Insula Connectivity during Narratives Predicts Willingness to Donate to a Cause

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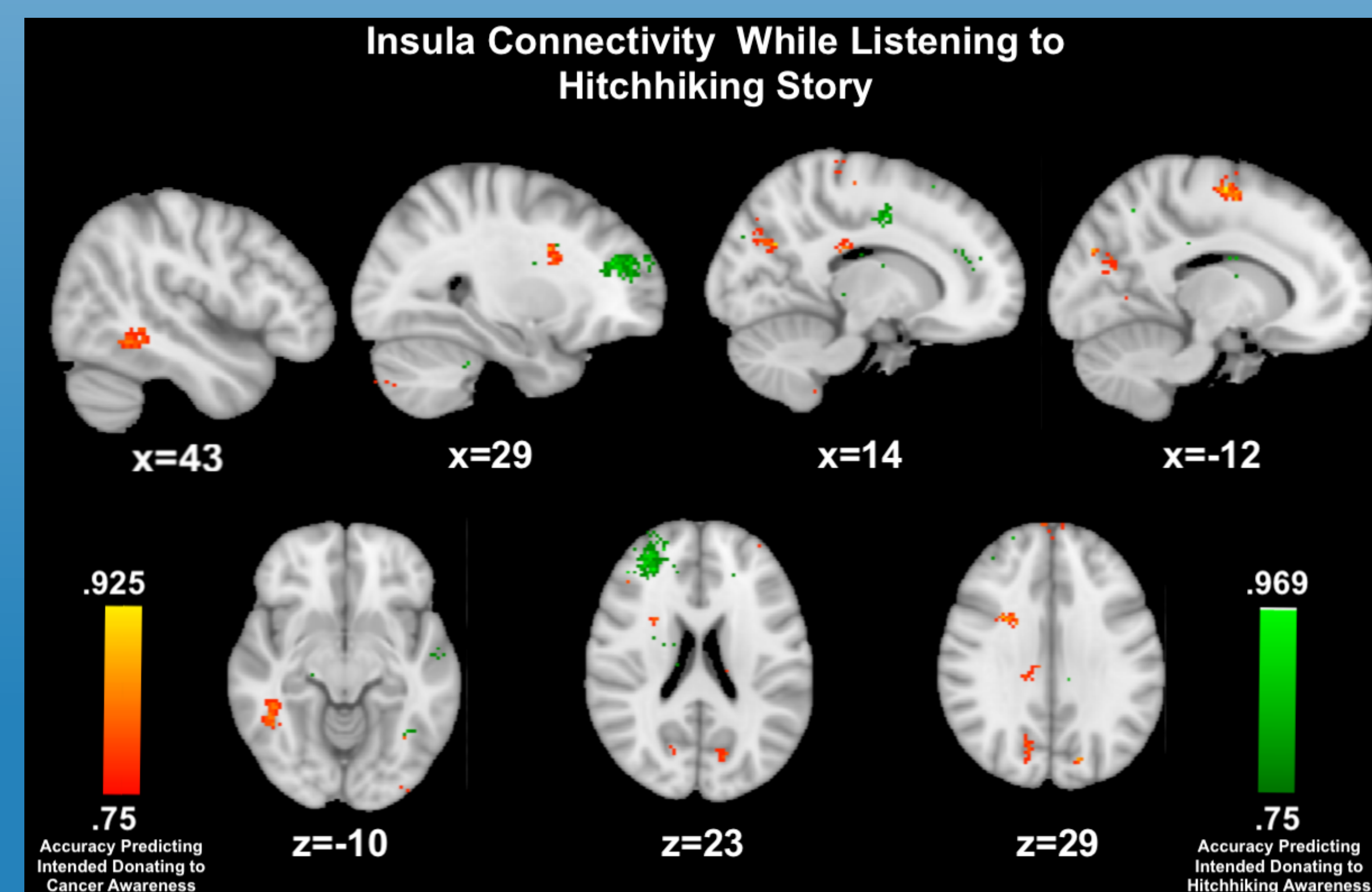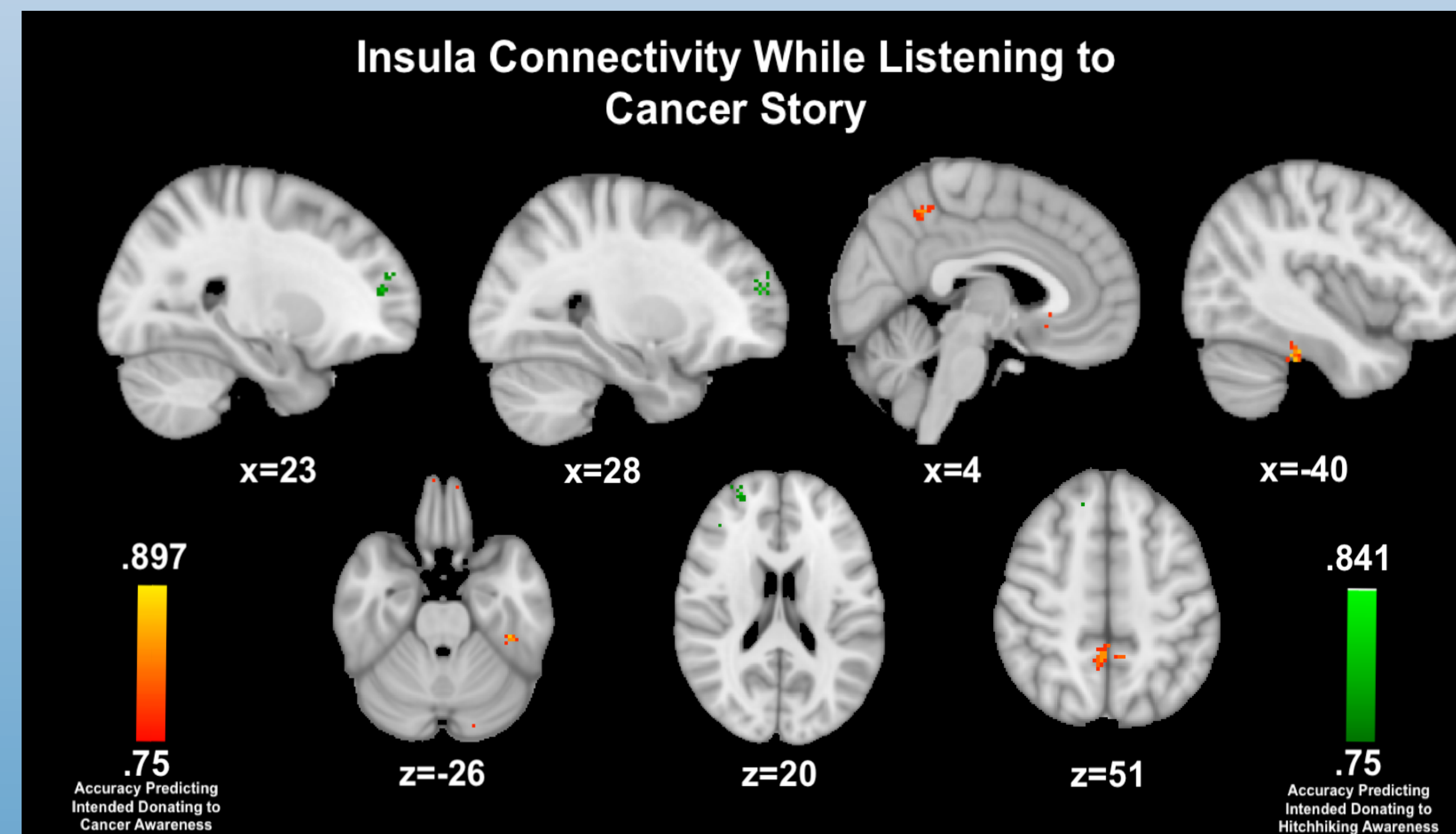University of Southern California

