making the truth stick & the myths fade: lessons from cognitive psychology

Norbert Schwarz, Eryn Newman, & William Leach

abstract

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Back in 2000, flesh-eating bananas were on the loose and wreaking havoc, according to trending Internet reports. The story claimed that exported bananas contained necrotizing bacteria that could infect consumers after they had eaten the fruit. It was a hoax, but one with such legs of believability that the Centers for Disease Control and Prevention (CDC) set up a hotline to counter the misinformation and assure concerned fruit lovers that bananas were perfectly safe. The *Los Angeles Times* even ran an article explaining the

origin of the myth, noting that the hoax gained traction because a secretary from the University of California, Riverside's agricultural college forwarded the story to friends in an e-mail, seemingly giving it the imprimatur of the college. Paradoxically, the efforts by the CDC and the *Los Angeles Times* to dispel the myth actually increased some people's acceptance of it, presumably because these trustworthy sources had taken the time and effort to address the "problem." These corrections likely made the myth more familiar and probably helped the myth and its variants to persist for the entire decade.[1]

No one doubts that the Internet can spread misinformation, but when such falsehoods go beyond banana hoaxes and into the health care realm, they have the potential to do serious harm. For example, websites abound that mischaracterize the scientific evidence and misstate the safety of vaccines, such as that they cause infection that can be passed on;[2] that falsely claim a certain kind of diet can beat back cancer, such as claims that drinking red wine can prevent breast cancer;[3] and that overstate preliminary associations between certain foods and healthful outcomes, such as that eating grapefruit burns fat.[4] These erroneous statements can cause people to modify their behaviors—perhaps in a detrimental fashion—affecting what they eat and how they seek medical care.

The persistence of the necrotizing banana myth shows that correcting false beliefs is difficult and that correction attempts often fail because addressing misinformation actually gives it more airtime, increasing its familiarity and making it seem even more believable.[5] For instance, one of the most frequently used correction strategies, the myth-versus-fact format, can backfire because of repetition of the myth, leaving people all the more convinced that their erroneous beliefs are correct.[6] The simple repetition of a falsehood, even by a questionable source, can lead people to actually believe the lie. The psychological research showing how people determine whether something is likely to be true has important implications for health communication strategies and can help point to more efficient approaches to disseminating well-established truths in general. Overall, behavioral research shows that often the best strategy in the fight against misinformation is to paint a vivid and easily understood summation of the truthful message one wishes to impart instead of drawing further attention to false information.

The Big Five Questions We Ask to Evaluate Truth

When people encounter a claim, they tend to evaluate its truth by focusing on a limited number of criteria.[7] Most of the time, they ask themselves at least one of five questions (see Table 1).

1. Social Consensus: Do Others Believe It?

In 1954, the American social psychologist Leon Festinger theorized that when the truth is unclear, people often turn to social consensus as a gauge for what is likely to be correct.[8] After all, if many people believe a claim, then there is probably something to it. A fun example of this is played out on the popular TV show *Who Wants to Be a Millionaire?* where, when stumped for the correct answer to a question, the contestant may poll the audience to see if there is a consensus answer.

Overall, people are more confident in their beliefs if others share them,[9,10] trust their memories more if others remember an event the same way,[11,12] and are more inclined to believe scientific theories if a consensus among scientists exists.[13]

To verify a statement's social consensus, people may turn to opinion polls, databases, or other external resources. Alternatively, they may simply ask themselves how often they have heard this belief. Chances are that a person is more frequently exposed to widely shared beliefs than to beliefs that are held by few others, so frequency of exposure should be a good gauge for a belief's popularity. Unfortunately, people are bad at tracking how often they have heard something and from whom; instead, people rely on whether a message feels familiar. This reliance gives small but vocal groups a great advantage: The more often they repeat their message, the more familiar it feels, leaving the impression that many people share the opinion.

