

Online Supplementary Materials

For:

Finding Meaning in the Clouds: Illusory Pattern Perception Predicts Receptivity to Pseudo-Profound Bullshit

Alexander C. Walker^a, Martin H. Turpin^a, Jennifer A. Stolz^a, Jonathan A. Fugelsang^a, and Derek

J. Koehler^a

^aUniversity of Waterloo

Pattern Perception (Coin Sequences; Experiment 1 Only)
Van Prooijen, Douglas, and Inocencio (2018)

Instructions: Below you will see the results of the same coin being flipped 10 times ("H" means Heads, and "T" means Tails). Please rate the extent to which you see a pattern. If you believe the coin flip results are completely random, answer "1". If you believe the coin flip results are completely determined (for instance because of a biased coin, or if the results were rigged), please answer "7".

Please rate the extent to which you believe the following sequence is fully random or fully determined.

Response Options: 1 (completely random); 2; 3; 4; 5; 6; 7 (completely determined)

Sequences:

HTHHHHHHHTH
HTHHTTTTTHH
HHHTTTTTHH
HTHHHTHTHH
HTTHHTTTTT
HTTHTHHHTT
THHTTTTHHTH
HTHHHTHTHT
TTHTTHTHHT
TTHTTTTHTT

Now imagine that the above items represent 100 consecutive throws with the same coin. Please again rate how random or determined the outcomes are.

Response Options: 1 (completely random); 2; 3; 4; 5; 6; 7 (completely determined)

Profundity Judgments (Experiments 1, 2, and 3)
Pennycook, Cheyne, Barr, Koehler, and Fugelsang (2015)

Instructions: We are interested in how people experience the profound. Below are a series of statements taken from relevant websites. Please read each statement and take a moment to think about what it might mean. Then please rate how "profound" you think it is. Profound means "of deep meaning; of great and broadly inclusive significance."

Response Options:

- 1 (not at all profound);
- 2 (somewhat profound);
- 3 (fairly profound);
- 4 (definitely profound);
- 5 (very profound)

1. Hidden meaning transforms unparalleled abstract beauty.
2. Good health imparts reality to subtle creativity.
3. Wholeness quiets infinite phenomena.
4. The future explains irrational facts.
5. Imagination is inside exponential space time events.
6. We are in the midst of a self-aware blossoming of being that will align us with the nexus itself.
7. Consciousness consists of frequencies of quantum energy. "Quantum" means an unveiling of the unrestricted.
8. Consciousness is the growth of coherence, and of us.
9. We are in the midst of a high-frequency blossoming of interconnectedness that will give us access to the quantum soup itself.
10. Today, science tells us that the essence of nature is joy.
11. Your teacher can open the door, but you must enter by yourself.
12. The creative adult is the child who survived.
13. A river cuts through a rock, not because of its power but its persistence.
14. All endings are also beginnings. We just don't know it at the time.
15. Art and love are the same thing: It's the process of seeing yourself in things that are not you.
16. At the centre of your being you have the answer; you know who you are and you know what you want.
17. A wet person does not fear the rain.
18. Forgiveness means letting go of the hope for a better past.
19. Only those who will risk going too far can possibly find out how far one can go.
20. I wonder how many people I've looked at all my life and never seen.

**Statements 1-10 belong to the Bullshit Receptivity (BSR) scale; statements 11-20 belong to the Motivational Quotation Scale.*

Existing Conspiracy Belief Scale (Experiment 1 Only) **Van Prooijen, Douglas, and Inocencio (2018)**

Instructions: There is often debate about whether or not the public is told the whole truth about various important issues. These questions are designed to assess your beliefs about some of these subjects. Please indicate the degree to which you believe each statement is likely to be true.

Response Options: 1 (definitely not true); 2; 3; 4; 5 (definitely true)

1. The US government deliberately conceals a lot of information from the public.
2. Ebola is a man-made virus.
3. The US government had advance knowledge of the 9/11 attacks.
4. The US government covered up crucial information in the aftermath of J. F. Kennedy's assassination.
5. The science behind global warming has been invented or distorted out of self-interest.
6. Various wars in the Middle East were launched by oil companies.
7. The moon landing was a hoax.

