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Disfluency attenuates the reception of pseudoprofound and postmodernist bullshit

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ABSTRACT
Four studies explore the role of perceptual fluency in attenuating bullshit receptivity, or the tendency for individuals to rate otherwise meaningless statements as "profound". Across four studies, we presented participants with a sample of pseudoprofound bullshit statements in either a fluent or disfluent font and found that overall, disfluency attenuated bullshit receptivity while also finding little evidence that this effect was moderated by cognitive thinking style. In all studies, we measured participants' cognitive reflection, need for cognition, faith in intuition, and superstitious beliefs. Superstition strongly predicted bullshit receptivity regardless of fluency. Inconclusive results were found for the remaining scales. Potential links for the role of perceptual disfluency in promoting analytic thinking are discussed.

A body without organs is not an empty body stripped of organs, but a body upon which that which serves as organs (wolves, wolf eyes, wolf jaws?) is distributed according to crowd phenomena, in Brownian motion, in the form of molecular multiplicities. The desert is populous. Thus the body without organs is opposed less to organs as such than to the organization of the organs insofar as it composes an organism. The body without organs is not a dead body but a living body all the more alive and teeming once it has blown apart the organism and its organization.—Deleuze and Guattari (1988, pp. 34)

Making sense of an unclear stimulus is tricky. "Colorless green ideas sleep furiously" is famously supposed to be a semantically uninterpretable string of category mistakes but one can nonetheless give it meaning. Much of what is understood as deep wisdom similarly proceeds *via* paradoxical unclarity. Laozi writes, "Great straightness seems crooked; Great skillfulness seems clumsy; Great speech seems to stammer". Taken on their own, such paradoxes have the air of "sham profundity" (Schwitzgebel, 2007).

Here, we aim to see whether one can detect this "sham profundity" by seeing how people respond to hard-to-parse pseudoprofound bullshit. Recent research in social and cognitive psychology has sparked interest in how people comprehend and respond to bullshit (e.g., Pennycook et al., 2015), defined as any statement constructed without concern for the truth (Frankfurt, 2005). This is in contrast to a lie, which is often constructed with the truth as a referent. In our modern informational environment, the ability to detect bullshit is imperative, given the rampant spread of information, disinformation, and misinformation (Quilty-Dunn & Mandelbaum 2018; Vosoughi et al., 2018)—the latter of which regularly meets the definition of bullshit (Frankfurt, 2005).

Theoretical framework

Dual process theory argues that human beings have two broadly different types of information processing: an intuitive, automatic system (Type 1) and a deliberative, controlled system (Type 2; Evans & Stanovich, 2013; Kahneman, 2011). Of these two, Type 1 is the least cognitively demanding, relying on a person's intuition, and consequently conserving mental resources (e.g., Evans & Stanovich, 2013; Stanovich & Toplak, 2012). Conversely, Type 2 is more rational, controlled, and cognitively demanding (Evans, 2003; Evans & Stanovich, 2013; cf. Mandelbaum 2016). Prior research has found that of these two systems, Type 2 reasoning shares a stronger relationship with general intelligence (Evans, 2003; Kokis et al., 2002; Stanovich & Toplak, 2012; Stanovich & West, 2000; West & Stanovich, 2003).

Recent work has linked Type 1 and 2 reasoning to *reflexive* versus *reflective* open-mindedness, respectively (Pennycook et al., 2015). Much like Type 1 processing, reflexive open-mindedness is by default receptive to information without much processing. Reflective open-mindedness instead appears to engage Type 2 processing by searching for more information to reach a more rational, critically analyzed conclusion (Pennycook et al., 2015). Unsurprisingly, both reflexive and reflective open-mindedness share a strong, negative relationship (Baron et al., 2015). In the present experiments, we use this dual-process as a performance-based metric for Type 1 or Type 2 reasoning, along with a number of self-report measures previously shown to correspond to thinking styles and bullshit receptivity. These are summarized below.

Bullshit receptivity

Seminal research into bullshit receptivity has explored people's tendency to evaluate bullshit as "profound" (Pennycook et al., 2015). In their original study, Pennycook and colleagues presented participants with computer-generated statements that retained a valid syntactic structure but were absent any clear semantic meaning. Their results showed that bullshit receptivity was negatively correlated with individual differences in intelligence (i.e., verbal intelligence, numerical literacy, ability to override heuristic thinking) and positively correlated with measures of cognitive reflexivity (i.e., faith in intuition, ontological confusion, religiosity, paranormal beliefs). Other research has explored how bullshit receptivity is related to a number of other individual differences, including political orientation (e.g., Evans et al., 2020; Gligorić & Vilotijević, 2020a; Nilsson et al., 2019; Pfattheicher & Schindler, 2016; Sterling et al., 2016), personality (i.e., openness/intellect; Bainbridge et al., 2019; see also DeYoung et al., 2012), context (i.e., messenger qualities; Gligorić & Vilotijević, 2020b), cognitive abilities and biases (i.e., Čavojová et al., 2019), illusory pattern perception (Walker et al., 2019), and has even found bullshit receptivity to negatively predict prosocial behavior (Erlandsson et al., 2018).

Several mechanisms have been proposed as to why people find meaning in otherwise vacuous statements. Pennycook et al. (2015) reasoned that some individuals tend to be more accepting of information without deliberation, a hallmark of chronic reflexive open-mindedness. These individuals may thus be more receptive to bullshit (Nilsson et al., 2019; Pennycook et al., 2015; Pennycook & Rand, 2020). Other proposed mechanisms involve belief-default models, where people need to believe a proposition before it can be rejected (e.g., Asp & Tranel 2013; Gilbert, 1991; Gilbert et al., 1993; Mandelbaum 2014). On these "Spinozan" theories, all people accept information automatically, but the effortful rejection process allows for a wide range of individual differences to influence outcomes. Those less willing or able to put in the cognitive effort will be less inclined to reject information, thus more susceptible to accepting information. Put in dual process theory terms, Spinozan theories posit Type 1 processing produces belief acceptance while Type 2 processing is needed for belief rejection. Consequently, individuals that are inapt to engage in Type 2 processing are likely more receptive to bullshit than those who have an easier time accessing Type 2 processing.

Several individual difference scales have been used to study the reception of pseudoprofound bullshit, thus assessing the degree of Type 1 versus Type 2 processing used in comprehending these statements. To illustrate, the cognitive reflection (CRT; Frederick, 2005) test has been found to be a reliable predictor of bullshit receptivity (e.g., Pennycook et al., 2015; Sterling et al., 2016), such that higher scores on the CRT predict decreases in bullshit receptivity. The CRT is taken to be a reliable assessment of an individual's engagement in Type 1 versus Type 2

processing because the items contained in the test are designed to elicit an intuitive answer that is incorrect. To arrive at the correct solution, an individual must overcome their initial intuitive response and thus engage in a degree of Type 2 processing. In addition to the CRT, need for cognition (NFC; Caccioppo & Petty, 1982) has been tested as a correlate of bullshit receptivity (Pennycook et al., 2015; Sterling et al., 2016), as this scale assesses an individual's self-rated enjoyment of thinking. While the NFC has often been found to be a reliable predictor of cognitive abilities (e.g., Caccioppo et al., 1996; Caccioppo & Petty, 1982; Haddock et al., 2008; Sicilia et al., 2005; Tsfati & Cappella, 2005), it has had mixed results in predicting bullshit receptivity (Pennycook et al., 2015; Sterling et al., 2016). This may be due to the way that the scale is designed (i.e., as self-report), such that people may *believe* they are analytic thinkers, even if they in fact are not (Pennycook et al., 2017). Faith in intuition (FI; Epstein et al., 1992) has also been used to predict bullshit receptivity, with more success than the NFC (Pennycook et al., 2015; Sterling et al., 2016). FI is broadly construed as one's degree of trust in one's intuitive impressions, and thus overlaps to a degree with reflexive open-mindedness (though see Pennycook & Rand, 2020). The superstitious beliefs questionnaire (SBQ; Griffiths et al., 2019) measures one's belief in unverifiable claims. This scale is distinguished from other measures of superstition (e.g., Tobacyk, 2004), such that the claims participants are asked to rate are commonly held beliefs that imply impossible causal relationships. Prior work has found that individuals endorsing superstitions and paranormal beliefs tend to have a lower reliance on reflective open-mindedness (Pennycook et al., 2012), suggesting interesting results when applied to research exploring bullshit receptivity. Taken together, these results suggest that bullshit receptivity shares an intimate relationship with cognitive thinking styles. Individuals who are more reflexively open-minded—or less reliant on Type 2 processing—are more likely to endorse bullshit as profound than those who are more reflectively open-minded (i.e., are more reliant on Type 2 processing).

