Poison Parasite Defense: Turning Frequently-Encountered Duplicitous Mass Communications into Self-Negating Memory Retrieval Cues

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One sentence summary

A cognitive science-based procedure turns a more prominent rival's frequently presented communication into a memory retrieval cue for a less prominent communicator's counter-message, thereby enduringly undermining the rival's communication.

Abstract (151 words)

Democracy requires the free and full exchange of ideas. However, asymmetrical reach in mass communications due to disparities in communicators' resources or power can lead to imbalances in who is heard, regardless of the validity of their ideas. The Poison Parasite Defense (PPD) involves inserting a strong (poisonous) counter-message, just once, into a replica of a rival's communication. The rival's communication then serves as a "host" for the poisonous counter-message, carrying the message in its body and enabling its recall upon each subsequent exposure to the rival communication. This strategy harnesses associative memory to turn the rival's communication into a retrieval cue for its own self-negating counter-message. Using fictional and real political ads in single-day and multi-day studies, we show that the PPD procedure lastingly undermines a rival's communication by influencing voting preferences as well as the allocation of real political donations to actual candidates.

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In any well-functioning democracy, the free and full exchange of ideas has long been viewed as essential to the discovery of truth and, consequently, to a properly informed citizenry (*1-4*). However, powerful, wealthy, or unduly influential sources are often able to use their positions and assets to obtain unequal access to mass communications such as through paid advertising. As a result, the messages of less powerful and less prominent sources can become overwhelmed and functionally suppressed—for example, in a political election campaign (*5, 6*)—diminishing their influence for reasons unrelated to their validity or veracity. This process, in itself, inhibits the development of a well-informed citizenry; but an even greater threat emerges when advantaged communicators—those who are more powerful and more visible— spread deceptive or untruthful information that ultimately influences public opinion. The threat is particularly worrisome in the political arena, as citizens' political beliefs and choices shape their societies.

We propose a cognitive science-based strategy to counter this problem of asymmetric reach in mass communications. Even absent asymmetries, the persuasive effects of mass communications, such as print, television, radio, or online advertising, tend to decay rapidly as the messages become less salient in memory over time (*7, 8*). The rare evidence of persistence is believed to result from deeper information processing of a communication's message (*9, 10*). In memory science literature, retrieval cues are particularly noteworthy for their efficacy in facilitating recall and for the range of contexts in which they are effective (*11*). We present a new strategy, the Poison Parasite Defense (PPD), that leverages Tulving's "encoding specificity" mechanism to turn an advantaged rival's communication into a memory retrieval cue for a countervailing message, thereby strengthening persistence of persuasive effects even in the presence of asymmetrical reach. The encoding specificity principle suggests that memory recall is facilitated when information and conditions present when a memory is first encoded are also present at the time of retrieval (*12, 13*). By this process, associating a disadvantaged communicator's counter-message with a close replica of a rival's existing communication effectively embeds the counter-message into the rival's communication. Thereafter, the advantaged rival's existing communication functions as a retrieval cue for the counter-message. Thus, the advantaged rival's communication becomes a "host" for the disadvantaged communicator's countervailing messages, which are then recalled upon each subsequent exposure to the rival's communication.

In a series of online randomized studies, we test this possibility in the realm of political candidate advertising, where asymmetric reach in mass communications is common and consequential (*14-16*). Fixed print (or online) visual ads are a pervasive form of political mass communication. In this context, we show that the PPD procedure can be executed by inserting strong (poisonous) counter-messages, just once, into a close replica of a rival's communication, causing the counter-messages to then live (parasitically) in that communication. Specifically, we focus on the capability of the PPD to reduce asymmetric reach in its most troubling form—when the claims of the advantaged candidate are untruthful. There is an evolved human sensitivity and

aversion to deceptive presentations (*17, 18*), as well as a robust reaction against them (*19-21*). As such, offering evidence of a rival's duplicity and bringing it to mind each time the rival's communications are encountered produces an especially toxic kind of "poison" against the rival's message. Meanwhile, the PPD's parasitic component is the perceptual similarity between the advantaged rival's communication and the disadvantaged candidate's communication. This parasitic element results in recurring, cue-induced recall of the poisonous counter-messages whenever the political rival's communication is later encountered, mitigating the consequences of asymmetrical reach and making the counter-messages resistant to normal memory degrading processes (*22*). We hypothesized that the combination of poisonous and parasitic elements would reduce the persuasive effects of the rival's communication compared to presenting the same counter-messages in a traditional, visually independent form.