8. The HIV/aids virus has been genetically engineered to wipe out certain sectors of the population.
9. Evidence of unidentified flying objects and extraterrestrial visitors is being suppressed by the government.

Modified Cognitive Reflection Test (Experiments 1, 2, and 3)

Primi, Morsanyi, Chiesi, Donati, and Hamilton (2016); Toplak, West, and Stanovich (2014)

1. Ellen and Kim are running around a track. They run equally fast but Ellen started later. When Ellen has run 5 laps, Kim has run 15 laps. When Ellen has run 30 laps, how many has Kim run?
2. In his class, Jerry was both the 15th tallest and 15th shortest student. How many students are in the class?
3. In an athletics team, tall members are three times more likely to win a medal than short members. This year the team has won 60 medals so far. How many of those have been won by short athletes?
4. A man buys a pig for \$60, sells it for \$70, buys it back for \$80, and sells it finally for \$90. How much has he made?

**For all items participants provided their answers in a free-entry text box.*

***Items 1-3 taken from Primi et al. (2016); Item 4 taken from Toplak et al. (2014)*

Pattern Perception (Evaluating Modern Art; Experiment 2 Only)

Van Prooijen, Douglas, and Inocencio (2018)

Structured Paintings Condition (Vasarley):

Instructions: You will see a total of nine paintings by a modern art painter. All paintings are by the same artist. This artist is well known for his regular design and alignment of figures.

For each painting, your task is to briefly look at it, form an opinion of it, and answer three questions about the painting. You do not have to like or dislike a particular painting. There are no right or wrong answers. Just feel free to give us your honest opinion about each painting.

Try not to think too long about each painting; what matters most is your first impression.

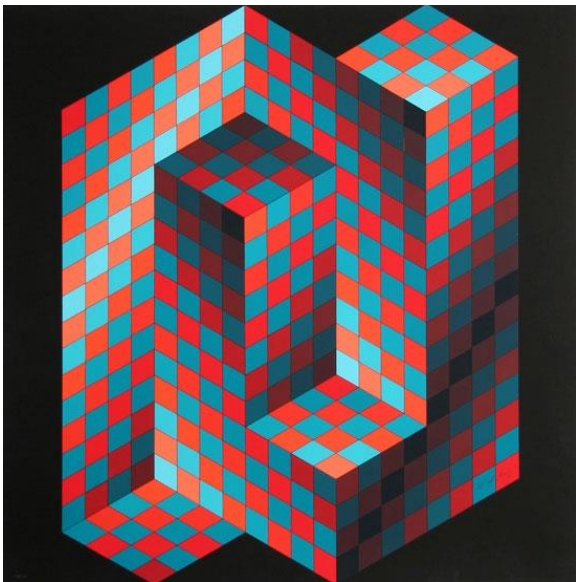
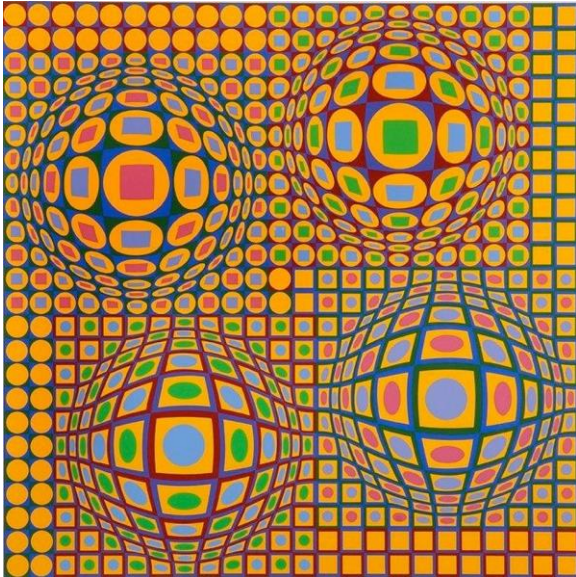
On the next screen, you will start with the first painting.