For example, Kimberlee Weaver of Virginia Polytechnic Institute and her colleagues showed study participants a group discussion regarding public space.[14] The discussion presented the opinion that open spaces are desirable because they provide the community with opportunities for outdoor recreation. Participants heard the opinion either once or thrice, with a crucial difference: In one condition, three different people offered the opinion, whereas in the other condition, the same person repeated the opinion three times. Not surprisingly, participants thought that the opinion had broader

Table 1. Five criteria people use for judging truth

Criteria	Analytic evaluation	Intuitive evaluation
Social consensus: Do others believe it?	Search databases, look for supporting statistics, or poll a group or audience.	Does it feel familiar?
Support: Is there much supporting evidence?	Look for corroborating evidence in peer-reviewed scientific articles or news reports, or use one's own memory.	Is the evidence easy to generate or recall?
Consistency: Is it compatible with what I believe?	Recall one's own general knowledge and assess the match or mismatch with new information.	Does it make me stumble? Is it difficult to process, or does it feel right?
Coherence: Does it tell a good story?	Do the elements of the story logically fit together?	Does the story flow smoothly?
Credibility: Does it come from a credible source?	Is the source an expert? Does the source have a competing interest?	Does this source seem familiar and trustworthy?

support when three speakers offered it than when only one speaker did. But hearing the same statement three times from the same person was almost as influential as hearing it from three separate speakers, proving that a single repetitive voice can sound like a chorus.[14,15] These findings also suggest that the frequent repetition of the same sound bite in TV news or ads may give the message a familiarity that makes viewers overestimate its popularity. This is also the case on social media, where the same message keeps showing up as friends and friends of friends like it and repost it, resulting in many exposures within a network.

2. Support: Is There Much Evidence to Substantiate It?

When a large body of evidence supports a position, people are likely to trust it and believe that it is true. They can find this evidence through a deliberate search by looking for evidence in peer-reviewed scientific articles, reading substantiated news reports, or even combing their own memories. But people can also take a less taxing, speedier approach by making a judgment on the basis of how easy it is to retrieve or obtain some pieces of evidence. After all, the more evidence exists, the easier it should be to think of some. Indeed, when recalling evidence feels difficult, people conclude that there is less of it, regardless of how much information they actually remember. In one 1993 study,[16] Fritz Strack and Sabine Stepper, then of the University of Mannheim in Germany, asked participants to recall five instances in

which they behaved very assertively. To induce a feeling of difficulty, some were asked to furrow their eyebrows, an expression often associated with difficult tasks. When later asked how assertive they are, those who had to furrow their eyebrows judged themselves to be less assertive than did those who did not have to furrow their brows. Even though both groups recalled five examples of their own assertive behavior, they arrived at different conclusions when recall felt difficult.

In fact, the feeling of difficulty can even override the implications of coming up with a larger number of examples. In another study,[17] participants recalled just a few or many examples of their own assertive behavior. Whereas participants reported that recalling a few examples was easy, they reported that recalling many examples was difficult. As a result, those who remembered more examples of their own assertiveness subsequently judged themselves to be less assertive than did those who had to recall only a few examples. The difficulty of bringing many examples to mind undermined the examples' influence.

These findings have important implications for correction strategies. From a rational perspective, thinking of many examples or arguments should be more persuasive than thinking of only a few. Hence, correction strategies often encourage people to think of reasons why an erroneous or potentially erroneous belief may not hold.[18] But the more people try to do so, the harder it feels, leaving them all the more convinced that their belief is correct.[6] For example, in

a study described in an article published in the *Journal of Experimental Psychology; Learning , Memory, and Cognition*, participants read a short description of a historic battle in Nepal.[19] Some read that the British army won the battle, and others read that the Nepal Gurkhas won the battle. Next, they had to think about how the battle could have resulted in a different outcome. Some had to list only two reasons for a different outcome, whereas others had to list 10. Although participants in the latter group came up with many more reasons than did those in the former group for why the battle could have had a different result, they nevertheless thought that an alternative outcome was less likely. Such findings illustrate why people are unlikely to believe evidence that they find difficult to retrieve or generate: A couple of arguments that readily pop into the head are more compelling than many arguments that were hard to think of. As a result, simple and memorable claims have an advantage over considerations of a more complicated notion or reality.

3. Consistency: Is It Compatible with What I Believe?

People are inclined to believe things that are consistent with their own beliefs and knowledge.[20–22] One obvious way to assess belief consistency would be to recall general knowledge and assess its match with new information. For example, if you heard someone claim that vaccinations cause autism, you may check that claim against what you already know about vaccinations. But again, reliance on one's feelings while thinking about the new information provides an easier route to assessing consistency. When something is inconsistent with existing beliefs, people tend to stumble—they take longer to read it and have trouble processing it.[23–25] Moreover, information that is inconsistent with one's beliefs produces a negative affective response, as shown in research on cognitive consistency since the 1950s.[26,27] Either of these experiences can signal that something does not feel right, which may prompt more critical thought and analysis.