Processing fluency

Processing fluency is defined as the ease with which a stimulus can be encoded and understood (e.g., Song & Schwarz, 2008). Classic research has found that fluent stimuli typically enjoy higher ratings of belief and familiarity relative to disfluent stimuli (Whittlesea et al., 1990), which in turn have been typically rated as less true or believable. Fluency can be manipulated in a number of ways, including figure-ground contrast, exposure time differences, and font readability (Kelley & Rhodes, 2002; Reber et al., 2004; Reber & Schwarz, 1999; Schwarz, 2004; Song & Schwarz, 2008; Whittlesea et al., 1990). Song and Schwarz (2008) presented participants with fluent and disfluent statements (*via* a font manipulation) to explore

the effect of fluency on the Moses illusion, which tests whether people can recognize erroneous details in statements (e.g., asking how many of each type of animal *Moses* included on the Ark, instead of *Noah*). Their results showed that disfluency led to an increased number of correct responses compared to fluency, suggesting that disfluency promotes error detection and potentially analytic thinking more generally.

Despite the above-cited evidence in favor of the disfluency–analytic processing link, there is also a body of evidence that casts doubt on disfluency's ability to promote analytic thinking. Specifically, while research has found that disfluency can reduce self-reported religiosity (Gervais & Norenzayan, 2012), attempts to replicate this study have failed (Sanchez et al., 2017), suggesting possible alternative effects (see also Yonker et al., 2016). Additional work has found only limited evidence that disfluency promotes reasoning (e.g., Thompson et al., 2013), though attempts to replicate these limited circumstances have also been unsuccessful (Meyer et al., 2015). However, the failed replications do not completely refute the possible link between disfluency and analytic thinking in verbal reasoning tasks. For one, Sanchez et al. (2017) attempted to manipulate analytic thinking using images from either *The Thinker* or *Discobolus* in a direct replication of Gervais & Norenayan's (2012) Study 2, making this a study on the effectiveness of priming rather than fluency. A similar comment applies to the attempt by Yonker et al. (2016), who also found no compelling evidence for a link between primed analytic thinking and religiosity. Meyer et al. (2015) provide more compelling evidence against the disfluency–analytic thinking link, finding no effect for disfluent fonts on CRT scores in a large-scale replication attempt. This suggests that disfluency may not produce any real benefits for numerical applications of analytic thinking, though it does not provide supporting or refuting evidence for disfluency's role in helping people parse verbal statements, specifically those designed to trick readers into perceiving depth (i.e., bullshit).

A final perspective on the role of processing fluency is that fluency promotes the belief that a statement is true, independent of a statement's validity. Past research has focused on this idea, finding that belief stems from fluent processing: the more easily one can process a statement, the more they are receptive to that statement's content (e.g., Reber et al., 2004; Reber & Unkelbach, 2010; Unkelbach & Greifeneder, 2018). Prior work has shown that perceptual fluency can be used to trick readers into rating stimuli as more likable (Iyengar & Lepper, 2000) and even more beautiful (Reber et al., 2004), suggesting that such a manipulation can be used to increase receptivity to ambiguous statements (i.e., bullshit) by relying on the positive nature with which fluent stimuli are received (Brashier & Marsh, 2020). Assuming that truth judgments and perceptual fluency are positively correlated, it is possible that participants will be more receptive to fluent bullshit statements, finding them more profound and meaningful, than disfluent statements, owing to the role of high perceptual fluency in promoting belief.

The present research

The present studies were designed to address this issue. The primary goal of this research was to explore the effect of disfluency on bullshit receptivity while considering moderation by cognitive reflectivity (CRT performance) and individual differences (NFC, FI, SBQ) associated with analytic or heuristic thinking. Additionally, we sought a new approach to the analysis of bullshit statements. Prior studies on bullshit receptivity have treated this measure like a scale, such that they selected a number of statements from bullshit-generating websites, had participants rate these on profundity, then correlated this measure with other individual difference measures of intelligence, belief, and cognitive thinking styles (e.g., Bainbridge et al., 2019; Čavojová et al., 2019; Erlandsson et al., 2018; Evans et al., 2020; Gligorić & Vilotijević, 2020a; 2020b; Nilsson et al., 2019; Pfattheicher & Schindler, 2016; Sterling et al., 2016; Walker et al., 2019). Given that this involves taking a random assortment of statements (cf. items from a defined scale), this analysis method ignores the variance associated with the random sample of bullshit items (see Judd et al., 2012, 2017; Westfall et al., 2015). ; This is important, especially in light of Dalton's (2016) argument that some statements could still be seen as more profound than others, regardless of the fact that the statements were randomly generated. To address this, we included these pseudoprofound statements as a random effect in a linear mixed effects model (LMM) to determine how much variance these statements accounted for in participants' profundity ratings. Moreover, we also expanded the ratings used for these statements. Rather than measuring profundity alone, we had participants rate each statement on a four-item receptivity index that included profundity, believability, understandability, and meaning, collapsing these ratings into a mean receptivity score to capture a multidimensional nature of bullshit receptivity.

In Study 1, we presented participants with a set of 60 pseudoprofound bullshit items taken from the same website used by Pennycook et al. (2015). In Study 2, we sought to expand our test of bullshit receptivity by replacing the pseudoprofound statements with five-to-six sentence paragraphs from randomly generated essays based on postmodernist texts. This was done to explore whether the effect of the fluency manipulation on typical pseudoprofound statements (e.g., as used in Pennycook, et al., 2015) would replicate using different and longer forms of bullshit, and whether length and complexity of the statements led to different effects for participants with different cognitive thinking styles. In Study 3, we ran a direct replication of Study 1 but also included a measure of participant reading time to determine whether participants were actually attending more to the disfluent than to the fluent statements to further support our argument in favor of disfluency leading to increased analytical processing. In Study 4, we include a sample of non-bullshit inspirational quotes to explore whether disfluency affects receptivity to bullshit uniquely or works similarly for both bullshit and non-bullshit statements.

In all studies, we assessed participants' rational versus deliberative thinking style using the CRT, their enjoyment of thinking using the NFC, their reliance on gut intuitions using the FI, and their superstitious beliefs using the superstitious beliefs questionnaire (SBQ; Griffiths et al., 2019). This afforded us a multidimensional view of the cognitive mechanisms involved in bullshit receptivity, as well as a test of whether these differences moderated our hypothesized effect of fluency.

Our main prediction was that bullshit receptivity would be higher for fluent statements than for disfluent statements. We further predicted that higher scores on the CRT would predict decreased bullshit receptivity while higher scores on the FI and SBQ would predict increased bullshit receptivity. We were agnostic on the effect of NFC scores, given this measure's unreliability in predicting bullshit receptivity, but included it here to hew closely with past studies on bullshit receptivity (Pennycook et al., 2015) and to clarify the direction and strength of the NFC–receptivity connection.

Study 1

Study 1 was designed to extend the work of prior explorations into bullshit receptivity. As stated, we sought to move away from using bullshit receptivity as an individual difference measure and instead explore the effect of fluency on bullshit receptivity as an outcome measure as well as whether this fluency effect was moderated by individual differences in cognitive thinking styles.

Method

Participants

Prior to recruiting our study sample, we conducted an *a priori* power analysis *via* simulation. We estimated the fixed and random effects for a linear mixed model, running 50 Markov Chain Monte Carlo (MCMC) simulations to determine the minimum sample size required to detect a small effect.[11] Our analysis found that a sample of 80 participants afforded us > 99% power to detect a minimum effect size of $d = .12$, corresponding to an effect of $b = .15$, $p < .05$. We recruited a sample of 135 participants from Amazon's Mechanical Turk ($M_{age} = 37.01$, $SD_{age} = 10.62$; $N_{males} = 85$, $N_{females} = 49$, 1 did not respond), oversampling to account for erroneous or invalid responses. Demographically, our sample was diverse, with 55.56% White respondents, 21.48% Black respondents, 15.56% Latino/a respondents, 4.44% Asian respondents, 1.48% Native American respondents, and 1.48% other.

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[1]Because prior research on bullshit receptivity has been correlational in nature, we conducted simulation analyses to determine the smallest detectable effect size rather than use prior literature as a basis.

Materials

We generated 60 pseudoprofound bullshit statements from a website designed to produce syntactically correct statements that were semantically empty (www.sebpearce.com/bullshit/). We made two versions of each statement to create our fluency manipulation. Fluent statements were written in Calibri font, while disfluent statements were written in Vladimir Script font (Jain et al., 2021) (Figure 1).

For the individual difference measures, we used a modified four-item version of the CRT, including the original statements from the CRT3 and adding an additional item from the original CRT4 (see Toplak et al., 2014). We also included the 18-item NFC scale (Cacioppo & Petty, 1982), the 12-item FI scale (Epstein et al., 1992), and the 25-item SBQ scale (Griffiths et al., 2019).

Procedure

After providing informed consent, participants were introduced to the task, ostensibly described as a task designed to measure people's experience of the profound. Participants were shown all 60 bullshit statements in a randomized order, one at a time, rating each one on how profound, understandable, meaningful, and believable the statement was. 30 of the presented statements were fluent while 30 were disfluent, counterbalanced across two blocks so that participants would see a single statement in only the fluent or disfluent font. After rating the statements, participants were given the individual difference measures. To control for order effects, we randomized the presentation order of the individual items within each scale and randomized the order in which the scales themselves were shown. After providing these responses and reporting their demographic information, participants were thanked and debriefed.

