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Neurophysiological Effects of Childhood Sexual Abuse in Adult Men

Exploring the Feasibility & Developing the Methods

Abstract

Little to no research has investigated how childhood sexual abuse (CSA) affects memory and emotion in adult men, despite the fact that many men experience CSA (Homma et al., 2012; Saewyc et al., 2013). It is known that maltreatment during childhood often results in many challenges for the individual, such as the way they think, feel, and interact with others (Gabowitz, Zucker, & Cook, 2008). As such, this study will compare the brain functioning of men with a history of sexual abuse who also have Post-Traumatic Stress Disorder (PTSD), men who had CSA but do not have PTSD, and healthy men without a history of abuse or PTSD.

Methods: Forty adult males (30 with CSA - with or without PTSD, and 10 controls) will undergo questionnaires and brain imaging using magnetic resonance imaging (MRI). They will have a structural MRI scan required as well as functional MRI (fMRI) scans. fMRI will quantify the blood flow in the brain of participants as they perform an emotional working memory task.

The results will show how sexual abuse in childhood and PTSD symptoms are associated with memory and emotion in males. It will also give more information on the differences between the specific effects that sexual abuse has on brain function, as opposed to the effects of PTSD and other types of childhood abuse.

Introduction

When developing the methods of a study, it is important that the tasks used actually measure what is being investigated. It is also important to tailor the tasks to the population being studied, especially when it is a vulnerable or clinical population. Failure to do either will result in a set back in schedule at best, or an inability to run the experiment at worst.

As this experiment plans to work with men who have experienced sexual abuse, some of which who also have PTSD, the feasibility of the original study design must be explored.

One of the tasks to be performed in the fMRI is the emotional memory N-Back. This task requires the participant to watch a series of images, and indicate when they have seen the same image that was shown two images before. The emotional component lies in the type of images shown. Three categories of images from the International Affective Pictures System (IAPS) are used: negative, neutral, and positive images. These photographs should elicit the corresponding emotion, thus engaging the person's emotional memory. Whether or not images for the general population can be used with the population of this study needs to be investigated.

Another aspect of the emotional N-Back task is whether or not it can measure what is of interest. The hypothesis of the study is that those with PTSD would have impaired memory with the negative images, and have no significant difference for neutral or positive images in comparison to those without PTSD. As such, the task must be able to show that there is a difference between negative emotional memory and neutral/positive emotional memory.

Methods

Emotional N-Back Task

Initial image selection for the emotional N-back is shown on the first row in Figure 1 below. The original images were taken from a previous study that worked with 18 year-old females. After the pilot study, these images proved to be problematic for men with CSA. In the examples below, the image intended to be neutral using an older man's face would likely have a negative connotation to the participants. Similarly, the intended positive image of a baby boy may also have negative connotations. Changes were made to be more sensitive and specific to the participants, so the images did not interfere with the purpose of the task.