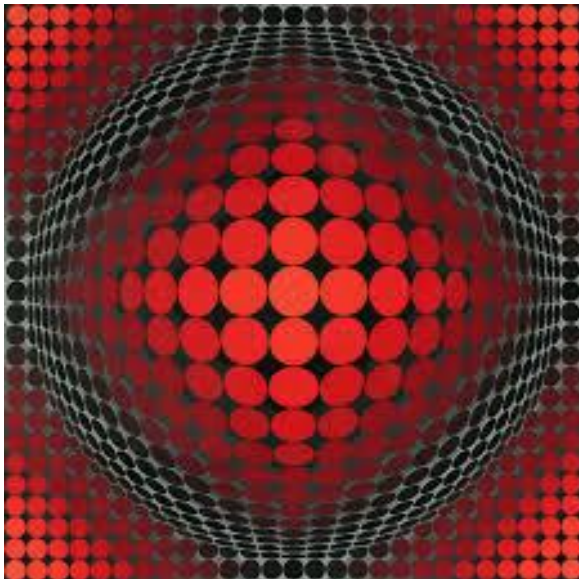
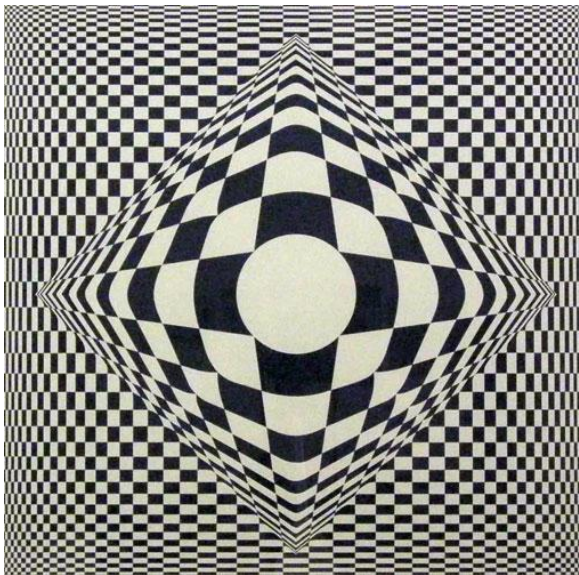
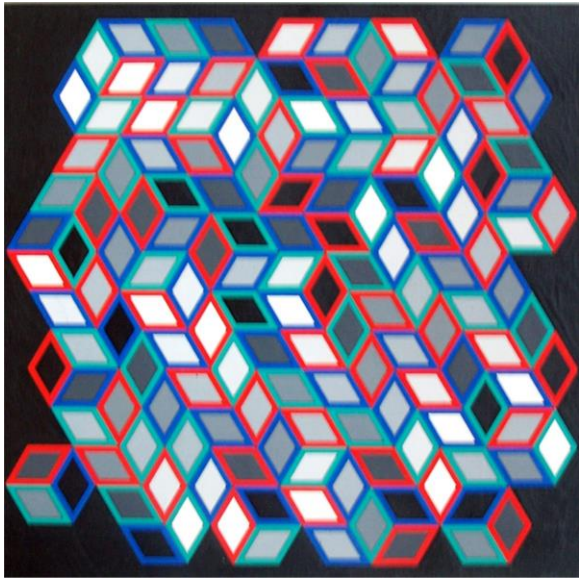
Participants were then presented with nine paintings, which are displayed below. Below each painting was the following questions:

1. How ugly or beautiful do you find this painting? (1 = very ugly, 7 = very beautiful)
2. How familiar are you with this painting? (1 = never seen before, 7 = very familiar)

3. To what extent do you see a pattern in this painting? (If you only see random strokes of paint, answer “1”; if you clearly see a pattern, answer “7”) (1 = not at all, 7 = very much).