In study 1, which was pre-registered with the Open Science Foundation (OSF), we showed 602 Amazon Mechanical Turk (MTurk) workers a set of 10 fictional political ads, including one "pro" and one "response" ad for each of five different candidates. For one of these candidates, Walter McKinley, we developed two response ads. The first utilized the PPD procedure by overlaying counter-messages highlighting the duplicitous nature of the original ad on an exact visual replica of the rival's original ad (see Figure S1). The traditional response ad presented the same counter-messages as the PPD ad, but, as is conventionally done, in a different format and with a different visual aesthetic that provided no associative links to the rival's original ad. All participants were shown the original McKinley ad, and then were randomly assigned to see either the PPD ad, the traditional response ad, or a control ad for an unrelated candidate competing in a separate election. The PPD and traditional ads were from the same source, which ensured that any difference between conditions was not the result of source sleeper effects. The ads were interspersed with eight "decoy" ads for other fictional candidates, designed to both draw attention away from McKinley and to interfere with memory retrieval processes. After viewing all ten ads and answering a series of filler questions, participants were shown the McKinley ad (the "rival ad") a second time, and asked to rate his honesty and how likely they would be to vote for him if he were running in a primary election in their state.

Results from study 1 are shown in Figure 1. Exposure to the PPD ad significantly reduced participants' likelihood of voting for McKinley by 0.92 points (SE=0.10, *p*<.001) on a 5-point scale relative to the control ad, and by 0.41 points (SE=0.10, *p*<.001) relative to the traditional response ad. In a similar pattern, participants who saw the PPD ad rated McKinley as 0.47 points (SE=0.07, *p*<.001) less honest than participants in the control condition, and as 0.21 points (SE=0.07, *p*=.002) less honest than participants in the traditional response condition (see Figure S3). As shown in the supplement, honesty partially mediated the effect of assignment to the PPD condition on participants' likelihood of voting for McKinley (*z*=-6.25, *p*<.001; see Table S17). This suggests that, as predicted, the duplicity-focused counterclaims against McKinley's assertions were indeed toxic and more effective when presented in the PPD ad. In supplement

studies I and II, we replicated these results with variations in the frequency of exposure to both the rival McKinley ad and the traditional response ad.
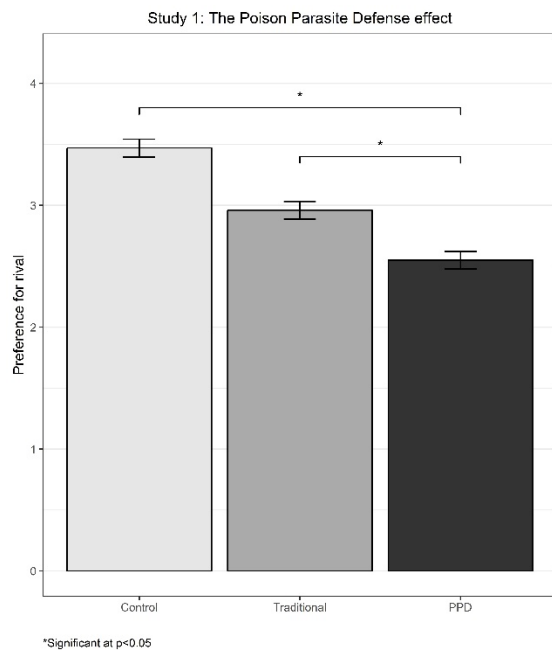

Fig. 1. Study 1 results. Participants' likelihood of voting for the rival candidate (McKinley) in Study 1 on a 1-5 scale where 5 represents "extremely likely" and 1 represents "extremely unlikely." Error bars reflect ±1 standard error. Top horizontal bars show regression-adjusted difference in means. *p<0.05.