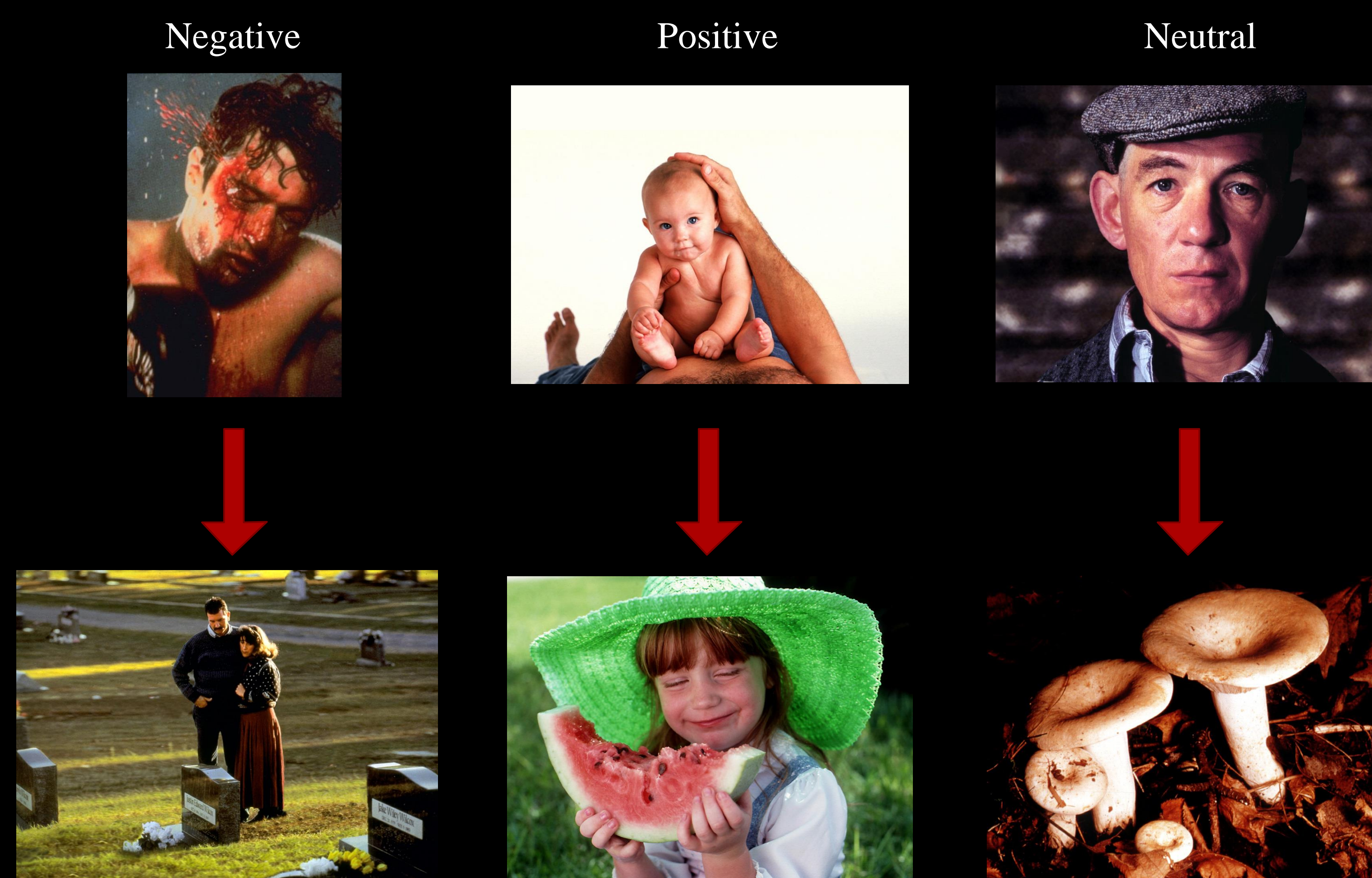


Figure 1. Changes made to the images used in the emotional memory N-Back task. Top row shows the original pictures to be used, while the bottom row shows the change in pictures deemed more suitable for the specific population being investigated.