Vasarely paintings used:





Chaotic Paintings Condition (Pollock):

Instructions: You will see a total of nine paintings by a modern art painter. All paintings are by the same artist. This artist is well known for his random brush strokes and irregular figures.

For each painting, your task is to briefly look at it, form an opinion of it, and answer three questions about the painting. You do not have to like or dislike a particular painting. There are no right or wrong answers. Just feel free to give us your honest opinion about each painting.

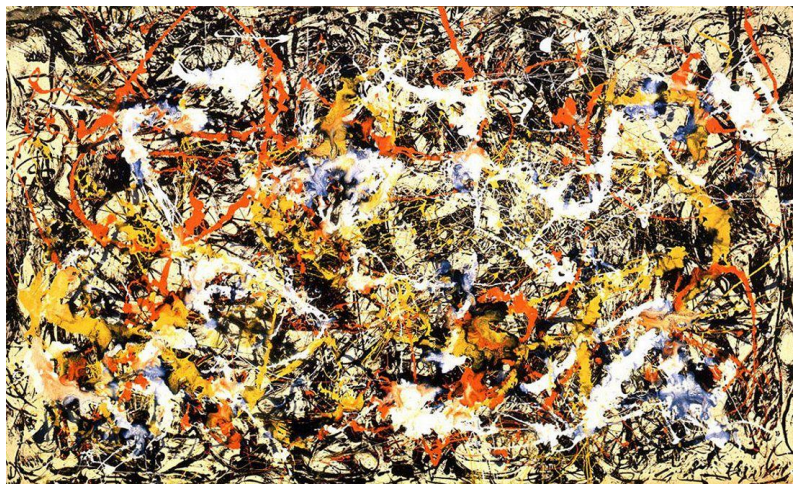
Try not to think too long about each painting; what matters most is your first impression.

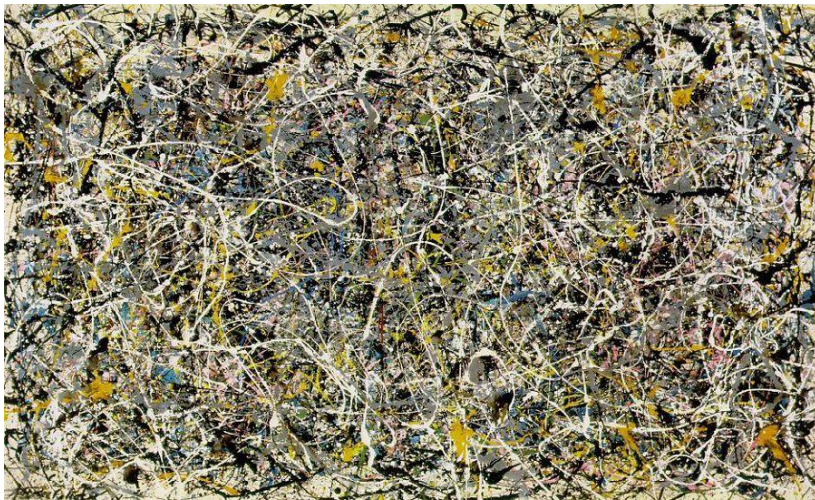
On the next screen, you will start with the first painting.

Participants were then presented with nine paintings, which are displayed below. Below each painting was the following questions:

1. How ugly or beautiful do you find this painting? (1 = very ugly, 7 = very beautiful)
2. How familiar are you with this painting? (1 = never seen before, 7 = very familiar)
3. To what extent do you see a pattern in this painting? (If you only see random strokes of paint, answer “1”; if you clearly see a pattern, answer “7”) (1 = not at all, 7 = very much).

Pollock paintings used:









Pattern Perception (Modified Snowy Pictures Task; Experiment 3 Only)
Whitson & Galinsky (2008)

Instructions: The following task involves visual perception. It is helpful to be able to see objects quickly in spite of their being partially concealed by snow, rain, haze, darkness, or other visual obstructions.