Study 2, also pre-registered with OSF, extended the findings of study 1 by testing whether the effect of the PPD procedure is durable over time and in the presence of more significant memory interference. With a sample of 330 MTurk workers, we conducted five assessments of McKinley's candidacy over a span of 17 days. Demographics as measured on the first day and attrition across days are both balanced across conditions. In each assessment, the political ads were interspersed with news articles in order to more closely mimic the way in which people traditionally interact with political ads. Additionally, to ensure that we did not unintentionally provide associative links between the McKinley ad and the PPD or traditional response ads, participants viewed the McKinley ad on day one, and the PPD, traditional response, or control ads in the second assessment, which was administered on day 3. On all other days, participants were only shown the McKinley ad so that by the end of the fifth assessment, each had seen the McKinley ad (the "rival ad") nine times.

The results from day 3, the only day on which participants saw either the PPD, traditional response, or control ads, match those of study 1. As expected, the PPD procedure had a large and significant effect on likelihood of voting for and perceived honesty of McKinley relative to both the traditional response and the control ads. In the assessments on all later days, the effect of the PPD procedure remained significantly superior to the traditional response ad (see Figure 2). By

day 16, participants who had seen the PPD ad on day 3 were still 0.65 points (SE=0.11, $p<.001$) less likely to vote for McKinley, and rated him as 0.31 points less honest (SE=0.10, $p=.002$) relative to those who had seen the traditional response ad. Despite large frequency-of-exposure disparities and interference from time, the PPD procedure continued to undercut the rival ad throughout the two-week period. In contrast, the initial effectiveness of the traditional response ad waned relative to the control condition, in keeping with the characteristic decay of political ad effectiveness (*7, 8*) over time: on days 6, 9, and 16, there was no significant difference in likelihood of voting or perceived honesty for McKinley between participants who saw the control ad and those who had seen the traditional response ad by standard thresholds of statistical significance (all $p>.05$; see Figure S4). As in study 1, observers' perceived honesty of McKinley significantly mediated the effect of assignment to the PPD condition on participants' likelihood of voting for McKinley on each of days 3, 6, 9 and 16 (all $z<-4.2$, $p<.001$; see Table S18). These findings were replicated in supplement study III.
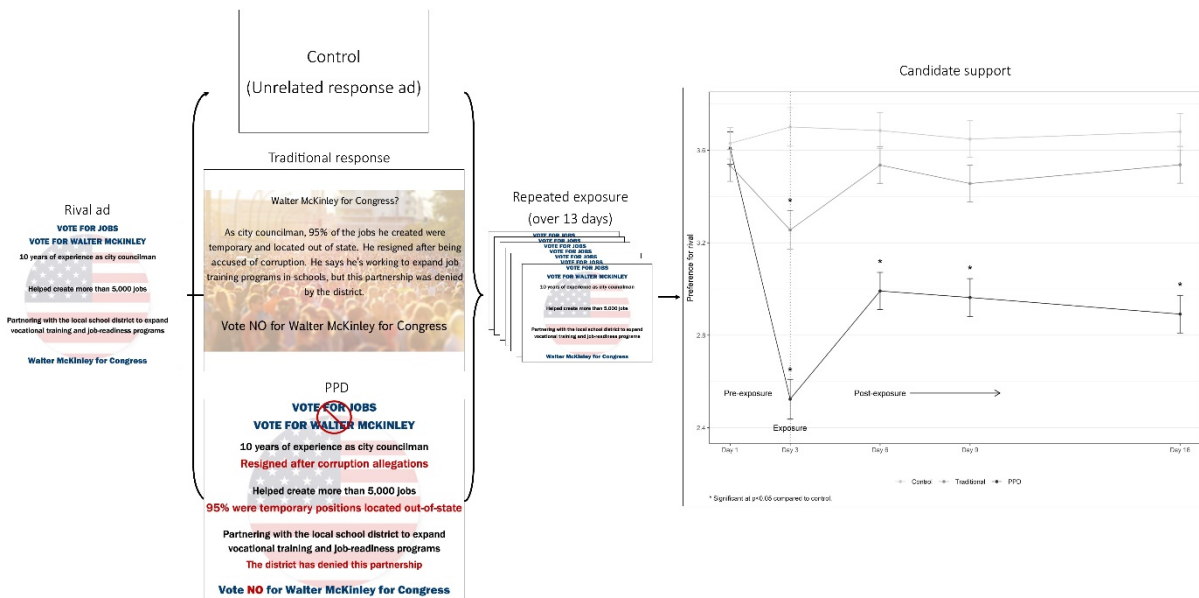