Results

We first scored the CRT, assigning a value of 1 for each correct (deliberative) answer (e.g., an answer of $0.05 for the bat-and-ball problem, see Fredrick, 2005) and a value of 0 for each incorrect (intuitive) answer. After
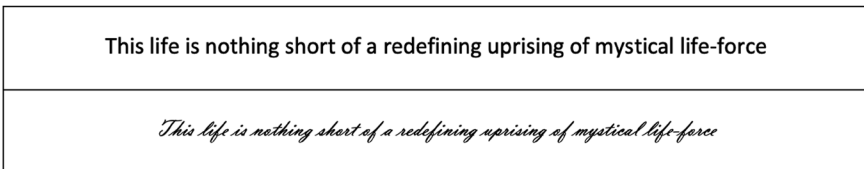
Figure 1. Example of the pseudoprofound bullshit statements used in Study 1. The top statement is the fluent version (Calibri) while the bottom statement is the disfluent version (Vladimir Script).

determining that the CRT had good internal reliability ($\alpha = .77$), we averaged the scores of the four items together to form our measure of deliberative thinking. After reverse-scoring nine items from the NFC, we averaged these items together as well, and also averaged the items from the FI and SBQ. All scales demonstrated satisfactory reliability (NFC $\alpha = .82$, FI $\alpha = .88$, SBQ $\alpha = .97$).

We next indexed our four-item measure of bullshit receptivity (BSR). The four items together had excellent reliability ($\alpha = .92$) and were highly correlated (minimum $r = .93$, $p < .001$). We entered this index into an LMM, using Satterthwaite-approximated degrees of freedom to determine significance. We specified a random intercept for participants, a random intercept for stimuli, random slopes for the fluency manipulation for both random intercepts and included the predictors of font fluency (fluent = .5, disfluent$=-0.5$), the mean-centered individual difference measures, and the interaction of each mean-centered measure with fluency. Overall, the model's random effects structure provided adequate fit ($ICC_{adjusted} = .42$, $r^2_{conditional} = .66$; Lüdecke et al., 2021). In the subsections below, we first present the results from a correlational analysis conducted between the individual difference measures and the four items that comprise our overall bullshit receptivity DV. Next, we present the full model results based on each individual difference measure and factor of interest.

Correlational analyses

In keeping with past research on bullshit receptivity, we first conducted a correlational analysis on participants' bullshit receptivity and their individual difference measures. To ensure that our BSR index was valid, we conducted these analyses on the four items that comprised this index. We collapsed participants' responses to the measures of how profound, meaningful, understandable, and believable each statement was across the fluency manipulation to produce a mean response to each item. In doing so, we can be sure that all four items relate to the individual difference measures in a similar manner.

Overall, we found that the four constituent measures of BSR were very highly correlated, validating our decision to average these into a single DV. The only individual difference measure not correlated with any of the constituent items (or the other individual difference scales) was the NFC. In sum, reflective thinking ability (i.e., CRT) negatively correlated with BSR items, such that more reflective thinking was associated with a decrease in bullshit receptivity. Conversely, increased *reflexive* thinking (i.e., FI, SBQ) positively correlated with BSR. Full results from these analyses are available in Table 1.

LMM Analyses

Fluency. Overall, we found the predicted main effect of fluency, $b = .09$, $SE = .03$, $t(135.87) = 3.35$, $p = .001$, $d = .29$, $\eta_p^2 = .08$, 95% CI$_b$

Table 1. Correlation matrix from the four constituent measures of the bullshit receptivity index and the four individual difference scales used in Study 1.

Variable	1	2	3	4	5	6	7	8
1. Profound								
2. Meaningful	0.98***							
3. Understandable	0.93***	0.96***						
4. Believable	0.97***	0.99***	0.96***					
5. CRT	−0.25**	−0.26**	−0.25**	−0.29**				
6. NFC	−0.07	−0.06	−0.02	−0.08	0.16+			
7. FI	0.46***	0.49***	0.50***	0.47***	−0.05	0.08		
8. SBQ	0.80***	0.82***	0.78***	0.82***	−0.28***	−0.22*	0.50***	

Note. '***' $p < .001$, '**' $p < .01$, '*' $p < .05$, '+' $p < .10$.

[.04, .15][22], where participants were more receptive to fluent ($M = 4.84$, $SD = 1.60$) than disfluent statements ($M = 4.66$, $SD = 1.67$).

Cognitive Reflection test. There was no main effect of CRT, $b = −.27$, $SE = .21$, $t(128.92) = −1.30$, $p = .20$, $\eta_p^2 = .01$, 95% CI_b [−.67, .14]. The fluency × CRT interaction was not significant, $b = −.06$, $SE = .079$ $t(128.39) = −.63$, $p = .53$, $\eta_p^2 = .003$, 95% CI_b [−.23, .12].

Need for cognition. Our model found a significant main effect of NFC, $b = .27$, $SE = .12$, $t(128.87) = 2.25$, $p = .03$, $\eta_p^2 = .04$, 95% CI_b [.03, .50], such that increases in NFC predicted greater bullshit receptivity. The fluency × NFC interaction was not significant, $b = −.05$, $SE = .05$, $t(128.14)$ $= −1.05$, $p = .30$, $\eta_p^2 = .009$, 95% CI_b [−.15, .05].

Faith in intuition. Our model found no main effect of FI, $b = .15$, $SE = .11$, $t(128.88) = 1.29$, $p = .20$, $\eta_p^2 = .01$, 95% CI_b [−.08, .37], nor a fluency × FI interaction, $b = −.02$, $SE = .05$, $t(128.20) = −.32$, $p = .75$, $\eta_p^2 = .0008$, 95% CI_b [−.11, .08].

Superstitious beliefs Questionnaire. We found a significant main effect of SBQ, $b = 1.03$, $SE = .08$, $t(128.88) = 12.67$, $p < .001$, $\eta_p^2 = .55$, 95% CI_b [.87, 1.19], such that higher levels of superstition predicted a significant increase in bullshit receptivity. There was no significant fluency × SBQ interaction, $b = −.04$, $SE = .03$, $t(128.21) = −1.23$, $p = .22$, $\eta_p^2 = .01$, 95% CI_b [−.11, .03].

Discussion

Results from Study 1 show that overall, disfluency reduced bullshit receptivity. As predicted, participants rated the perceptually disfluent bullshit

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[2]For all LMM analyses, we report an estimated *d* value for any comparisons involving the two-level effect of fluency only, in addition to η_p^2, as an estimate of effect size. For any estimates involving continuous variables or moderations, we only report η_p^2, owing to the difficulty in interpreting an estimate of *d* for continuous variables and interactions between continuous and categorical predictors.

lower on scales of profundity, meaning, believability, and understandability, suggesting a putative link between perceptual disfluency and analyticity. Additionally, participants scoring higher on the NFC also demonstrated an increased receptivity to bullshit that was not moderated by our fluency manipulation. This suggests the possibility that individuals who rate themselves as high on thinking enjoyment may be more receptive overall, though we hesitate to interpret this too deeply given the inconsistent results found for this scale in previous BSR research (e.g., Pennycook et al., 2015; Sterling et al., 2016). We also found a main effect of superstitious beliefs, where more superstitious participants were overwhelmingly more receptive to pseudoprofound bullshit. Within the context of our framework, this suggests that highly superstitious individuals rely on reflexive open-mindedness to process information, regardless of whether the presentation of that information excites effortful versus intuitive thinking.

Study 2

Study 2 was designed to extend the results from Study 1 by exploring whether participants are susceptible to a different type of bullshit. Prior studies have used the same type of bullshit stimuli: short statements that can be quickly processed and interpreted (termed "pseudoprofound" bullshit). We sought to extend the effect of bullshit by including longer more syntactically complex statements to test the robustness of the fluency effects found in Study 1.

Method

Participants
We conducted a similar *a priori* power analysis to that used in Study 1, this time estimating the likelihood of detecting a fluency effect of $d = .29$ (corresponding to the fluency effect size from Study 1). Our simulation analyses again showed that 80 participants afforded us > 99% power to detect this effect (corresponding to $b = .22$, $p < .05$). We collected data from 142 participants ($M_{age} = 37.61$, $SD_{age} = 11.50$; $N_{males} = 95$, $N_{females} = 47$). Our sample was 50.7% White, 30.99% Black, 9.86% Latino/a, 4.93% Native American, and 3.5% Asian. Prior to analyses, we removed the responses from one participant for displaying nonvariance (i.e., giving the same rating to all items in the receptivity index for all statements), yielding a final sample of 141 individuals.