For this task you will be presented with several pictures. These pictures may or may not have an object in them. For each picture you will be asked whether or not you see an object in the presented picture. If you see an object in the picture answer "Yes", if you do not see an object in the picture answer "No." Your score on this test will be the number of pictures you categorize correctly. Work as quickly as you can without sacrificing accuracy.

Participants were then presented with 24 images (each presented on a separate page), which are displayed below. Below each image was the following question:

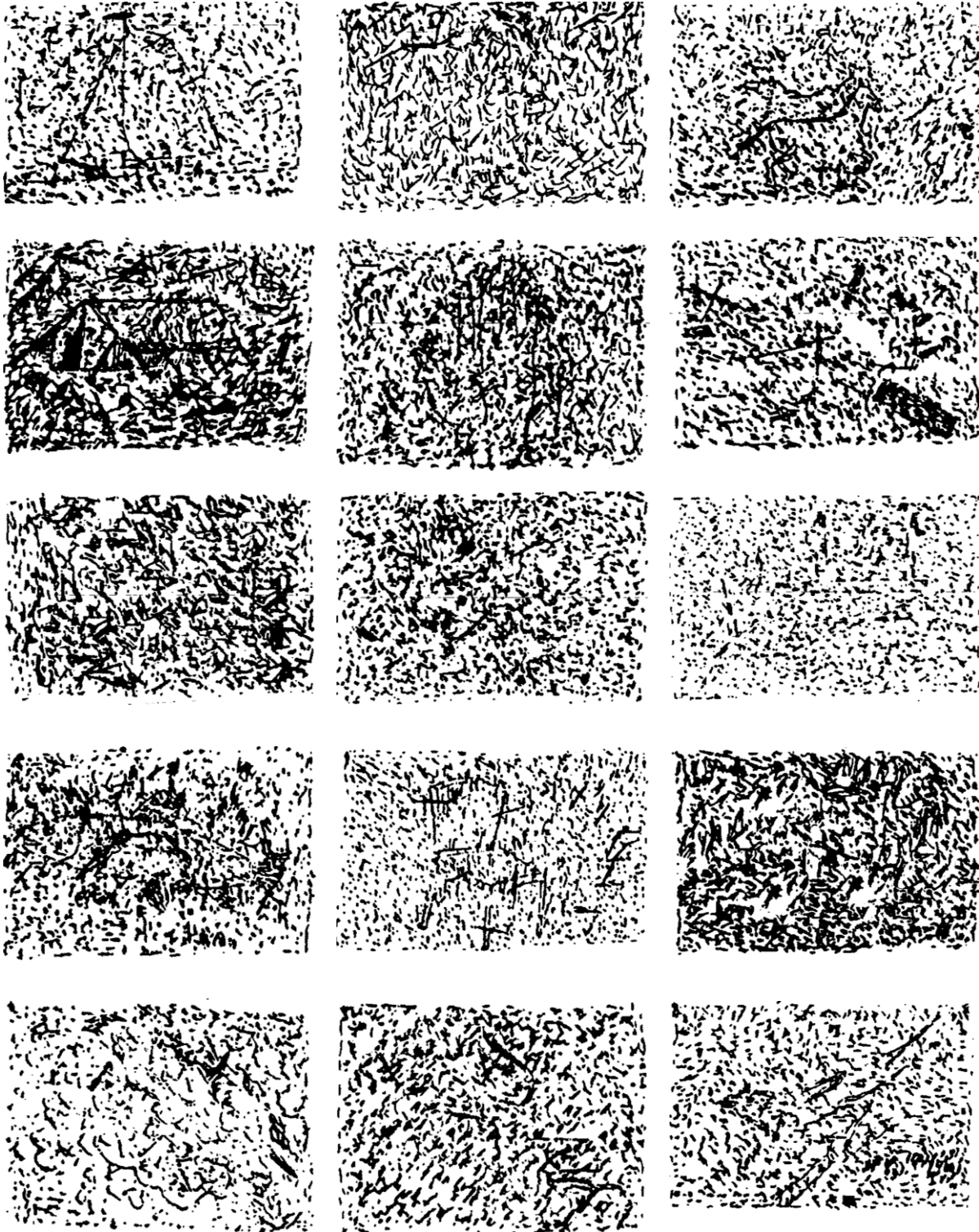
Does the above picture contain an object?

