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The Physical Impact of Emotions and Psychological Disorders on the Brain

One of the least understood parts of the human body is the brain. Although extensive and continuous research has been conducted to uncover more of the mysteries behind the workings of the various parts of the brain, there is still quite a way to go. One of these mysteries is the science behind how exactly psychological issues arise and the exact ways in which they affect each part of the brain. Because of the gaps in knowledge behind these topics, brain-based therapy for psychological issues has remained largely unexplored. This is where one recent neurological study comes in.

Using fMRI (functional magnetic resonance imaging), an imaging method used to examine brain activity by detecting changes in blood flow within the brain, researchers measured brain activity in 183 people in response to a sequence of different photographs. Half of these images were categorized as “negative,” depicting things such as injuries and vehicular accidents. The other half were “neutral,” depicting everyday scenes and random objects. Participants were tasked with viewing a photo for seven seconds and then rating their emotional reaction on a five-point scale (five being heavily negative and one being completely neutral) after each photo. With these results in hand, researchers were able to create a neural signature called PINES (Picture Induced Negative Emotion Signature) that accurately predicted the way that around 94% of the participants reacted to the photos. A neural signature is essentially a predictive model of the brain’s psychological process, built using machine learning algorithms. While the PINES was not able to accurately predict reactions 100% of the time, it was more accurate than more than five other previously created similar neural signatures.

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One of the most intriguing findings from this study came with the division of PINES into several distinct subregions, each involved in a different function (vision, memory, etc.) as they are in a human brain. Researchers ran tests using each subregion to again predict responses to the photos, with every region on it’s own predicting less accurately then PINES as a whole. This seems to imply that no specific one portion of the brain is singularly responsible for negative emotion, going against the tradition belief that the amygdala and the insular cortex alone are almost solely responsible for these emotions. While this discovery on its own is not life-altering, it has much to offer in the furthering the development of more nuanced and potentially effective treatments or tests for psychological disorders.

In order to utilize this information for said treatments or tests, more research must be conducted on the identification of biomarkers of mental health disorders. In this context, biomarkers are characteristics measured as indicators of normal biological processes, or biological responses to exposure, intervention, or therapy. For example, EEG testing (a test that measured electrical activity in the brain using metal disks attached to the scalp) has shown differences patterns found in patients with depression. Research on these biomarkers is still in the fairly early stages, but further investigation could help researchers find consistent ways of identifying psychological disorders through brain scans.

Works Cited

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I chose this topic because I am very interested in neuroscience and the relationship between mental illness and physical changes in the brain. I never got much of a chance to explore these topics in previous school classes, so I wanted to take this opportunity to do a little bit of research into it. I hope this is sufficiently biology related, I tried to connect it all as much as I could.