Materials
We replaced the pseudoprofound statements from Study 1 with 20 short paragraphs generated by the Postmodernism Generator, a website designed to produce page-long essays constructed in a similar manner as the

In the works of Eco, a predominant concept is the concept of semioticist truth. But the premise of pretextual deappropriation states that reality may be used to entrench the status quo, given that neodeconstructive discourse is valid. Foucault uses the term 'the dialectic paradigm of narrative' to denote the bridge between art and sexual identity. It could be said that many appropriations concerning the role of the observer as poet may be discovered. The subject is interpolated into a pretextual deappropriation that includes reality as a reality.

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Figure 2. Example of the postmodernist bullshit paragraphs used in Study 2. The top statement is the fluent version (Calibri) and the bottom statement is the disfluent version (Vladimir Script).

algorithmically generated pseudoprofound statements used in Study 1 (http://www.elsewhere.org/pomo/).[33] We selected five- to six-sentence paragraphs from each essay and used the same font manipulation from Study 1 where the fluent stimuli were written in Calibri, 12 pt font and the disfluent stimuli were written in Vladimir Script, 12 pt font (Figure 2). We also included the same four-item CRT, 18-item NFC scale, 12-item FI scale, and 25-item SBQ scale used in Study 1.

Procedure

The procedure for Study 2 was identical to that of Study 1. The only difference was in the number of statements and their length.

Results

As in Study 1, we first indexed the four individual difference measures after confirming that all scales were reliable (CRT $\alpha = .75$, NFC $\alpha = .76$, FI $\alpha = .82$, SBQ $\alpha = .96$). We then created our four-item BSR index. These four items again demonstrated excellent reliability ($\alpha = .88$) and were highly correlated with each other (minimum $r = .93$, $p < .001$).

We again regressed participants' indexed receptivity scores on fluency (fluent $= .5$, disfluent $= -.5$), the mean-centered individual difference measures, and the interaction of fluency with each mean-centered measure. To ensure adequate model fit, we also included an uncorrelated random slope of fluency for the random intercept for stimuli in addition to the random fluency slope for the participant intercept. Our random effects

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[3]We included fewer statements than in Study 1, due to these stimuli's length and increased linguistic complexity to prevent possible fatigue effects in our online sample.

structure again provided an adequate fit ($ICC_{adjusted} = .58$, $r^2_{conditional} = .79$). As in Study 1, we report results from a correlational analysis first, then each model effect individually in the subsections below.

Correlational analyses

Full results from these analyses can be found in Table 2. Overall, we found a similar pattern of results for the constituent BSR items as in Study 1, such that all were highly correlated with each other. We also found a similar pattern for the reflexive (e.g., FI, CRT) and reflective (e.g., CRT) cognitive scales, such that as the former increased, BSR increased, while as the latter increased, BSR decreased. Unlike Study 1, in Study 2 we found significant relationships between the BSR items and the NFC, with all four sharing a significant, negative relationship with self-reported need for cognition.

LMM analyses

Fluency. We again found the predicted main effect of fluency, $b = .10$, $SE = .03$, $t(78.44) = 3.87$, $p < .001$, $d = .44$, $\eta_p^2 = .16$, 95% CI_b [.05, .15], indicating that overall, participants were more receptive to fluent ($M = 5.11$, $SD = 1.28$) than disfluent statements ($M = 4.92$, $SD = 1.37$), replicating the attenuating effect of disfluency found in Study 1.

Cognitive reflection test. There was no main effect of CRT, $b = -.15$, $SE = .19$, $t(133.70) = -.77$, $p = .44$, $\eta_p^2 = .004$, 95% CI_b [−.52, .23]. However, there was a significant fluency × CRT interaction, $b = .20$, $SE = .08$, $t(134.09) = 2.67$, $p = .008$, $\eta_p^2 = .05$, 95% CI_b [.05, .35] (Figure 3). We conducted simple slopes analyses by exploring the effect of fluency at three different levels of CRT: −1 SD, 0 SD, +1 SD. For participants scoring −1 SD on the CRT, there was no effect of fluency, $b = .03$, $SE = .04$, $t(122.29) = .77$, $p = .44$, $d = .07$, $\eta_p^2 = .005$, 95% CI_b [−.04, .10]. For participants scoring at the mean of the CRT (0 SD), there was a significant, positive effect of fluency, $b = .10$, $SE = .03$,

Table 2. Correlation matrix from the four constituent measures of the bullshit receptivity index and the four individual difference scales used in Study 2.

Variable	1	2	3	4	5	6	7	8
1. Profound								
2. Meaningful	0.96***							
3. Understandable	0.93***	0.95***						
4. Believable	0.96***	0.97***	0.95***					
5. CRT	−0.34***	−0.31***	−0.35***	−0.33***				
6. NFC	−0.24**	−0.27**	−0.29***	−0.23**	0.30***			
7. FI	0.60***	0.58***	0.51***	0.56***	−0.20*	−0.10		
8. SBQ	0.78***	0.79***	0.80***	0.78***	−0.39***	−0.40***	0.62***	

Note. '***' $p < .001$, '**' $p < .01$, '*' $p < .05$, '+' $p < .10$.
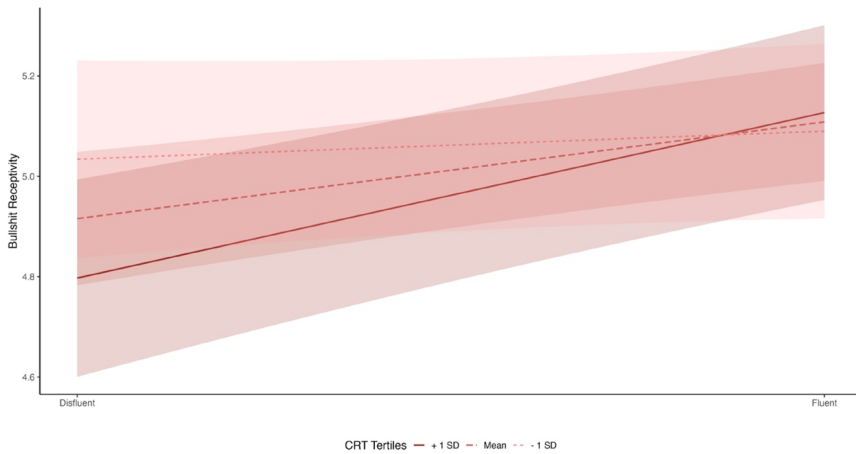
Figure 3. Visualization of the three-way reading time × fluency × statement type interaction. Ribbons reflect 95% CIs of the estimates.

$t(78.45) = 3.84$, $p < .001$, $d = .43$, $\eta_p^2 = .16$, 95% CI_b [.05, .15], as well as for participants scoring $+1$ SD on the CRT, $b = .16$, $SE = .04$, $t(121.49)$ $= 4.62$, $p < .001$, $d = .42$, $\eta_p^2 = .15$, 95% CI_b [.09, .23], indicating increased BSR for fluent compared to disfluent statements.

Need for cognition. Unlike in Study 1, there was no main effect of NFC, $b = .13$, $SE = .14$, $t(133.70) = .91$, $p = .37$, $\eta_p^2 = .006$, 95% CI_b [−.15, .40], nor was there a fluency × NFC interaction, $b = .01$, $SE = .05$, $t(134.09) = .20$, $p = .84$, $\eta_p^2 = .0003$, 95% CI_b [−.10, .12].

Faith in intuition. We found a moderate effect of FI, $b = .23$, $SE = .13$, $t(133.76) = 1.72$, $p = .09$, $\eta_p^2 = .02$, 95% CI_b [−.03, .48]. No fluency × FI interaction emerged, $b = −.009$, $SE = .05$, $t(134.48) = −.17$, $p = .86$, η_p^2 $= .0002$, 95% CI_b [−.11, .09].

Superstitious beliefs questionnaire. As in Study 1, we found a main effect of SBQ, $b = 1.05$, $SE = .11$, $t(133.77) = 9.90$, $p < .001$, $\eta_p^2 = .42$, 95% CI_b [.84, 1.26], such that increases in superstition predicted increased BSR. We found no significant fluency × SBQ interaction, $b =$ $.02$, $SE = .04$, $t(134.50) = .41$, $p = .68$, $\eta_p^2 = .001$, 95% CI_b [−.06, .10].

Discussion

The data from Study 2 show that disfluency predicts lower levels of bullshit receptivity. This replicates the results from Study 1, showing that fluent

stimuli are more positively received while disfluent stimuli are more scrutinized. Moreover, we show this effect exists to a similar degree for relatively short, single-sentence statements (Study 1) as well as longer, more syntactically complex paragraphs (Study 2), suggesting effects that are generalizable across stimuli. In addition to the fluency result, we again found an effect of superstitious beliefs, such that higher superstition predicted increased BSR, with no differences emerging when those statements are written fluently or disfluently. Taken together, these results suggest that some people have a higher "baseline" tendency toward accepting incoming information as true without much scrutiny.