In contrast, when the new information matches one's beliefs, processing is easy, and people tend to nod along. As an example, suppose you are asked, "How many animals of each kind did Moses take on the ark?" Most people answer "two" despite knowing that the biblical actor was Noah, not Moses[28]—the biblically themed question feels familiar, and people focus on

what they are asked about (how many?) rather than the background details (who). But when the question is printed in a difficult-to-read font that impedes easy processing, the words do not flow as smoothly. Now something seems to feel wrong, and more people notice the error embedded in the question.[29]

4. Coherence: Does It Tell a Good Story?

When details are presented as part of a narrative and individual elements fit together in a coherent frame, people are more likely to think it is true.[30,31] For instance, in a 1992 article about juror decision making, Nancy Pennington and Reid Hastie of the University of Colorado described experiments in which they asked volunteers to render verdicts after reading transcripts of cases consisting of several witness statements. The researchers varied the way information was presented: Either evidence was blocked so that all of the evidence (across several witnesses) regarding motive appeared as a summary, or it was presented more like a story, as witness narratives. The researchers found that people tended to believe the witnesses more when the same evidence was presented in the format of a coherent story.

In fact, when asked to remember a story, people often remember it in ways that make it more coherent, even filling in gaps and changing elements.[32] Maryanne Garry of the University of Wellington in New Zealand and her colleagues had volunteers watch a video of a woman making a sandwich. Although participants probably thought they saw the whole video, certain parts of the sandwich-making process were not shown. In a later memory test, participants confidently but falsely remembered events they had never witnessed in the video.

When a story feels coherent, people think that it makes more sense, and they enjoy reading it more.[33,34] Coherent stories flow more smoothly and are easier to process than incoherent stories with internal contradictions are.[30] There are several ways to increase the chances that readers will feel as though they are reading a coherent story. For example, in one line of studies, Jonathan Leavitt and Nicholas Christenfeld of the University of California, San Diego, gave some participants summary information that enabled them to anticipate a story's ending before they began to read it. After reading, those who had the extra information said they enjoyed the story more—having some prior context lent the story more coherence and made it easier to follow.

5. Credibility: Does It Come from a Credible Source?

Not surprisingly, people are more likely to accept information from a credible source than from a less credible one.[35,36] People evaluate the credibility of a source in many ways, such as by looking at the source's expertise, past statements, and likely motives. Alternatively, people can again consult their feelings about the source. When they do so, the apparent familiarity of the source looms large. Repeatedly seeing a face is enough to increase perceptions of honesty, sincerity, and general agreement with what that person says.[37,38] Even the ease of pronouncing the speaker's name influences credibility: When a person's name is easy to say, people are more likely to believe what they hear from the person.[39] Thus, a source can seem credible simply because the person feels familiar.

An exception to this rule is when people realize that the person seems familiar for a bad reason. For example, although the name Adolf Hitler is familiar and easy to pronounce, it does not lend credibility. Similarly, familiarity is unlikely to enhance the credibility of a source that is closely identified with a view that one strongly opposes, as might happen if the source is a politician from an opposing party. (See the sidebar *Political Messages from the Other Side*.) In these cases, familiarity with the source comes with additional information that serves as a warning signal and prompts closer scrutiny.

A source also seems more credible when the message is easy to process. For example, people are more likely to believe statements when they are made in a familiar and easy-to-understand accent rather than a difficult-to-understand one. In a 2010 study, for instance, Shin Lev-Ari and Boaz Keysar of the University of Chicago asked native speakers of American English to rate the veracity of trivia statements (such as "A giraffe can go longer without water than a camel can"). Volunteers rated statements recited by native English speakers more truthful than statements recited by speakers of accented English (whose native tongues included Polish, Turkish, Italian, and Korean).[40]

Summary of Truth Evaluation

Regardless of which truth criteria people draw on, easily processed information enjoys an advantage over information that is difficult to process: It feels more familiar, widely held, internally consistent, compatible with one's

Political Messages from the Other Side

Messages from the other side of a political debate rarely change partisan minds. The five truth tests discussed in the main text shed some light on why. To begin with, a message from a political opponent comes from a source that one has already identified as being associated with other interests, thus limiting its credibility. Moreover, its content is likely to be at odds with several of one's beliefs. Accordingly, thinking of many arguments that support a message from the other side is difficult, but coming up with many counterarguments is easy. In addition, opposing beliefs interfere with the processing of the information, so arguments will not seem to flow smoothly. This limits the perceived coherence of the message—it is just not a good story. Finally, one's own social network is unlikely to agree with other-side messages, thus limiting perceived social consensus as well.

