EVALUATION & RESPONSE

(a) Question for Young Reviewer: What is this article about? What did the authors discover?

I thought that this article was very interesting and it taught me a lot about the pre-frontal cortex. Reading that people who have damage to the pre-frontal cortex do not have the same capabilities to communicate with others as a normal person does showed me how important this part of the brain was. I cannot imagine how it would be to not have the basic communication skills that we have. The smallest interactions would be so difficult for those people. This article was well-written and informative.

- How the brain makes you respond to a person appropriate to how that person is
- The purpose of this article was to see if your prefrontal cortex plays a big part in communication skills. To test this a game was created in which two participants are placed in two separate rooms. One participant is the subject who communicates to the other as to where the acorn (target) is. The subject is told that they are going to play with a child and adult alternately, but in reality they are only playing with an adult. The objective of the game is to see if the subject's pre-frontal cortex plays a role in how they communicate. If the subject lingers over the acorn's location for a longer period of time when they are told they are playing against a child, than if they are told they are playing against an adult, we can assume that the prefrontal cortex does play a role in communication. In this experiment, 3 groups were tested: people with no brain damage (Group 1), people with brain damage to the pre-frontal cortex (Group 2), and people with brain damage in other parts of the brain besides the pre-frontal cortex (Group 3). It was found that participants from Group 1 and 3 slowed down their communication when told they were playing with a child, while participants from Group 2 did not change their communication even when told that they were playing against a child. This led to the conclusion that the pre-frontal cortex does play an important role in communication.

(b) Question for Young Reviewer: Why is this discovery important?

- How the brain influences who you are and how you function in society, however subtle.

(c) Question for Young Reviewer: What part of the article did you find the most interesting and why?

- Liked mention of how brain damage leads to differences in thinking and can relate directly to the brain damage.

(d) Question for Young Reviewer: Are the images and figures easy to understand? Did they help you to understand the article better?

• Which part of the prefrontal cortex specifically is responsible for adaptive communication? Call it what it is: the OFC, a subpart of the frontal lobe.

Reply:

A more precise anatomical description would be the "ventromedial prefrontal cortex" (ventral: frontal/belly; medial: middle). There is no consensus on the borders of prefrontal subregions, but this region is indeed often considered anatomically synonymous or overlapping with the "orbitofrontal cortex" (OFC). In the manuscript, I opted for leaving out the ventromedial prefix as it might make the manuscript less accessible to the journal's youngest readers. The original source article is listed at the end of the manuscript so that the anatomical details are directly available to any older or more interested reader. I am hoping the reviewer agrees with this decision but I am happy to change it if both reviewer and editor think the full anatomical description would be more appropriate.

• If a different part of (1) the frontal lobe, or (2) elsewhere in the brain were damaged, how would behavior change (is only one part responsible for this behavior)? Tell us where the control lesion group's lesion was! Which part of the prefrontal cortex specifically is responsible for adaptive communication? If a different part was damaged, how would it change (only a part of the part responsible for this)? What about difference in behavior/communication style? Do we need this region, really?

Reply:

The lesion controls were selected on the basis of having brain damage that did not involve the prefrontal cortex. They had damage to temporal (on the side), occipital (in the back), or parietal (on top) areas of the brain. I now mention these details in the manuscript:

"… patients with damage elsewhere in the brain (the so called 'lesion controls', who had damage to temporal, occipital, or parietal areas of the brain) …"

Unlike the prefrontal patients, the lesion controls did produce communicative adjustments, suggesting that brain damage in general is not sufficient for obstructing adaptive communication. In the original source article, we describe a separate search analysis that highlighted the most medial aspect of the prefrontal cortex as the most important region for adjusting communication to a social partner. The specificity of the medial part is further supported by another study that was also discussed and cited in the present manuscript (Beer et al., Journal of Cognitive Neuroscience, 2006). That study showed that patients with medial but not lateral prefrontal damage displayed socially awkward communication. To date, we know from neuroimaging work that other brain

regions such as the right temporal lobe are also involved during communication but the necessity of those regions is yet to be determined.

• In traumatic brain injuries, is this area at risk (mainly concussions)?

Reply:
The prefrontal cortex is more vulnerable to injury from trauma than any other brain region (Levin et al., Journal of Neurosurgery, 1987). Possibly this is because the frontal lobes may impact and/or undergo friction from the orbital plate of the frontal bone under forceful movement.

• Is there a specific region even within the OFC?

Reply:
The OFC is a large frontal brain region with subregions including the medial and lateral OFC. These regions can be further divided depending on whether one looks at postmortem tissue structure ("cytoarchitectonics"), fiber tracts, connectivity with other brain regions, or functional activation. The latter, for instance, has consistently shown that the ventromedial prefrontal cortex is involved during social but also complex memory tasks.

• In the chart in Figure 3: it shows that prefrontal patients are adjusting in the reverse direction for kids? Why?

Reply:
Unfortunately, averages in general are not always an ideal representation of an effect. Namely, three of the eight prefrontal patients spent slightly longer on the location of the acorn when interacting with the presumed adult addressee. This effect, however, was not consistent across the group as assessed with a statistical test. The same statistical test, in contrast, showed that the communicative adjustments made by the control groups (to the presumed child addressee) were consistent across both groups.

• The paper said that prefrontal is needed to guide communication in the moment; does that mean a little slower it is able guide or let them know if it was right or wrong? if so, is it possible to give some sort of training to make it more in the moment? Also, maybe we can train other parts of the brain to make up for this? do people with damage to the prefrontal cortex know they are acting differently?

Reply:
In the Beer et al. study mentioned above, the prefrontal patients were unaware of the social inappropriateness of their behavior, only to recognize it as so when watching videotapes of it afterwards. This suggests that their knowledge of what is socially appropriate and what is not is still intact. Yet, their prefrontal damage seemingly

obstructed them from using that knowledge to guide their actions. This is what was meant with "in the moment" but given that this label gives the impression of a time component, I no longer include it in the manuscript.

(e) Question for Young Reviewer: Was any part of the article confusing? Which part? Were there words that were hard for you to understand?

• Add Fig 1 of Phineas Gage with presumed lesion reconstruction. Show in experiment that patients actually had a lesion in the same place.

Reply:
I have added a figure (Fig 1) showing Phineas Gage holding the iron rod that penetrated this forehead, as well as a drawing of the rod's potential trajectory.

• Fig 2/Methods (original Fig 1): game was a little confusing, but overall the logic of 2 players and beliefs made sense; would help to include visual depiction of timing differences in addition to supplemental movie.

Reply:
I agree with the reviewer that it is not intuitively clear that the communicative adjustments shown in Fig 4 were made at game board locations containing the acorn such as shown in Fig 2. To emphasize this link, I have added the sublabel "Difference in time spent with the bird on the location of the acorn" to Fig 4. And to give another feeling for the bird movements, I have placed translucent versions of the bird along its trajectory on the game board in Fig 2.

• Fig 3 (Fig 2): Add B of the other lesion group, with text describing how the damage does not overlap with the OFC group.

Reply:
As outlined above, I now include a short statement regarding the locations of the control group's brain damage.

• Fig 4 (Fig 3): great.

(f) Question for Young Reviewer: Are there any questions you would like to ask the authors about why they did what they did?

• OFC, lesion group, task (see above)

(g) Question for Young Reviewer: Do you think the reading level is correct for you? If no, would it be better for a younger or older reader?

Yes.