The fluency × CRT interaction suggests a curious result. Participants scoring 1 *SD* below the mean on the CRT demonstrated no differences in their BSR scores, responding the same to fluent and disfluent statements. As CRT scores increased, participants scoring around the mean evinced a significant response to the fluency manipulation, increasing their BSR scores when these statements were perceptually fluent. This effect persisted as participants' CRT scores increased to 1 *SD* over the mean CRT response. The fact that the CRT moderated fluency has a counterintuitive implication for rational thinking, as participants who demonstrated an ability to override their first intuition to the CRT items to arrive at the correct answer saw more profundity in otherwise vacuous statements when those statements were presented fluently. This result runs counter to what one might otherwise expect for rational individuals, who should demonstrate low BSR scores regardless of the font those items are shown in. We return to this point in the General Discussion.

Thus far, two studies have demonstrated that disfluency attenuates bullshit receptivity. A caveat that arises in any research exploring the effects of font fluency on statement receptivity is that it is difficult to determine how much participants attend to the statements used in the study. Participants may not attempt to carefully read and encode difficult to process passages, making it challenging to interpret their profundity ratings. We designed Study 3 to address these potential concerns.

Study 3

We designed Study 3 with two goals in mind. First, we sought to directly replicate our results from Study 1. Second, we sought to disentangle the nature of the fluency results. While our working theory is that disfluency promotes a more analytic thinking style that leads to lower levels of BSR, it is also possible that disfluency reduces attention to bullshit statements, leading people to reject them because they are simply too difficult to read. To disentangle these possibilities, we recorded participants' reading times (RTs) to each statement as a separate DV. This way, we could determine whether participants actually spent time processing the statements,

assuming our fluency hypothesis is correct. If participants' RTs to the disfluent statements were significantly lower than their RTs to the fluent statements, this would suggest that they may not be processing the statements at all and simply rejecting them out of disinterest. Should participants' RTs to fluent and disfluent statements be the same, this would suggest that participants are processing these items equally. Should RTs be higher for disfluent than fluent statements, this would provide evidence that participants are in fact spending more time parsing the disfluent statements and ultimately rejecting them, providing strong support for our fluency hypothesis.

Method

Participants
We relied on the same power analysis used in Study 1, given that this was a direct replication with an added reading time DV. To ensure that we were adequately powered, we sought to increase our sample size from Study 1 by at least 100 participants. In total, 250 people took our study (M_{age} = 40.9, SD_{age} = 13.05; N_{males} = 88, $N_{females}$ = 159, 3 did not identify). Racially, our sample was largely homogenous, with 74.8% identifying as White, 6% identifying as Asian, 10.8% identifying as Black, 5.2% identifying as Latino/a, .8% identifying as Native American, and 2.4% identifying as another race.

Materials
We used the same 60 bullshit statements from Study 1, as well as the same four individual difference scales to measure participants' cognitive thinking styles.

Procedure
The procedure was identical to Study 1's. The only change was the inclusion of a timer to measure participants' RTs to each of the statements. The timer was not displayed on the screen and participants were unaware we were measuring time spent reading the passages.

Results

As in our previous studies, we conducted a correlational analysis between our four constituent measures of BSR (α = .97, minimum r = .80) and the four individual difference scales (CRT α = .73, NFC α = .92, FI α = .85, SBQ α = .94). We then analyzed participants' BSR scores using the same LMM approach from Study 1. As with the previous studies, our random effects structure provided adequate fit ($ICC_{adjusted}$ = .32, $r^2_{conditional}$ = .41). For our analyses of participants' RTs, we first transformed them into milliseconds,

then applied a natural log transformation to ensure a normal distribution.[44]

Correlational analyses

Full correlational analysis results are available in Table 3. The results from this analysis largely mirrored those from Study 1, such that the four BSR constituent items were very strongly correlated (albeit to a lesser degree than in Study 1). We found a similar pattern of correlations for the individual difference scales. Items measuring reflexive thinking had significant, positive relationships with the BSR items, while items measuring reflective thinking had significant, negative relationships with these items. The NFC was unrelated to any of the BSR items.

LMM analyses

Fluency. As with Study 1, we found a significant main effect of fluency in Study 3, $b = .13$, $SE = .05$, $t(86.87) = 2.47$, $p = .02$, $d = .27$, $\eta_p^2 = .07$, 95% CI_b [.03, .23], such that participants' BSR scores were higher when statements were presented in a fluent font ($M = 3.65$, $SD = 1.93$) than in a disfluent font ($M = 3.48$, $SD = 1.92$). Figure 4(A) presents these data.

Cognitive reflection test. We found a main effect of the CRT, $b = −.39$, $SE = .19$, $t(243.95) = −2.06$, $p = .04$, $\eta_p^2 = .02$, 95% CI_b [−.76, −.02]. There was no significant fluency × CRT interaction, $b = −.09$, $SE = .09$, $t(153.71) = −1.03$, $p = .31$, $\eta_p^2 = .007$, 95% CI_b [−.26, .08].

Need for cognition. We found no main effect for the NFC, $b = .07$, $SE = .08$, $t(243.95) = .80$, $p = .42$, $\eta_p^2 = .003$, 95% CI_b [−.10, .23], nor did

Table 3. Correlation matrix from the four constituent measures of the bullshit receptivity index and the four individual difference scales used in Study 3.

Variable	1	2	3	4	5	6	7	8
1. Profound								
2. Meaningful	0.97***							
3. Understandable	0.80***	0.85***						
4. Believable	0.93***	0.97***	0.83***					
5. CRT	−0.28***	−0.28***	−0.21***	−0.31***				
6. NFC	−0.03	−0.02	−0.01	0.00	0.16*			
7. FI	0.22***	0.25***	0.20**	0.27***	−0.11+	0.13*		
8. SBQ	0.57***	0.58***	0.44***	0.61***	−0.33***	−0.08	0.35***	

Note. '***' $p < .001$, '**' $p < .01$, '*' $p < .05$, '+' $p < .10$.

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[44]We ran additional analyses on participants' untransformed millisecond RTs using a GLMM that assumed a gamma distribution in accordance with recommendations from Lo and Andrews (2015). While this model produced similar results, we report log-transformed analyses here. The GLMM analyses can be found in the supplementary materials.

we find a fluency×NFC interaction, $b = .06$, $SE = .04$, $t(145.97) = 1.55$, $p = .12$, $\eta_p^2 = .02$, 95% CI_b [−.02, .13].

Faith in intuition. We found no main effect of FI, $b = .09$, $SE = .11$, $t(243.95) = .88$, $p = .38$, $\eta_p^2 = .003$, 95% CI_b [−.12, .30], nor did we find a fluency×FI interaction, $b = −.008$, $SE = .05$, $t(152.04) = −.17$, $p = .86$, $\eta_p^2 = .0002$, 95% CI_b [−.10, .09].

Superstitious beliefs questionnaire. Our model again yielded a significant effect for the SBQ, $b = .75$, $SE = .08$, $t(243.95) = 9.13$, $p < .001$, $\eta_p^2 = .25$, 95% CI_b [.59, .91]. No fluency×SBQ interaction emerged, $b = −.05$, $SE = .04$, $t(149.30) = −1.33$, $p = .18$, $\eta_p^2 = .01$, 95% CI_b [−.12, .02].

Reading time analysis. We entered participants' natural log-transformed RTs into an LMM that included the same random effects structure as the model used to analyze participants' BSR scores. This model found a main effect of fluency, $b = −.09$, $SE = .01$, $t(149.10) = −7.83$, $p < .001$, $d = −.64$, $\eta_p^2 = .29$, 95% CI_b [−.11, −.07], indicating that participants'
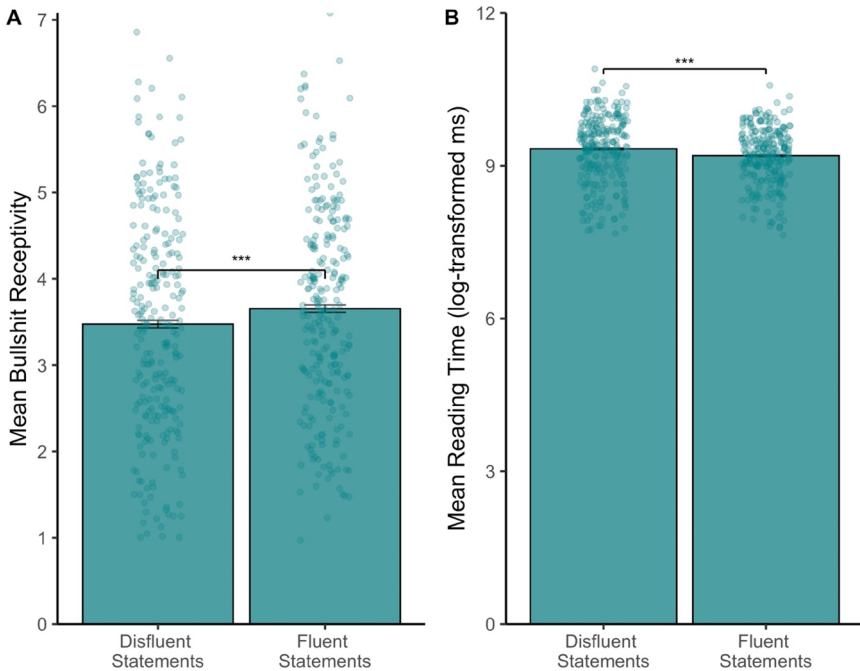
Figure 4. Results of the fluency manipulation for Study 3 (A) and the reading time analysis (B). error bars represent 95% CIs. Points represent individual participants' mean receptivity scores for fluent and disfluent statements.