As a result, messages that contradict a person's worldview and advocate opposing positions are unlikely to feel true and compelling to that person. This effect is not just evidence for the stubbornness of partisans but inherent in how people gauge truth: The dominant truth criteria inherently place beliefs of the other side at a disadvantage.

However, the other side's messages may gain in acceptance as time passes. For example, election campaigns expose all citizens to messages that are closely linked to partisan sources. Yet, as time goes by, the specific source will be forgotten, but the message may feel fluent and familiar when it is encountered after the campaign is over. That is, although one may reject a message from the other side at first, the message itself may seem more plausible later on, when the original source cannot be remembered. At that point, it may receive less scrutiny, and people may nod along because of the fluency resulting from previous encounters.

beliefs, and likely to have come from a credible source. In short, easy processing gives folks an intuitive feeling of believability and helps pass the Big Five major truth criteria tests outlined above.[7] Put simply, when thought flows smoothly, people tend to accept them without analyzing them too closely.

Alternatively, information that is difficult to process, feels unfamiliar, and makes people stumble is more likely to trigger critical analysis. When something feels wrong, people pay closer attention, look for more relevant information, and are willing to invest more effort into figuring out what is likely to be true. People are

also more likely to notice misleading questions and to critically examine their own beliefs.[7,29,41] If their critical analysis reveals something faulty, they will reject the message. But if the arguments hold up to scrutiny, a message that initially felt wrong may end up being persuasive. Nevertheless, in most cases, recipients will conclude that a message that feels wrong is not compelling. After all, at first glance, it did not meet the Big Five truth criteria discussed above.

Repeating False Information: A Bad Idea

The reviewed research sheds light on why some correction strategies may unintentionally cement the ideas they are trying to correct: When a correction attempt increases the ease with which the false claim can be processed, it also increases the odds that the false claim feels true when it is encountered again at a later point in time.

Repetition Increases Acceptance

The popular strategy of juxtaposing myths and facts necessarily involves a repetition of the false claims (or *myths*) in order to confront them with the facts. A growing number of studies show that this strategy can have unintended consequences: increasing the acceptance of false beliefs, spreading them to new segments of the population, and creating the perception that the false beliefs are widely shared. For example, in a 2005 study,[42] Ian Skurnik of the University of Toronto and his colleagues had participants view health-related statements. They told them which ones were true and which were false. When participants were tested immediately, they were able to recall this information from memory and could distinguish fact from fiction. But 3 days later, after their memories had a chance to fade, participants were more likely to think that any statement they had seen was true, whether it had been presented as true or false. Moreover, the acceptance of false statements increased with the number of warnings: Participants who had been told thrice that a statement was false were more likely to accept it as true than were those who had only been told once. Older participants were particularly vulnerable to this bias, presumably because their poorer memory made it harder to remember the details of what they had heard earlier.

> *Participants who had been told thrice that a statement was false were more likely to accept it as true than were those who had only been told once.*

Startlingly, it takes neither 3 days nor old age for such a paradoxical effect to occur. When undergraduates viewed a myths-and-facts flyer about the flu taken from the CDC website, they remembered some myths as facts after only 30 minutes.[6] Moreover, despite the flyer's promotion of the flu vaccine for their age group, participants who had read the myths-and-facts flyer reported lower intentions to get a flu vaccination than did participants who read only the facts. Worse, their reported intentions to get vaccinated were even lower than those of control participants who had not been exposed to any message about the flu. Apparently, realizing there might be some controversy about the issue was sufficient to undermine healthy intentions.