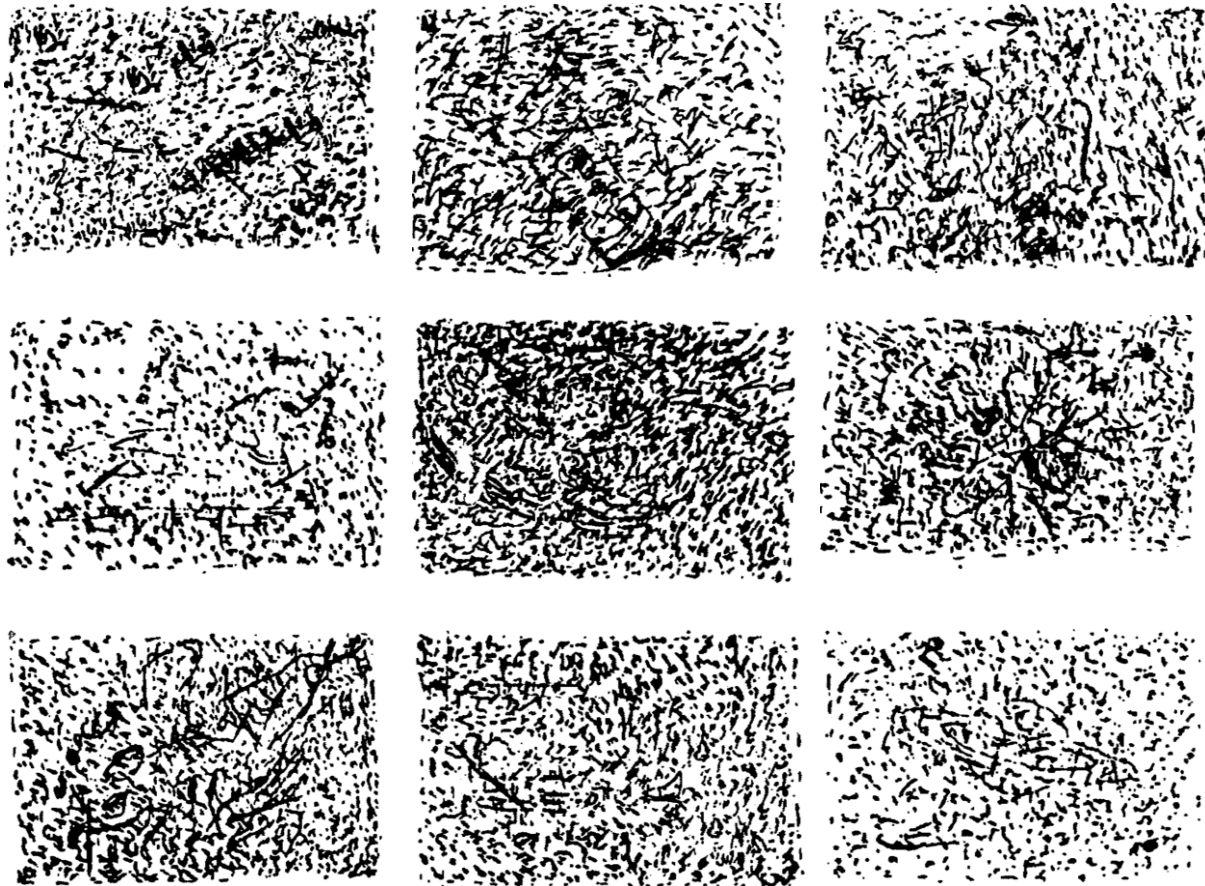
Answer "Yes" if you believe you see an object in the picture above, answer "No" if you do not see an object in the picture above.