RTs were higher for disfluent ($M = 9.33$, $SD = .83$) than for fluent statements ($M = 9.20$, $SD = .74$), supporting the argument that disfluency promotes a more analytical approach (indexed by time spent trying to parse the hard-to-read statements) that attenuates the perceived profundity of bullshit statements (see Figure 4(B)). In addition, we found a main effect for the NFC scale, $b = .13$, $SE = .05$, $t(243.91) = 2.60$, $p = .01$, $\eta_p^2 = .03$, 95% CI_b [.03, .22], suggesting that average RTs increased as participants' NFC scores increased. We found moderate effects for the SBQ, $b = -.09$, $SE = .05$, $t(243.91) = -1.83$, $p = .07$, $\eta_p^2 = .01$, 95% CI_b [−.18, .006], and a moderate fluency × CRT interaction, $b = -.05$, $SE = .03$, $t(177.18) = -1.78$, $p = .08$, $\eta_p^2 = .02$, 95% CI_b [−.12, .006]. No other effects were significant ($ps \geq .11$).

Discussion

The data from Study 3 allow us to draw two important conclusions. First, our fluency manipulation has a stable effect on bullshit receptivity, such that disfluency reduces overall BSR to pseudoprofound bullshit statements. Second, participants spent more time reading these statements, in support of our disfluency hypothesis. This second conclusion is vital to the validity of our results. Had participants spent less time on these disfluent items, it would be difficult to argue that our fluency effect is a product of increased analytical processing (Song & Schwarz, 2008) and not simply the result of participants rejecting the disfluent items due to a lack of attention or to dislike.

Study 4

Thus far, our data provide compelling evidence for a role of disfluency in attenuating bullshit receptivity. While we putatively attribute this to an increase in the engagement of analytic thinking, other explanations are plausible. To address this, we designed Study 4 to present participants with a selection of pseudoprofound bullshit and non-bullshit inspirational quotes to serve as a reference condition. This design affords us the ability to test whether the effects of fluency reduce receptivity to any incoming information unilaterally or to only bullshit specifically.

Method

Participants
We collected data from a sample of 209 students from a mid-sized urban public university in the Northeastern United States ($M_{age} = 21.39$, $SD_{age} = 4.48$; $N_{males} = 69$, $N_{females} = 108$, 1 identified as non-binary and 8 did not

respond). This sample was somewhat diverse, being 53.23% Asian, 15.59% Latino/a, 12.9% White, 6.99% Black, and the remaining 11.3% comprising either Middle Eastern, Bi- or multi-racial, or chose not to identify their race. We removed data from 23 participants for having a substandard completion rate (< 87%) and from one additional participant for displaying response invariance (i.e., responding with the same rating for all study items), leaving a final sample of $N = 185$.

Materials

We selected 10 pseudoprofound bullshit items from the same online generator used in Studies 1 and 3 and also selected 10 inspirational quotes from SOURCE. As per our previous studies, two versions of each statement existed: one fluent (Calibri) and one disfluent (Vladimir Script) version of each.

Procedure

The procedure was identical to that used in Studies 1–3. Participants saw a selection of pseudoprofound and inspirational sentences displayed in a random order. Of the 10 statements for the bullshit and inspirational conditions, five were displayed in the fluent font and five were displayed in the disfluent font, with these manipulations being counterbalanced between subjects to ensure that nobody read the same sentence twice. Participants again rated each statement on perceptions of profundity, understanding, meaning, and believability, and we also recorded reading time for each trial. After rating all the sentences, participants again responded to the individual difference metrics, provided demographic information, then were thanked and debriefed.

Results

As with our previous studies, we first conducted correlational analyses between the four component measures of our receptivity index ($\alpha = .97$, minimum $r = .81$) and the four individual difference scales ($\alpha_{CRT} = .67$, $\alpha_{NFC} = .81$, $\alpha_{FI} = .86$, $\alpha_{SBQ} = .92$). We then entered the indexed receptivity scores into a 2 (fluency: fluent = +1, disfluent = −1) × 2 (statement type: pseudo-profound bullshit = +1, inspirational quotes = −1) repeated-measures LMM that also included controls for the individual difference scales and moderations with each scale and the fluency manipulation and each scale and the statement type manipulation. As with the first three studies, we included a similar crossed random effects structure ($ICC_{adjusted} = .13$, $r^2_{conditional} = .25$).

Correlational analyses

Tables 4a and 4b display the full correlational analyses of the data from Study 4. Table 4a displays the correlations between the constituent items

Table 4a. Correlation matrix from the four constituent measures of the receptivity index and the four individual difference scales used in Study 4 for pseudoprofound bullshit.

Variable	1	2	3	4	5	6	7	8
1. Profound								
2. Meaningful	0.92***							
3. Understandable	0.84***	0.89***						
4. Believable	0.90***	0.95***	0.92***					
5. CRT	0.08	0.03	0.04	0.04				
6. NFC	0.06	0.02	0.08	0.04	0.08			
7. FI	0.23**	0.25***	0.25***	0.27***	0.04	0.17*		
8. SBQ	0.32***	0.39***	0.36***	0.37***	−0.10	−0.01	0.29***	

Note. '***' $p < .001$, '**' $p < .01$, '*' $p < .05$, '+' $p < .10$.

Table 4b. Correlation matrix from the four constituent measures of the receptivity index and the four individual difference scales used in Study 4 for inspirational quotes.

Variable	1	2	3	4	5	6	7	8
1. Profound								
2. Meaningful	0.88***							
3. Understandable	0.77***	0.88***						
4. Believable	0.83***	0.94***	0.91***					
5. CRT	0.09	0.06	0.11	0.09				
6. NFC	0.20**	0.16*	0.22**	0.15*	0.08			
7. FI	0.23**	0.28***	0.26***	0.28***	0.04	0.17*		
8. SBQ	0.25***	0.28***	0.15*	0.28***	−0.10	−0.01	0.29***	

Note. '***' $p < .001$, '**' $p < .01$, '*' $p < .05$, '+' $p < .10$.

of the receptivity index and the individual difference scales for pseudo-profound bullshit while Table 4b displays these for inspirational quotes. Overall, a similar pattern of relationships emerged for both types of statements. For pseudoprofound bullshit, no relationship emerged between the receptivity items and the CRT and NFC scales, though there was a significant positive relationship between receptivity and the FI and SBQ scales. This pattern was also largely reflected in the data for the inspirational quotes, though for these there was a moderate but significant relationship between receptivity and the NFC. Overall, this suggests that participants were cognitively processing the two types of statements differently, though the overt measure of cognitive reflectivity did not relate to either one.

LMM analyses

Fluency × statement type. Our model revealed a nonsignificant effect of fluency, $b = .04$, $SE = .03$, $t(174.89) = 1.52$, $p = .13$, $d = .11$, $\eta_p^2 = .01$, 95% CI$_b$ [−.01, .09], suggesting that the fluency manipulation in Study 4 failed to attenuate receptivity ($M_{fluent} = 4.59$, $SD_{fluent} = 1.76$; $M_{disfluent} = 4.49$, $SD_{disfluent} = 1.76$). We found a significant effect of statement type, suggesting that participants rated inspirational quotes

($M = 5.01$, $SD = 1.60$) higher on our index than they did pseudoprofound bullshit ($M = 4.07$, $SD = 1.78$), $b = -.47$, $SE = .13$, $t(17.98) = -3.52$, $p = .002$, $d = -.83$, $\eta_p^2 = .41$, 95% CI_b [−.74, −.21]. No interaction between fluency and statement type emerged ($b = -.01$, $p = .67$)[55].

Cognitive reflection test. Our model found a main effect of the CRT, $b = .26$, $SE = .08$, $t(3411.04) = 3.43$, $p < .001$, $\eta_p^2 = .003$, 95% CI_b [.11, .41], suggesting that participants scoring high on the CRT were overall more receptive to both pseudoprofound bullshit and inspirational quotes. This effect was not moderated by either the fluency manipulation ($b = .03$, $p = .74$) or the statement type manipulation ($b = -.02$, $p = .81$).