Repetition Spreads Misinformation to New Audiences

Myths typically take root in a small segment of the population, yet sometimes a myth breaks free and spreads to larger audiences. Ironically, the cause of the spread may be education campaigns. Although one may hope that the clear juxtaposition of myth and fact teaches the new audience what's right and wrong and inoculates them against later misinformation, this is not always the case. Instead, a well-intentioned information campaign may have the unfortunate effect of spreading false beliefs to a broader population.

The flesh-eating bananas rumor is an example. It moved from the fringes of the Internet to mainstream media after the CDC published its correction, which was picked up by the *Los Angeles Times*. After a while, people misremembered the sources of the correction as the sources of the false information itself, resulting in the impression that flesh-eating bananas are a real problem.[43] This retrospective attribution of a myth to a more credible source goes beyond the more common observation that messages initially seen as unconvincing because they come from an untrustworthy source can exert an influence later on, once their source is forgotten (a phenomenon known as the *sleeper effect*).[44,45]

Myth-Busting Can Convey Controversy

The popular myth-versus-fact formats also convey the impression that a significant number of people hold a different position or positions on an issue, or else there would be no reason to juxtapose myths and facts. So although the myth-versus-fact format may increase readership and engagement, it also can make a topic seem controversial and render the truth unclear. It tells people that either side could be right and can make a vocal minority seem larger than it is. People with limited expertise in an area are therefore likely to defer judgment and hesitate to take sides. This is particularly likely in scientific controversies, where the facts are difficult for the public to evaluate, as is the case with certain dietary approaches or health treatments[4] as well as for climate change.[13,46] The strategy of emphasizing controversy to engage readers is problematic when the actual facts have been well demonstrated, because it undermines the credibility of the facts and facilitates overestimates of the disagreement.

Anecdotes and Photographs Reinforce the Message

Anecdotes and photos serve several communicative goals—they capture attention, boost comprehension, and enhance the readability of associated text.[47–49] This makes the content easier to imagine, which can artificially boost its perceived truth.[50]

Anecdotes promote understanding because they link new information with prior knowledge and evoke vivid pictures in people's minds. For these reasons, they can have powerful effects on people's beliefs, leading them to ignore available statistics and scientific facts and use feelings and intuition as measures by which to evaluate information. In 2005, Angela Fagerlin, now at the University of Michigan, and her colleagues asked study volunteers to read a scenario about angina and to choose between bypass surgery and balloon angioplasty. They tended to overlook statistical data about the cure rates and instead choose the option that included anecdotes of those who underwent that procedure.[51]

Photos can produce similar effects, even when they have no probative value for the claim with which they are paired. In one experiment conducted by Eryn Newman of the University of Southern California and colleagues,[50] participants in New Zealand were shown

Photographs and Truthiness

Messages or claims that appear with photos catch the eye and generally are more easily understood and remembered. But adding a photo to claims can also add authority: People are more likely to think claims are true when they appear with a photo. Photos have this influence even when they provide no probative evidence about whether the claim is correct. For instance, people are more likely to believe the claim "Magnesium is the liquid metal inside a thermometer" when they see a photo of a thermometer, even one that provides no information regarding what metal can be found inside. (Most household glass thermometers use alcohol with red dye.) One reason why photos bring about this truthiness effect is that they make it easy for the reader to understand and imagine the claim. As a result, the claim feels fluent, familiar, and true.

Want to convince people that Nick Cave is dead or Nick Cave is alive? Easy. Just add his picture to either claim and voila! People believe.

(For more information on the experiment that investigated this scenario, see "Nonprobative Photographs (or Words) Inflate Truthiness," by E. J. Newman, M. Garry, D. M. Bernstein, J. Kantner, and D. S. Lindsay, 2012, *Psychonomic Bulletin & Review, 19,* 969–974.)

a picture of Nick Cave, a musician with the Australian band the Bad Seeds. When the photo accompanied the claim "Nick Cave is alive," people were more likely to agree that he is, indeed, alive than when no photo was presented. But the same photo also made people more likely to think that Nick Cave is dead when the photo accompanied the claim "Nick Cave is dead." (For the record, Nick Cave is alive as of this writing.)

