephrased as questions that do not presuppose that the underlying statements are false.

These findings are particularly striking, given that the diabetes knowledge we tested was reasonably basic. At baseline, participants displayed a solid grasp of this material: For instance, 98% of participants in the baseline condition knew that "being overweight significantly increases the likelihood that someone will become diabetic," but after reading the diabetes myths, only 81% of participants answered correctly. On a more challenging item, "people with diabetes have a compromised immune system and are more likely to have serious infections" (true), 76% of participants in the baseline condition answered correctly, but only 38% in the myths conditions did. These findings illustrate the power of pragmatics: Failing to honor the cooperative principle resulted in unintentional paltering strong enough to disrupt even reasonably basic diabetes knowledge.

Coupled with the myths, the facts did nothing to improve participants' diabetes knowledge or to prevent them from being misled. Worse, when coupled with the myths rephrased as questions, the ADA's explanations themselves led to a reduction in diabetes knowledge. Although they contain technically true statements, these explanations misled readers toward drawing incorrect inferences. For instance, one fact says that "most overweight people never develop Type 2 diabetes, and many people with Type 2 diabetes are at a normal weight or only modestly overweight" (ADA, 2017a). This reinforces the incorrect inference that being overweight is not a significant risk factor for diabetes. Another fact claims that sweets and chocolate "are no more 'off limits' to people with diabetes than they are to people without diabetes" (ADA, 2017a). Since many people without diabetes frequently eat sweets and chocolate, this falsely implies that people with diabetes

could safely do so as well. The need to respect conversational pragmatics is not limited to the pragmatics of myths. Rather, unintentional paltering appears to have occurred in the explanations as well.

Genuine palterers communicate to deceive rather than to communicate truths. We suspect that the ADA, although well-intentioned, unintentionally paltered because it also had goals beyond conveying factually true statements: It seems to have underplayed the role of individuals' behavior in managing their diabetes and the need for serious lifestyle changes in an attempt to avoid stigmatizing or discouraging diabetic readers. Although health education should avoid blaming or stigmatizing people, it also needs to motivate them to make the changes necessary to improve their health outcomes (Funnell et al., 1991).

This delicate communicative balancing act applies well beyond diabetes education: It is one that health professionals must face when treating patients for any disease driven by lifestyle factors such as diet and exercise. To empower people to improve their health, health professionals must entrust them with the information they need to make decisions and take appropriate actions. It is possible to be straightforward about the challenges people face while still empowering them to improve their situations (e.g., see Brady et al., 2018). More broadly, we suggest that health communicators should be forthright in their communicative intentions rather than risk missteps that could lead unintentionally to paltering.

Further, the consequences of misleading statements—intentional or accidental—are not easily reversed. For example, presenting corrections or clarifications directly following misleading claims in prescription drug advertising can sometimes be successful (Aikin et al., 2017) but often fails to entirely reverse their misleading effects (Aikin et al., 2015; also see Chan, Jones, Hall Jamieson, & Albarracín, 2017). Worse, attempts to debunk myths and correct misconceptions can even backfire, leading to even more deeply entrenched misconceptions (Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012). Even when myths are debunked felicitously, these interventions may backfire if the repetition of the myths strengthens people's memory for the incorrect information (Schwarz, Sanna, Skurnik, & Yoon, 2007). Given these difficulties, it is clearly vital to avoid misinforming health consumers in the first place.

Our findings highlight the more general need to empirically validate educational materials and interventions. Many interventions are designed by thoughtful people using their best judgment, but common sense cannot always anticipate the nuanced and counterintuitive ways that human psychology works (Wilson, 2005, 2011). From his extensive review, Wilson (2011) concludes, "It is no

exaggeration to say that common sense interventions have prolonged stress, increased drug use, made people unhappy, and even hastened their death” (p. 15). Interventions must be based on evidence. Because health websites are readily available communications from trusted experts and widely used by people seeking advice, their authors should ensure that the messages they provide accomplish what they intend.

Action Editor

Rebecca Treiman served as action editor for this article.