Need for cognition. We found a significant main effect for the NFC, $b = .17$, $SE = .05$, $t(3411.04) = 3.49$, $p < .001$, $\eta_p^2 = .004$, 95% CI_b [.08, .27], illustrating greater overall receptivity for participants scoring high on the NFC. This effect was not moderated by the fluency manipulation ($b = -.05$, $p = .30$), though a significant statement type × NFC interaction emerged, $b = -.13$, $SE = .05$, $t(3411.04) = -2.55$, $p = .01$, $\eta_p^2 = .006$, 95% CI_b [−.22, −.03]. Simple slopes analyses showed that there was a positive effect of the NFC for inspirational quotes, $b = .30$, $SE = .07$, $t = 4.27$, $p < .001$, 95% CI_b [.16, .44]. However, there was no effect of the NFC for pseudoprofound bullshit ($b = .05$, $p = .50$).

Faith in intuition. We found a significant effect of the FI scale, $b = .31$, $SE = .05$, $t(3411.04) = 6.72$, $p < .001$, $\eta_p^2 = .01$, 95% CI_b [.22, .40], illustrating that increases in FI scores produced a concurrent increase in receptivity. There was a marginal FI × fluency interaction, $b = -.08$, $SE = .05$, $t(174.98) = -1.71$, $p = .09$, $\eta_p^2 = .02$, 95% CI_b [−.18, .01], though no FI × statement type interaction ($b = -.01$, $p = .77$).

Superstitious beliefs questionnaire. We also found a significant effect of the SBQ, $b = .46$, $SE = .04$, $t(3411.04) = 11.10$, $p < .001$, $\eta_p^2 = .03$, 95% CI_b [.38, .54], suggesting that more superstitious participants were more receptive to all statements. This was qualified by a significant SBQ × statement type interaction, $b = .13$, $SE = .04$, $t(3411.04) = 3.08$, $p = .002$, $\eta_p^2 = .003$, 95% CI_b [.05, .21], though no SBQ × fluency interaction emerged ($b = .008$, $p = .86$). Simple slopes analyses of the significant interaction revealed that for inspirational quotes, higher

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[5]We also conducted analyses exploring bullshit sensitivity, subtracting participants' ratings for pseudoprofound bullshit from their ratings for the inspirational quotes (Pennycook et al., 2015). These revealed no significant differences in bullshit sensitivity across the fluency conditions ($b = .04$, $p = .67$) when controlling for the individual differences, and thus are not reported in the main text.

SBQ scores were associated with greater receptivity to these statements, $b = .33$, $SE = .06$, $t = 5.67$, $p < .001$, 95% CI$_b$ [.22, .44]. There was a similar—albeit stronger—effect for pseudoprofound bullshit, $b = .58$, $SE = .06$, $t = 10.02$, $p < .001$, 95% CI$_b$ [.47, .70], suggesting a stronger relationship between supernatural belief and pseudoprofound bullshit receptivity.

Reading time analyses. As with Study 3, we next explored participants' log-transformed reading times to test whether they spent more time on the disfluent than on the fluent statements as well as whether they spent differing amounts of time reading the bullshit sentences or the inspirational quotes. This model found a main effect of fluency, $b = -.05$, $SE = .01$, $t(157.3) = -3.81$, $p < .001$, $d = -.29$, $\eta_p^2 = .08$, 95% CI$_b$ [−.07, −.02], illustrating that as before, participants spent more time on the disfluent ($M = 9.44$, $SD = .93$) than on the fluent ($M = 9.34$, $SD = .90$) statements. No effect of statement type emerged ($b = -.02$, $p = .48$), nor was there a fluency×statement type interaction ($b = -.01$, $p = .17$). We also found a main effect of the FI scale, $b = .18$, $SE = .09$, $t(1760) = 2.08$, $p = .04$, $\eta_p^2 = .02$, 95% CI$_b$ [.01, .35], and a main effect of the SBQ scale, $b = -.23$, $SE = .08$, $t(1760) = -2.93$, $p = .004$, $\eta_p^2 = .05$, 95% CI$_b$ [−.38, −.08]. No other effects were significant ($ps \geq .15$).

Reading time, fluency, and statement type moderation. To more fully explore the role of perceptual fluency in information receptivity when confronted with bullshit and non-bullshit statements, we built an additional model that included the sum-contrasted predictors of fluency (fluent = +1, disfluent = −1), statement type (pseudoprofound bullshit = +1, inspirational quotes = −1), and the log-transformed predictor of reading time, as well as all two-way and three-way interactions, predicated on the idea that cognitive expenditure (i.e., reading time) may moderate the effect of fluency on statement receptivity.

This model found a significant effect of fluency, $b = .59$, $SE = .22$, $t(3432.60) = 2.68$, $p = .007$, $d = .05$, $\eta_p^2 = .002$, 95% CI$_b$ [.16, 1.01], suggesting that participants were more receptive to fluent than disfluent statements when controlling for reading time. We also found an effect of statement type, $b = 1.56$, $SE = .25$, $t(254.43) = 6.18$, $p < .001$, $d = .39$, $\eta_p^2 = .13$, 95% CI$_b$ [1.07, 2.05], suggesting that surprisingly, participants were more receptive to pseudoprofound bullshit than they were to inspirational quotes. The effect of reading time was significant, $b = -.27$, $SE = .03$, $t(3546.84) = -8.42$, $p < .001$, $\eta_p^2 = .02$, 95% CI$_b$ [−.33, −.21], illustrating that increased reading time led to decreased receptivity.

This model also found an interaction between statement type and fluency, $b = -.47$, $SE = .22$, $t(3427.21) = -2.19$, $p = .03$, $d = -.04$, $\eta_p^2 = .001$, 95%
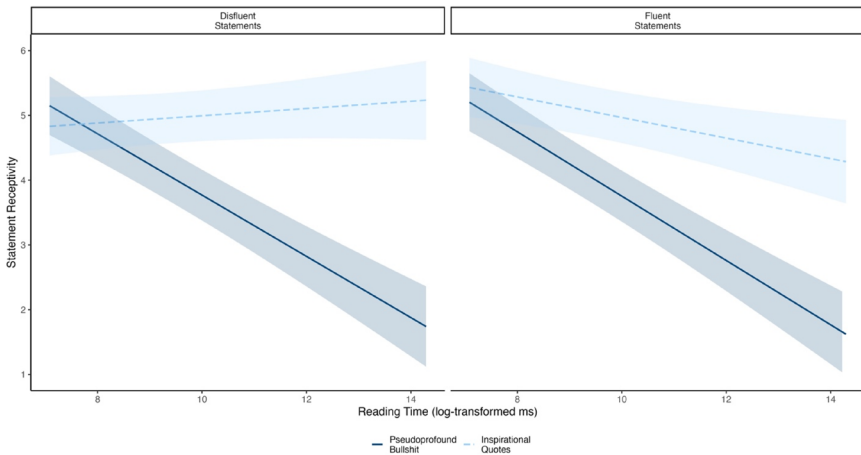
Figure 5. Visualization of the three-way reading time×fluency×statement type interaction. Ribbons reflect 95% CIs of the estimates.

CI_b [−.90, −.05], an interaction between fluency and reading time, $b = -.06$, $SE = .02$, $t(3432.76) = -2.58$, $p = .01$, $d = -.04$, $\eta_p^2 = .002$, 95% CI_b [−.10, −.01], an interaction between statement type and reading time, $b = -.22$, $SE = .02$, $t(3427.42) = -9.39$, $p < .001$, $d = -.16$, $\eta_p^2 = .03$, 95% CI_b [−.26, −.17], and a three-way fluency×statement type×reading time interaction, $b = .05$, $SE = .02$, $t(3427.25) = 2.07$, $p = .04$, $d = .04$, $\eta_p^2 = .001$, 95% CI_b [.003, .09] (see Figure 5)[66]. To ease interpretation, we conducted simple slopes analyses of the three-way interaction exploring the effect of reading time on receptivity, moderated by both statement type and fluency[77].

For disfluent sentences, increased reading time had no effect on receptivity to inspirational quotes ($b = .06$, $p = .26$), though increased reading time did produce a significant reduction in receptivity to pseudoprofound bullshit, $b = -.47$, $SE = .05$, $t = -9.31$, $p < .001$, 95% CI_b [−.57, −.37]. For fluent sentences, increased reading time reduced receptivity to both inspirational quotes, $b = -.16$, $SE = .05$, $t = -2.97$, $p < .001$, 95% CI_b [−.26, −.05], and to pseudoprofound bullshit, $b = -.50$, $SE = .05$, $t = -9.77$, $p < .001$, 95% CI_b [−.60, −.40].

Discussion

Our data from Study 4 provide mixed results regarding the effect of perceptual fluency on statement receptivity to both inspirational quotes and

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[6]While not reported here, these effects remained significant when we included the individual difference metrics into the model as predictors and moderators of the fluency and statement type effects.

[7]As the three-way interaction subsumed the two-way interactions, we report only the simple slopes analyses for this in the main text. The remaining simple slopes analyses can be found in the Supplementary Material.

pseudoprofound bullshit. When exploring the effect of fluency and state-ment receptivity alone, we found no fluency effect, despite the means being in the predicted directions. Instead, participants were significantly more receptive to inspirational quotes than to pseudoprofound bullshit, an effect which may have washed out the fluency effects observed in our prior studies. Specifically, the concurrent presentation of pseudoprofound bullshit and inspirational quotes may have led to an overall stronger effect of statement type that overrode the prior effects of perceptual fluency.