Response Options: Yes, No

There is an object in items 1, 3, 4, 5, 6, 10, 11, 17, 19, 21, 22, 24 (numbered left to right and top to bottom). The other items (2, 7, 8, 9, 12, 13, 14, 15, 16, 18, 20, and 23) do not contain an object.

Modified Snowy Pictures Task images used:





Pattern Perception (Co-variation Task; Experiment 3 Only)
White (2003)

Instructions: For the following task imagine you are a doctor investigating patients suffering from a disease (referred to as Disease Y) that involves the appearance of spots on the skin. In the following task you will be examining four possible causes of Disease Y, all of which are food additives (which for this task will be referred to as Additive A, Additive B, Additive C, and Additive D).

For this task you will be given information on various patients with your goal being to investigate the possible link between various food additives and Disease Y.

Page Break

In the following pages you will be presented with information from various patients. Specifically, you will be told whether a patient ate a meal containing a specific food additive and whether a patient suffered from Disease Y.

After viewing the data from several patients you will be asked to assess the extent that a particular food additive causes an increase, decrease, or shares no relation with the occurrence of Disease Y.

Page Break

Below is data evaluating the possible link between Additive (*A, B, C, D*) and Disease Y.

Please keep in mind that this sample of patients is different from the other samples of patients you will/have examined.

Presentation of relevant patient table, see below.

To what extent does Additive (*A, B, C, D*) cause an increase or decrease in the occurrence of Disease Y?

Select a number from +1 to +100 if you believe that Additive (*A, B, C, D*) causes an increase in the occurrence of Disease Y (with greater increases being represented as you move the slider to the right).

Select a number from -1 to -100 if you believe that Additive (*A, B, C, D*) causes a decrease in the occurrence of Disease Y (with greater decreases being represented as you move the slider to the left) .

Select 0 if you believe that Additive (*A, B, C, D*) has no effect on the occurrence of Disease Y.

Response Options: Slider anchored at 0 (No Effect) with scale ranging from -100 (Causes Great Decrease) to 100 (Causes Great Increase).

Patient	Additive A	Disease Y
1	Present	Yes
2	Absent	No
3	Absent	No
4	Absent	No
5	Present	No
6	Absent	Yes
7	Absent	No
8	Present	No
9	Present	Yes
10	Absent	No
11	Present	No
12	Present	No
13	Present	Yes
14	Absent	Yes
15	Present	No
16	Present	No
17	Absent	No
18	Present	No
19	Absent	Yes
20	Absent	No

Patient	Additive B	Disease Y
1	Present	No
2	Absent	Yes
3	Absent	No
4	Absent	Yes
5	Present	Yes
6	Absent	Yes
7	Absent	Yes
8	Present	No
9	Present	No
10	Absent	No
11	Present	Yes
12	Present	No
13	Present	No
14	Absent	Yes
15	Present	No
16	Present	Yes
17	Absent	Yes
18	Present	No
19	Absent	Yes
20	Absent	Yes

Patient	Additive C	Disease Y
1	Present	No
2	Absent	No
3	Absent	Yes
4	Absent	Yes
5	Present	Yes
6	Absent	No
7	Absent	No
8	Present	No
9	Present	Yes
10	Absent	No
11	Present	Yes
12	Present	No
13	Present	Yes
14	Absent	Yes
15	Present	No
16	Present	Yes
17	Absent	Yes
18	Present	No
19	Absent	Yes
20	Absent	No

Patient	Additive D	Disease Y
1	Present	Yes
2	Absent	No
3	Absent	No
4	Absent	Yes
5	Present	Yes
6	Absent	No
7	Absent	No
8	Present	No
9	Present	Yes
10	Absent	No
11	Present	Yes
12	Present	Yes
13	Present	Yes
14	Absent	Yes
15	Present	No
16	Present	Yes
17	Absent	No
18	Present	Yes
19	Absent	Yes
20	Absent	No

Exploratory Analysis: Existing Conspiracy Beliefs Scale (Experiment 1 Only)

In Experiment 1, we collected data assessing participants' existing conspiracy beliefs for reasons that were peripheral to the main objective of the current study and therefore did not discuss the results of any analyses featuring the existing conspiracy beliefs scale in the body of our manuscript. Instead, we report these analyses here (see Table 1).