Other more superficial communication approaches can produce similar effects. For example, rhyme can enhance memory for material by serving as a mnemonic device. But rhyme can also enhance the credibility of a message, even if it does not add any supporting evidence, by making words flow smoothly. In 2000, Mathew McGlone and Jessica Tofighbakhsh, then

of Lafayette College, asked study participants to evaluate sayings about human behavior and rate the truth of each saying. When the sayings rhymed (for example, "Woes unite foes"), people were more likely to think they were true representations of human conduct than when the sayings did not ("Woes unite enemies").[52]

In sum, anecdotes, pictures, and rhymes that contain little informational value are usually offered to engage readers. But they can nevertheless influence outcomes because they scaffold mental imagery, increase the ease with which a message is processed, produce a feeling of remembering, and systematically bias people to believe information whether it is true or false. For that reason, these communication devices can thwart the intended educational effect when they are presented with false information; we therefore discourage their use when written content contains myths or retractions.

Key Communication Strategies for Making Truths Stick and Myths Fade

So how can one correct false beliefs and increase public knowledge without propagating misinformation? The available research indicates that information is more likely to stick the more easily it can be processed and the more familiar it feels. Accordingly, the overarching goal for any communication strategy is to increase the fluency and familiarity of correct information and to decrease the fluency and familiarity of misinformation. Attempts at correcting misinformation—for example, using the myth-versus-fact setup—often fail because they center on the false information and unintentionally increase the ease with which false information can be processed when it is encountered again. Increasing the fluency and familiarity of true information can be achieved in three key ways.

The first way is through repetition—specifically, repetition of the correct information, not the misinformation one wants to undermine. For this reason, it is usually better to ignore false information than to repeat it. The popular myth-versus-fact format unwittingly reinforces the myths by repeating them, which makes them more influential once memory for the less familiar (and often more complex) facts fades. Focus rather on the facts, making them easy to understand and easy to remember. Instead of repeating various vaccination myths, for example, a more effective strategy is to document why vaccinations are safe and to emphasize

the scientific evidence that vaccines promote health and not harm.

> *Repeat correct information, not the misinformation one wants to undermine.*

Sometimes there are legal requirements to repeat false information in the context of a correction. In such cases, it is important to provide a fluent and coherent account of why the false information was presented to begin with. Consider the myth that autism is caused by childhood vaccines. A straightforward, easy-to-comprehend account of how the discovery of an alleged autism–vaccine link was completely made up and based on fraudulent data that cost the principal author his professional license will be more effective in addressing the misinformation than simply labeling the original myth *discredited,* as many news outlets routinely do.

Second, true information needs to be made as accessible as possible. Unfortunately, the truth is often more complicated than the myth, which usually involves considerable simplification. This puts the truth at a disadvantage because it is harder to process, understand, and remember. Presenting true information in ways that make processing it as easy as possible is therefore important. This requires clear, step-by-step exposition and the avoidance of jargon. Other more cosmetic changes can also make the truth easily digestible—choosing an easy-to-read font and ensuring the speaker's pronunciation is easy to understand can increase the fluency of a message. It also helps when the true information is accompanied by pictures that make the information easy to imagine or when key parts of the repeated message rhyme.

Finally, at the individual level, one of the most powerful strategies for avoiding misinformation is to know it is coming.[5] In one study, Stephan Lewandowsky of the University of Bristol and his colleagues asked participants to read a short description about a bus accident. After reading the passage, participants were told that some of the information was wrong. Despite the retractions, many participants held on to the inaccurate details that they learned from the initial description of the bus accident. That is, once the story was told, it was difficult to cleave out inaccuracies.

Two strategies can effectively prevent such misconceptions. One is to provide accurate details that present an alternative account of the misinformation, increasing the chances of people remembering the true information and allowing the false details to fade away. The second is to warn people before they read the passage about the influence of misinformation. Pre-exposure warnings can alert people to carefully scrutinize the content of information and ward off false details.[53–56]

Although research shows that warnings are more efficient when they are received prior to the false information, this is not where they are commonly placed. In the health domain, the law requires that labels claiming unsubstantiated health benefits must include a disclaimer: "This product is not intended to diagnose, treat, cure, or prevent any disease."[57] Such disclaimers commonly follow the unsubstantiated claims. Moving them to the top of a label or the beginning of radio advertisement is likely to enhance their impact.

In sum, the available research shows that highlighting false information and then attempting to unwind its effects is usually a bad idea. More promising communication strategies focus on the truth, making it easier to process and more handily remembered, which increases the chance that the correct message sticks.

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