When accounting for reading time, the picture painted by Study 4 changes. Here, we found that participants were indeed less receptive to disfluent than fluent stimuli, while also spending more time parsing the former than the latter. The moderation analyses suggest that, for the most part, participants who spent longer reading the statements were less receptive to them than participants who parsed the statements more quickly. However, interesting differences emerged between fluent and disfluent presentations. Here, our data show that people lose receptivity to both pseudoprofound bullshit and inspirational quotes when they spend a greater amount of time reading them, especially when those statements are easy to parse (i.e., high perceptual fluency). Conversely, when those statements are presented disfluently, increased reading time of inspirational quotes has no effect on how receptive participants are to those statements while sharply decreasing receptivity to pseudoprofound bullshit. We con-tend that when reading time is accounted for, perceptual fluency has a unique effect on statement receptivity for bullshit: disfluency leads readers to engage less with pseudoprofound bullshit while not affecting their engagement with—and consequentially, their receptivity to—inspirational quotes (i.e., non-bullshit).

General discussion

Our primary goal was to explore the effect of processing fluency on bull-shit receptivity while controlling for individual differences in reflexive and reflective cognition. We found that fluency predicted higher levels of bullshit receptivity than disfluency, providing data to potentially ameliorate a previously tenuous relationship between disfluency and analytic thinking (Song & Schwarz, 2008; Swami et al., 2014; cf. Meyer et al., 2015; Thompson et al., 2013). This was found for pseudoprofound statements similar to those used in prior studies (Bainbridge et al., 2019; Čavojová et al., 2019; Erlandsson et al., 2018; Gligorić & Vilotijević, 2020a; 2020b; Nilsson et al., 2019; Pennycook et al., 2015; Pfattheicher & Schindler, 2016; Sterling et al., 2016; Walker et al., 2019), and longer, more complex paragraphs taken from randomly generated postmodernist essays. Thus, a primary conclusion of the current experiments is that disfluency attenuates receptivity to varied types of bullshit. Our conclusion is further supported by the RT analyses conducted in Studies 3 and 4, as participants spent more time

reading the disfluent statements than the fluent statements. Thus, participants were not merely rejecting the disfluent statements through inattention or disinterest. Instead, they spent more time reading these items but still rated them as less profound than the fluent statements. The moderation analyses from Study 4 suggest that, when encountered with both bullshit and non-bullshit items, the effect of fluency changes. When RT is unaccounted for, it is likely that the contrast between the two statement types is strong enough to wash out any fluency effects. However, accounting for RT suggests that in such situations, disfluency produces a unique effect whereby receptivity to bullshit is significantly reduced while receptivity to non-bullshit is unaffected. We argue that this provides further evidence of a potential link between fluency and analytic thinking when RT is considered as a proxy for analytic thinking engagement. Specifically, increased analyticity allows participants to deduce that bullshit statements they are reading are nonsensical in contrast to the non-bullshit inspirational quotes when presented in a font that demands close inspection (i.e., perceptually disfluent).

Earlier, we mentioned a link between bullshit receptivity and the spread of misinformation, which in many cases may count as bullshit. The current results suggest that one strategy for reducing belief in misinformation may be to rely on disfluency cues to engage analytic thinking. For example, known pieces of misinformation might be less likely to be taken at face value, or to be judged profound or meaningful, when presented in a disfluent font. Disfluency's role in engaging analytical thinking might also prove to be a useful tool for combatting bullshit receptivity more generally, for example by decreasing receptivity to the bullshit produced by gurus (Sperber, 2010).

In this research, we introduced a new analytic approach for studying bullshit receptivity. Prior studies have averaged together participants' responses to all bullshit statements to form a bullshit receptivity scale, then correlated this scale with other individual difference measures of intelligence, beliefs, and cognitive thinking styles (e.g., Pennycook et al., 2015; Pennycook & Rand, 2020; Sterling et al., 2016). While we make no criticism of the validity of their findings, we do note that this method does not account for the variance associated with a random sample of stimuli (see Judd et al., 2012, 2017; Westfall et al., 2015). ; In the case of randomly generated bullshit statements, participants may be more receptive to some statements than they are to others (Dalton, 2016; see also Pennycook et al., 2016). To assess this, we modeled BSR as the outcome variable and included random intercepts for participants and stimuli (Judd et al., 2012) and random slopes for the fluency manipulation for both intercepts. Doing so affords us the ability to generalize our findings to new random samples of bullshit statements (and participants), given that we have a statistical basis to make claims that extend beyond the sample of statements we included in these studies (Judd et al., 2012, 2017). This is critical, given that all pseudoprofound bullshit statements are not taken

from a standardized database but instead are randomly generated from different websites (see Pennycook et al., 2015), thus inviting disparate levels of variance from one study to the next.

Contribution of individual differences to BSR

While not central to our hypotheses, we included individual difference measures to explore potential moderations between variations in cognitive inclinations and our fluency manipulation. Across four studies, we found mixed evidence for these effects, both in terms of main effects and interactions.

The relatively consistent significant results for the SBQ are not surprising in the light of prior research on superstitious individuals. For instance, Griffiths et al. (2019) found that superstitious individuals perceived more illusory causal connections between otherwise independent events, a result that has been echoed in recent research on the role of superstition and pseudoscientific beliefs in illusory causality (Torres et al., 2020). Furthermore, recent research connects bullshit receptivity to illusory pattern perception (Walker et al., 2019), suggesting similar cognitive mechanisms underlie superstitious beliefs, illusory causation, and bullshit receptivity. Some individuals may be more likely to believe that no statement is created "randomly" and without meaning and might therefore possess a default bias toward accepting ambiguous statements as sincere expressions of thoughts that aim at the truth. This would lead them to be more receptive to difficult-to-understand statements.

The final individual difference effect worth noting is the interaction between fluency and the CRT observed in Study 2. Here, we found that individuals at the low end of CRT scores (i.e., those −1 *SD* in CRT scores) had no differences in BSR between fluent and disfluent stimuli. When we explored the fluency effect for individuals scoring higher in the CRT (i.e., those scoring 0 *SD* and +1 *SD* in CRT scores), we again find that these individuals report lower BSR for disfluent than for fluent statements. Taken together, these results lend partial support to our argument in favor of disfluency attenuation, though with the caveat that disfluency's ability to engage analytic thinking in participants depends, in part, on their own capacity for reflective cognition.

Limitations and future directions

Our research is not without limitations. As an example, consider the disparity between the number of statements used between Studies 1 and 3 and the number used in Study 2. While we sought to avoid fatigue effects in Study 2 that might occur due to the longer statements, future studies may be well-served in expanding the number of stimuli used to more thoroughly explore the variance explained by the sample of bullshit

statements, especially when the use of longer and more complex faux-post-modernist essays as stimuli is novel and ripe for additional research.

Future studies may also look to expand the use of bullshit statements. While the effect of fluency was largely consistent across all studies, our data suggest that participants react differently to short, relatively simple statements (Studies 1, 3, and 4) versus longer, more complex paragraphs (Study 2), where certain differences in cognitive styles are concerned. Prior research suggests that sentence length affects reading comprehension (Scott, 2009; Thompson & Shapiro, 2007), with shorter sentences being easier to parse than longer, more syntactically complex sentences. Within the context of our research, participants in Study 2 likely had much more difficulty in interpreting the ambiguous bullshit statements than participants in Study 1 (and 3 and 4), possibly leading them to conclude that such ambiguous, difficult sentences must have been constructed with a deeper meaning. While we did not manipulate this difference between or within participants in a single study and thus are limited in our ability to compare the two effects, future research should manipulate this aspect of the statements to delineate these effects.

Future research may explore in more detail under what conditions disfluency facilitates analytic thinking. While our results suggest that it does so for at least some forms of bullshit, other results (Meyer et al., 2015) suggest that its effect on these verbal tasks may not carry over to numerical ones. Rather than turning on analytic thinking as a switch turns on a light, disfluency may be one signal among many (such as content domain or type of task) that are weighed in the engagement of analytic thinking. Future work could help get clear on what those other signals are.

Conclusion

Four studies demonstrated that perceptual disfluency potentially engages an individual's analytic thinking capabilities, and consequently reduces receptivity to both pseudoprofound (Studies 1, 3, and 4) and postmodernist (Study 2) bullshit. While we found that bullshit receptivity was correlated with individual difference measures (i.e., the CRT, NFC, FI, and SBQ scales), these scales did little to predict BSR or moderate the effect of fluency, suggesting low perceptual fluency has a generalized ability to attenuate bullshit receptivity.Notes

Author contributions

All authors conceptualized the study. R. E. Tracy collected and analyzed the data. All authors wrote the manuscript and approved the final version for submission.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Open practices

All data and analysis scripts can be found at https://github.com/ryanetracy/bullshit_fluency.git

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