

## **Brain Mechanisms Underlying Emotional Response in Social Pain. Football as a Proxy to Study Fanatism: An fMRI Study**

### **PURPOSE**

In this study, we aimed to explore the brain mechanisms underlying positive and negative social stimuli in football fanatics during positive and negative social scenarios and deepen the neural substrate of football-related emotional responses as a proxy of fanaticism.

### **METHODS AND MATERIALS**

Forty-three healthy male volunteers who support Chilean football teams were recruited for this fMRI study. Participants were divided into two groups, 22 supporters of the Colo-Colo team and 21 supporters of the Universidad de Chile team. All participants were presented with a compilation of football matches containing 63 goals, and their brain activity was registered in a Siemens 3T SKYRA, during the visual stimulation of score annotations to rivals and from rivals. We also apply a football supporters' fanaticism scale (FSFS) in order to determine the fanaticism level for each participant.

### **RESULTS**

The results demonstrate that the brain activity was different when the goals come or go to the most emblematic rival, which we termed the "emotional delta." In the winning scenarios, subcortical activation was observed, specifically in the ventral striatum, caudate, and lentiform nucleus. These areas are important for the reward dopaminergic circuit, inducing pleasure sensations. The mentalizing network was activated for the losing scenario. This mentalizing network strategy could be involved to mitigate the adverse result's pain. Simultaneously, a deactivation was observed at the dACC, which connects the limbic system with the frontal association regions that command normative behavior, decreasing cognitive control and increasing the probability to fall into disruptive or violent behavior. Both, mentalizing network and dACC correlate with FSFS, negatively and positively respectively.

### **CONCLUSIONS**

Football is an excellent social affiliation model, promoting inclusivity, teamwork, community spirit, social change, and personal achievement. Still, the gregarious component could be the reason behind acts of violence and vandalism. Our study provides new inputs for future research on different fanaticism expressions, which is crucial for promoting a more equitable and inclusive society.

### **CLINICAL RELEVANCE/APPLICATIONS**

Social affiliation is a crucial requirement for complex social phenomena. Fanaticism is extreme or excessive devotion or enthusiasm towards a particular cause, belief, or opinion. It often involves blind and unquestioning loyalty to a particular ideology or leader, and a refusal to consider other perspectives or opinions. Fanaticism can lead to intolerance, aggression, and even violence toward those who do not share the same beliefs or views. In this sense, our study proposes a new model for studying complex behaviors like fanaticism.