Fig. 2. Study 2 paradigm and results. All participants saw the rival ad on day 1; the control, traditional, or PPD ad on day 3; and then the rival ad six more times over 13 days. Graph represents participants' likelihood of voting (on a scale of 1-5) for the rival candidate (McKinley), measured after each subsequent exposure to the rival ad on days 6, 9, and 16. Error bars reflect ±1 standard error. *p<0.05.

Study 3 aimed to demonstrate that the PPD procedure can affect a consequential behavior in a real campaign. It involved the same paradigm as study 1, except we replaced the fictional ads with real political communications from an election that was active and on-going at the time of the study—the 2018 Democratic gubernatorial primary election in Michigan. The use of campaign-produced ads actually employed in the election allowed us to test the possibility that the superiority of the PPD versus the traditional response ads in studies 1 and 2 was not due to

the psychological properties of the PPD as we hypothesized but, instead, to an artifact within our procedures—perhaps we had constructed an inferior version of a traditional response ad, especially when compared to an ad created by professionals within a major campaign. Critically, we also added a consequential outcome measure that matters to political campaigns—political donations (*23*).

As the rival ad, we used a real print ad produced by Gretchen Whitmer's campaign, a 2018 Democratic gubernatorial candidate in Michigan. The traditional response ad was an actual ad produced by Shri Thanedar, one of her main Democratic opponents, and circulated during the campaign. We modified this response ad to create two new versions that used the PPD procedure: a "full" and a "tailored" PPD ad (*24*). In the "full" application of the PPD procedure, unaltered images of the "rival" Whitmer ad and of the traditional response ad were presented side-by-side in the same response ad (see Figure 3). In the "tailored" application, the "rival" Whitmer ad was modified using information extracted from the traditional response ad and inserted into the "rival" ad (see Figure S2). We tested the efficacy of these newly created PPD ads against that of the traditional response ad actually used in the campaign with a sample of 299 MTurk workers. This study used the same filler materials as study 2 so that the political ads were interspersed with news articles and related questions or activities. The study was conducted prior to the primary election, but excluded all MTurk workers in Michigan per IRB requirements so as not to influence the beliefs or opinions of prospective voters.
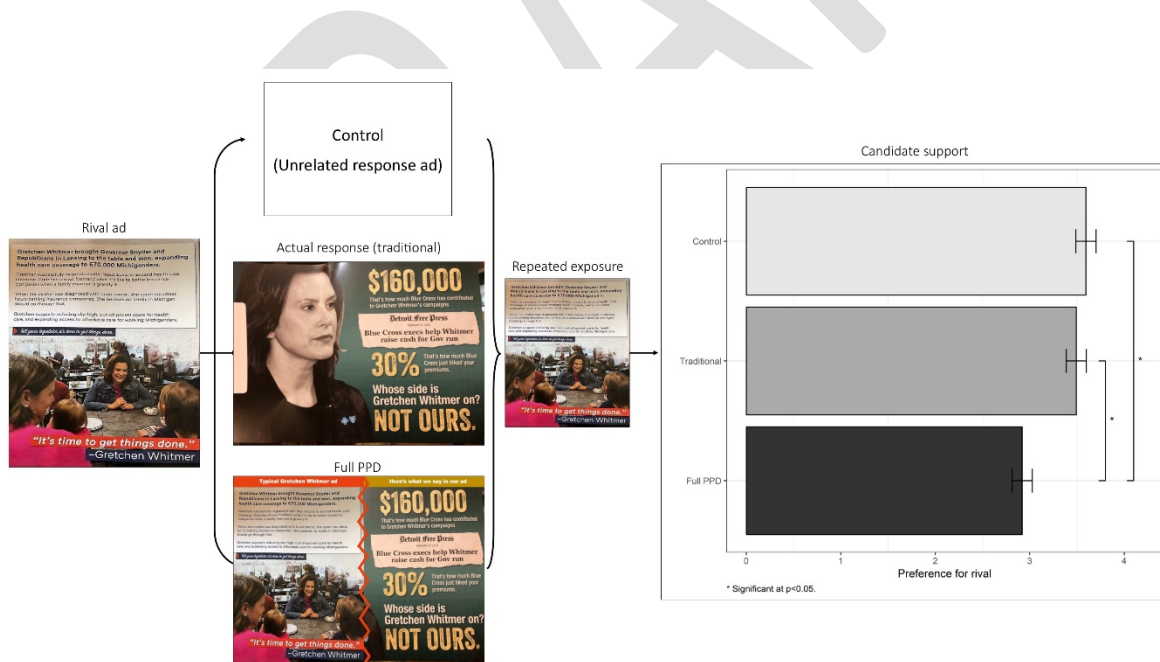