Table 1

Experiment 1 Supplementary Correlations

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1. Pattern Perception	3.20	1.16	(.86)					
2. BSR	2.31	0.97	.35***	(.93)				
3. Motivational quotations	3.13	0.83	.17*	.49***	(.87)			
4. CRT	1.84	1.47	-.23**	-.37***	-.18*	(.72)		
5. BS Sensitivity (Var2 – Var3)	-0.82	0.91	.21**	.61***	-.39***	-.22**	-	
6. ECB	2.34	0.80	.27***	.28***	.16*	-.31***	.15*	(.84)

Note. Pearson correlations (Experiment 1; $N = 201$). *BSR* = Bullshit Receptivity scale; *CRT* = Cognitive Reflection Test; *BS Sensitivity* = Participants' mean BSR profundity ratings minus their mean motivational quotation profundity ratings; *ECB* = Existing Conspiracy Beliefs scale. Cronbach's alphas reported in brackets. *** $p < .001$, ** $p < .01$, * $p < .05$.

Consistent with past research, we observed a positive association between illusory pattern perception and conspiracy beliefs, $r(191) = .27, p < .001$. That is, the more participants endorsed randomly generated coin flip sequences as determined the more likely they were to endorse various conspiracy beliefs. Additionally, as may be expected, conspiracy beliefs were negatively related to CRT performance, $r(196) = -.31, p < .001$, suggesting that a propensity to engage in

analytic thinking is related to lower levels of conspiracy belief. Lastly, we observed a positive association between bullshit receptivity and conspiracy beliefs, $r(194) = .28, p < .001$, suggesting that those more receptive to pseudo-profound bullshit statements are also more likely to endorse various conspiracy beliefs.

An interesting question is whether the relation between bullshit receptivity and conspiracy beliefs can be explained by the variance these two measures share with illusory pattern perception and cognitive reflection (as measured by the CRT). In an attempt to answer this question we conducted a partial correlation that featured CRT performance and illusory pattern perception (as measured by our Experiment 1 coin sequence task) as covariates. The result of this partial correlation show that including CRT performance and our pattern perception measure as covariates decreases the relation between bullshit receptivity and conspiracy beliefs, $r(187) = .12, p = .097$. Therefore, the results of this partial correlation suggest that much of the relation between bullshit receptivity and conspiracy beliefs may be due to their shared variance with analytic thinking (i.e., CRT performance) and illusory pattern perception.

References

- Pennycook, G., Cheyne, J. A., Barr, N., Koehler, D. J., & Fugelsang, J. A. (2015). On the reception and detection of pseudo-profound bullshit. *Judgment and Decision Making*, 10(6), 549-563.
- Primi, C., Morsanyi, K., Chiesi, F., Donati, M. A., & Hamilton, J. (2016). The development and testing of a new version of the cognitive reflection test applying item response theory (IRT). *Journal of Behavioral Decision Making*, 29(5), 453-469.
- Toplak, M. E., West, R. F., & Stanovich, K. E. (2014). Assessing miserly information processing: An expansion of the Cognitive Reflection Test. *Thinking & Reasoning*, 20(2), 147-168.
- Van Prooijen, J. W., Douglas, K. M., & De Inocencio, C. (2018). Connecting the dots: Illusory pattern perception predicts belief in conspiracies and the supernatural. *European Journal of Social Psychology*, 48(3), 320-335.
- White, P. A. (2003). Effects of wording and stimulus format on the use of contingency information in causal judgment. *Memory & Cognition*, 31(2), 231-242.
- Whitson, J. A., & Galinsky, A. D. (2008). Lacking control increases illusory pattern perception. *Science*, 322(5898), 115-117.