Author Contributions

All authors contributed to the study design. D. Powell conducted the experiment and analyzed the data. All authors contributed to early drafts of the manuscript. D. Powell, M. Keil, and E. M. Markman wrote the final manuscript.

Declaration of Conflicting Interests

The author(s) declared that there were no conflicts of interest with respect to the authorship or the publication of this article.

Open Practices



All data and materials have been made publicly available via the Open Science Framework and can be accessed at https://osf.io/38apk/?view_only=66833d11e36f4af8a17e56d45ac5e379. The design and analysis plan for this experiment were not preregistered. The complete Open Practices Disclosure for this article can be found at <http://journals.sagepub.com/doi/suppl/10.1177/0956797617753393>. This article has received badges for Open Data and Open Materials. More information about the Open Practices badges can be found at <http://www.psychologicalscience.org/publications/badges>.

Note

1. We are grateful to Stephan Lewandowsky for directing our attention to this literature.

References

- Aikin, K. J., Betts, K. R., Donoghue, A. C. O., Rupert, D. J., Lee, P. K., Amoozegar, J. B., & Southwell, B. G. (2015). Correction of overstatement and omission in direct-to-consumer prescription drug advertising. *Journal of Communication, 65*, 596–618.
- Aikin, K. J., Southwell, B. G., Paquin, R. S., Rupert, D. J., O'Donoghue, A. C., Betts, K. R., & Lee, P. K. (2017). Correction of misleading information in prescription drug television advertising: The roles of advertisement similarity and time delay. *Research in Social and Administrative Pharmacy, 13*, 378–388.
- American Diabetes Association. (2009). *Toolkit No. 14: All about carbohydrate counting*. Retrieved from https://professional.diabetes.org/sites/professional.diabetes.org/files/media/All_About_Carbohydrate_Counting.pdf
- American Diabetes Association. (2012). *Toolkit No. 1: All about your risk for prediabetes, Type 2 diabetes, and heart disease*. Retrieved from https://professional.diabetes.org/sites/professional.diabetes.org/files/media/All_about_Risk_for_Prediabetes_T2D_and_Heart_Disease.pdf
- American Diabetes Association. (2017a). *Diabetes myths*. Retrieved from <http://www.diabetes.org/diabetes-basics/myths/>
- American Diabetes Association. (2017b). *Flu and pneumonia shots*. Retrieved from <http://www.diabetes.org/living-with-diabetes/treatment-and-care/medication/other-treatments/flu-and-pneumonia-shots.html>
- American Diabetes Association. (2017c). *Frequently asked questions*. Retrieved from <http://www.diabetes.org/living-with-diabetes/treatment-and-care/oral-health-and-hygiene/oral-health-faqs.html>
- American Diabetes Association. (2017d). *Healthy eating*. Retrieved from <http://www.diabetes.org/>
- American Diabetes Association. (2017e). *Overweight*. Retrieved from <http://www.diabetes.org/are-you-at-risk/lower-your-risk/overweight.html>
- Brady, S. T., Walton, G. M., Fotuhi, O., Gomez, E. M., Cohen, G. L., & Urstein, R. (2018). *A scarlet letter? Institutional messages can, but need not, induce shame and stigma*. Manuscript in preparation.
- Chan, M. S., Jones, C. R., Hall Jamieson, K., & Albarracín, D. (2017). Debunking: A meta-analysis of the psychological efficacy of messages countering misinformation. *Psychological Science, 28*, 1531–1546.
- Clark, E. V. (2004). Pragmatics and language acquisition. In L. R. Horn & G. Ward (Eds.), *Handbook of pragmatics* (pp. 562–577). Oxford, England: Blackwell.
- Clark, H. H. (1979). Responding to indirect speech acts. *Cognitive Psychology, 11*, 430–477.
- Clark, H. H. (1996). *Using language*. Cambridge, England: Cambridge University Press.
- Fox, S., & Duggan, M. (2013). *Health online 2013*. Washington, DC: Pew Internet & American Life Project.
- Funnell, M. M., Anderson, R. M., Arnold, M., Barr, P. A., Donnelly, M., Johnson, P. D., . . . White, N. H. (1991). Empowerment: An idea whose time has come in diabetes education. *The Diabetes Educator, 17*, 37–41.
- Goldman, A. I. (2001). Experts: Which ones should you trust? *Philosophy and Phenomenological Research, 63*, 85–110.
- Goodman, N. D., & Stuhlmüller, A. (2013). Knowledge and implicature: Modeling language understanding as social cognition. *Topics in Cognitive Sciences, 5*, 173–184.
- Grice, H. P. (1975). Logic and conversation. In P. Cole & J. L. Morgan (Eds.), *Syntax and semantics: Vol. 3. Speech acts* (pp. 41–58). New York, NY: Seminar.
- Hendriks, F., Kienhues, D., & Bromme, R. (2015). Measuring laypeople's trust in experts in a digital age: The Muenster Epistemic Trustworthiness Inventory (METI). *PLOS ONE, 10*(10), Article e0139309. doi:10.1371/journal.pone.0139309.