Fig. 3. Study 3 paradigm and results. All participants saw the rival ad first, followed by filler material and either the control, traditional, full PPD, or tailored PPD ad. The tailored PPD ad is shown in the supplement (see Figure S2). Graph represents participants' likelihood of voting (on a scale of 1-5) for the rival candidate (Whitmer) after the second exposure to the rival ad. Error bars reflect ±1 standard error. Vertical bars represent regression-adjusted difference in means. *p<0.05.

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Consistent with results from the previous studies, participants in both PPD conditions were significantly less likely to vote for Whitmer and rated her as significantly less honest than participants in the traditional response and control conditions (see Figure S5). Meanwhile, there was no significant difference in voting likelihood or perceived honesty between participants who saw the traditional response ad and those who saw the control ad, demonstrating that the mere presence of counterarguments is not necessarily sufficient to produce meaningful resistance to a rival ad. Additionally, there was no significant difference in effect between the two PPD conditions on either of the outcome measures, although the "full" PPD ad produced stronger directional results. Nevertheless, the relative equivalency of the PPD versions suggests that there are multiple ways to implement the PPD procedure effectively. In line with studies 1 and 2, perceived honesty was again a significant mediator of the effect of assignment to one of the PPD conditions on likelihood of voting for Whitmer (all $z<-2.6$, $p<.001$; see Table S19).

After the questions on voting and perceived honesty, participants were told that a $0.10 donation would be made on their behalf to either Gretchen Whitmer or Shri Thanedar, her opponent, and were asked to direct the donation to their preferred candidate. Fifty-seven percent of participants in the "full" PPD condition and 60% in the "tailored" PPD condition directed the donation to Whitmer's campaign (instead of Thanedar's), compared to 75% in the traditional response condition and 89% in the control condition (see Figure S5). The percentage of participants who directed the donation to Whitmer was significantly lower in both PPD conditions than in the traditional response condition (both $\chi^2(1)>3.4$, $p<.10$) and the control condition (both $\chi^2(1)>5.0$, $p<.05$). Thus, not only does the PPD procedure reduce the viability of a rival's message, it also influences related behavior in the form of financial support for that candidate. These findings extend both the applicability and utility of the PPD procedure, especially for less prominent political candidates whose campaign messages may be relatively infrequently seen.