Preliminary Results

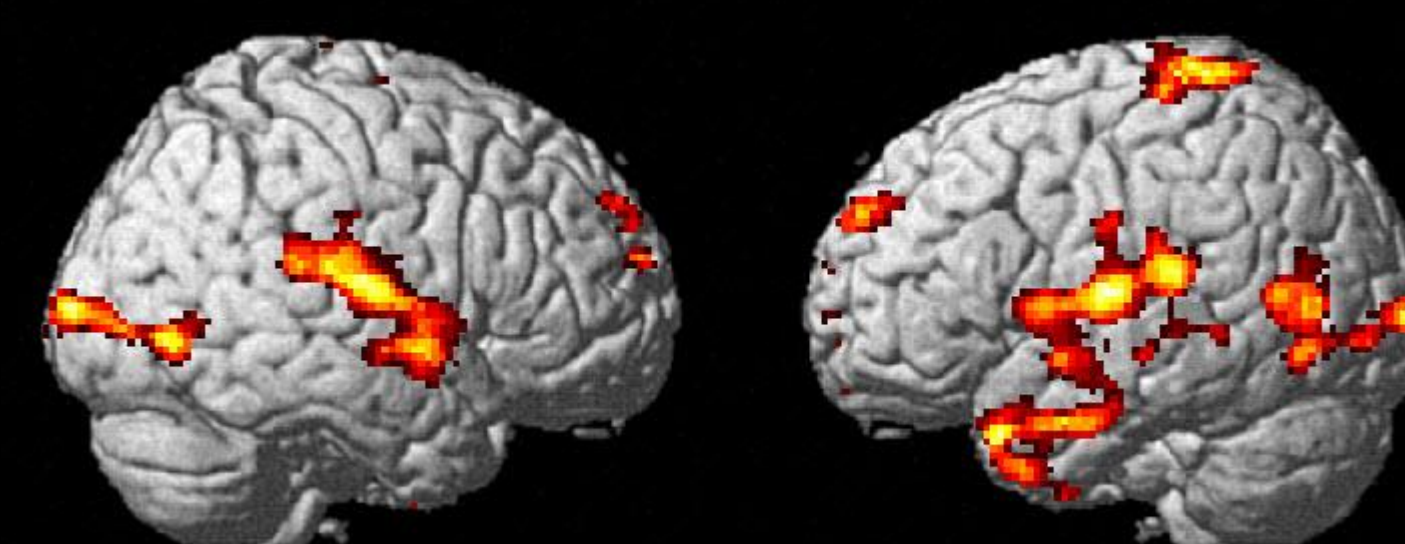


Figure 2. Regions of the brain in the pilot test that show more activation during the negative condition than the positive condition.

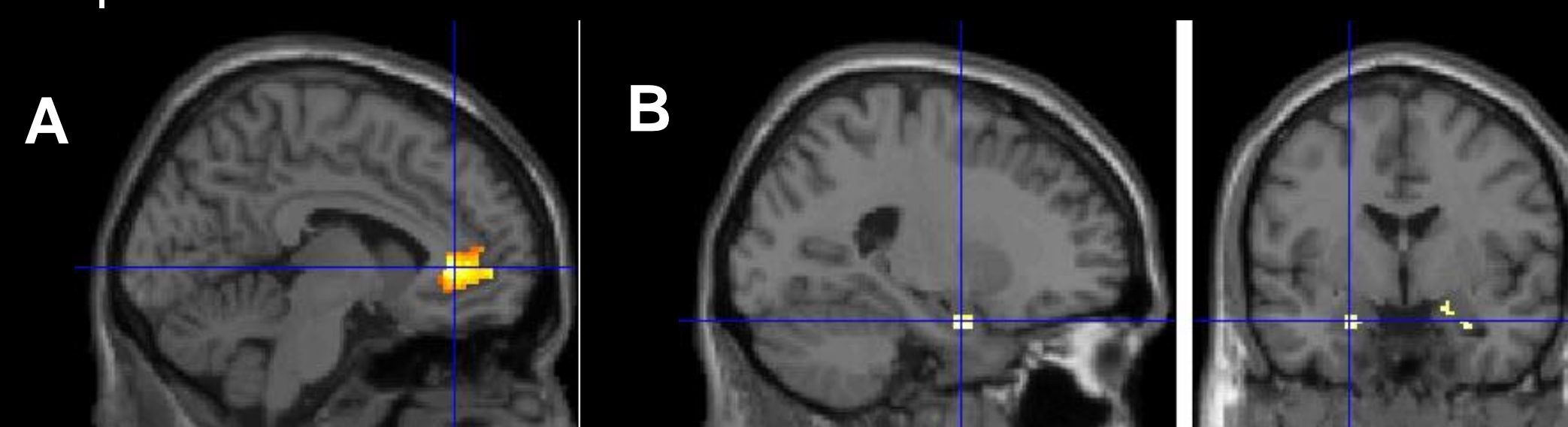


Figure 3. Regions of interest that were more active during the negative condition compared to the positive condition. 3A shows the Anterior Cingulate Cortex, while 3B shows bilateral Amygdala activity.

- Figures 2 and 3 taken were from the pilot study involving one healthy male control, and the original image selection was used during the task.
- Figure 2 shows that multiple areas in the brain show more activation during the negative condition compared to the positive.
- The Amygdala is known to play a role in emotions, particularly negative emotions, and reacts to aversive stimuli. As seen in Figure 3B, there is more activity in the amygdala during the negative condition.
- The Anterior Cingulate Cortex (ACC) also showed more activity, as seen in Figure 3A. The ACC is known to play a role in decision making, and this increased activity in the negative condition may be due to negative emotions interfering with the task; thus, increased ACC activity is required to overcome the interference provided by the negative images.

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Conclusion and Discussion

Overall, it is feasible to run this study using the emotional N-Back task to see if emotional memory differs between men having had CSA and now with PTSD and men without PTSD. The N-Back task can differentiate between types of emotional memory; this is important, since if it could not, then there would be no way to test whether only negative emotional memory was affected and not positive or neutral memory.

It is important to note that while the pilot test suggests feasibility, it consisted of only one person. Ideally, having a group average of brain activity is more valid. With just one person, we cannot be sure whether the brain activity is unique to that person or whether most people will exhibit similar results. Further piloting is required.

Another note is that the new image selection was not tested on the PTSD population. Thus, it is not confirmed whether the new series will be as effective in eliciting a difference between the different emotional memories.

References

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