- Huff, C., & Tingley, D. (2015). "Who are these people?" Evaluating the demographic characteristics and political preferences of MTurk survey respondents. *Research & Politics*, 2(3). doi:10.1177/2053168015604648
- Lewandowsky, S., Ecker, U. K. H., Seifert, C. M., Schwarz, N., & Cook, J. (2012). Misinformation and its correction: Continued influence and successful debiasing. *Psychological Science in the Public Interest*, 13, 106–131.
- Litman, L., Robinson, J., & Abberbock, T. (2016). TurkPrime .com: A versatile crowdsourcing data acquisition platform for the behavioral sciences. *Behavior Research Methods*, 49, 433–442.
- Neithercott, T. (2012). Top tips for better foot care with diabetes. *Diabetes Forecast*. Retrieved from <http://www.diabetesforecast.org/2012/dec/top-tips-for-better-foot-care-with-diabetes.html>
- Nickerson, R. S. (1999). How we know—and sometimes misjudge—what others know: Imputing one's own knowledge to others. *Psychological Bulletin*, 125, 737–759.
- Paolacci, G., & Chandler, J. (2014). Inside the Turk: Understanding Mechanical Turk as a participant pool. *Current Directions in Psychological Science*, 23, 184–188.
- Rogers, T., Zeckhauser, R., Gino, F., Norton, M. I., & Schweitzer, M. E. (2017). Artful paltering: The risks and rewards of using truthful statements to mislead others. *Journal of Personality and Social Psychology*, 112, 456–473.
- Schauer, F., & Zeckhauser, R. (2009). Paltering. In B. Harrington (Ed.), *Deception: From ancient empires to Internet dating* (pp. 38–54). Stanford, CA: Stanford University Press.
- Schwarz, N., Sanna, L. J., Skurnik, I., & Yoon, C. (2007). Metacognitive experiences and the intricacies of setting people straight: Implications for debiasing and public information campaigns. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 39, 127–161). San Diego, CA: Academic Press.
- Silberg, W. M., Lundberg, G. D., & Musacchio, R. A. (1997). Assessing, controlling, and assuring the quality of medical information on the Internet: Caveant lector et viewer—Let the reader and viewer beware. *Journal of the American Medical Association*, 277, 1244–1245.
- Sperber, D., & Wilson, D. (2005). Pragmatics. In F. Jackson & M. Smith (Eds.), *The Oxford handbook of contemporary philosophy* (pp. 468–501). Oxford: Oxford University Press.
- Tsai, A. (2016). Important vaccines for people with diabetes. *Diabetes Forecast*. Retrieved from www.diabetesforecast.org/2016/sep-oct/important-vaccines-for-people.html
- Wilson, P., & Risk, A. (2002). How to find the good and avoid the bad or ugly: A short guide to tools for rating quality of health information on the Internet. *British Medical Journal*, 324, 598–600.
- Wilson, T. D. (2005). The message is the method: Celebrating and exporting the experimental approach. *Psychological Inquiry*, 16, 185–193.
- Wilson, T. D. (2011). *Redirect: The surprising new science of psychological change*. London, England: Penguin Books.