These three studies establish the superiority of the PPD procedure relative to a traditional response ad that offers identical counterclaims without providing associative links to the rival ad. We hypothesized that the PPD procedure would be effective against a more frequently seen rival ad because the parasitic component of the procedure spurs recall of the embedded counter-messages each time the rival ad is subsequently viewed, thereby blocking memory decay. In study 4 (N=267), we tested this mechanism directly by adding two questions to measure participants' recall of the counter-messages. Using the McKinley materials, we followed the same procedures as study 3 (see supplement) and asked the same outcome questions regarding voting and perceived honesty. However, instead of the donation measure, we asked all participants (a) how well they remembered any specific arguments they may have seen against McKinley on a scale of 1 to 5, and (b) to identify the specific anti-McKinley claims they saw from a list of 9 possible choices.

Replicating the effects seen in previous studies, exposure to the PPD advertisement reduced participants' likelihood of voting for McKinley by 0.45 points (SE=0.13, p=.001) and

0.68 points (SE=0.13, *p*<.001) relative to the traditional response and control ads, respectively. Similarly, those who were shown the PPD ad rated McKinley as 0.35 points (SE=0.11, *p*=.001) less honest than those who saw the traditional response ad, and 0.47 points (SE=0.10, *p*<.001) less honest than those who were shown the control ad. On the first recall measure, participants were asked how clearly they recalled the specifics of any arguments they may have seen against McKinley's claims on a scale of 1 to 5, from "not at all clearly" to "extremely clearly." Twenty-nine percent of participants in the PPD condition reported that they recalled seeing specific arguments against McKinley's claims "extremely clearly," versus 15% of participants in the traditional response condition ($\chi^2(1)$=4.73, *p*=.03) and 4.6% of participants in the control condition ($\chi^2(1)$=14.06, *p*<.001). When asked to identify which anti-McKinley messages they saw—from a list of eight possible choices—24% of participants in the PPD condition correctly identified all three counter-messages, compared to only 15% of participants in the traditional response condition ($\chi^2(1)$=2.96, *p*=.09) and 0% of participants in the control condition. The effect of assignment to the PPD condition on perceived honesty was mediated by participants' recall of the specific counter-messages against McKinley (*z*=-4.66, *p*<.001). In turn, honesty mediated the effect of assignment to the PPD condition on participants' likelihood of voting for McKinley (*z*=-4.21, *p*<.001). This supports our hypothesis that the PPD procedure causes later encounters with the advantaged rival's ad to spur recall of the counter-messages, which subsequently undermines the advantaged rival's favorability.

We showed that the PPD procedure leverages associative memory and cue-based recall to structure one-time communications that lastingly undermine the claims of a more frequently encountered disputable rival and that consequently undermine support for that rival. Across the four studies reported here (and three additional studies in the supplement), the PPD procedure reduced participants' preference for the rival candidate and their perceptions of his or her honesty by using retrieval cues to activate their memories of counter-messages to the rival's message. While these studies examined only fixed visual ads because they readily lent themselves to experimental control, the underlying cognitive mechanisms of the PPD procedure likely apply to other repeated communications, from a dissembling or disputable rival's repeated phraseology to such a rival's repeated imagery across mass communication modalities. The PPD procedure's effectiveness represents an important step towards redressing the commonly imbalanced information environment in which legitimate critiques by disadvantaged voices can be drowned out by more advantaged communicators.

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23. All donations that were allocated as part of this study were made to the candidates' actual campaigns prior to the primary election.

24. Neither of the PPD ads was sent by the campaign; they were created solely for the purpose of this study.

25. "HIT" stands for "human intelligence task." Each survey or task completed by a worker on MTurk is called a HIT.

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List of supplementary materials:

Materials and Methods
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