Background

Engaging with narratives involves a complex array of cognitive and affective processes, and can influence pro-social decision-making. The insula may play an important role in pro-sociality given its function in processing feelings from the body, and thus, may participate in narrative influence on prosocial behavior. In this study, we performed neuroimaging while participants listened to personal stories obtained from podcasts as stimuli and investigated whether the narratives' impact on functional connectivity could predict whether an individual would be willing to donate to relevant causes.

Methods

45 right-handed subjects were scanned with fMRI for the study. In the scanner subjects listened to two stories from popular podcasts, one involving watching a stranger die of cancer and another involving children hitchhiking and nearly getting kidnapped. After removing subjects for excessive motion and incorrect story comprehension, 36 subjects remained for analysis. After the scan, subjects were asked on a scale from 1 to 5 how willing they were to donate $5 to both a cancer awareness campaign and a hitchhiking dangers campaign for youths.

Analysis

An anterior insula functional connectivity (fc) map was generated for each subject during both stories using a seed region correlation approach. These individual whole-brain fc maps were used for searchlight MVPA with a 5mm sphere size. For each story two searchlight analyses were run, one discriminating between people above vs. below mean willingness to donate to cancer awareness, and the other discriminating for hitchhiking awareness. In each sphere, a support vector machine was trained on data from all subjects leaving out one in each cross-validation fold. For statistical thresholding, we performed permutation testing by shuffling the map labels inside a sphere. Permutation testing yielded a threshold of .75% accuracy corrected for multiple comparisons using Bonferonni correction for the number of independent spheres in the map.

Insula Connectivity While Listening to Cancer Story

x=23   x=28   x=4   x=-40

.897
Accuracy Predicting Intended Donating to Cancer Awareness

z=-26   z=20   z=51

.841
Accuracy Predicting Intended Donating to Hitchhiking Awareness

Insula Connectivity While Listening to Hitchhiking Story

x=43   x=29   x=14   x=-12

.925
Accuracy Predicting Intended Donating to Cancer Awareness

z=-10   z=23   z=29

.969
Accuracy Predicting Intended Donating to Hitchhiking Awareness

Cancer Story Results

Reported willingness to donate to cancer awareness was predicted by insula connectivity with small clusters in the precuneus (83.3%) and in the posterior fusiform gyrus (86.1%) while listening to the cancer story.

The reported willingness to donate to hitchhiking awareness was predicted by insula connectivity with a cluster in the anterior prefrontal cortex (83.3%).

Hitchhiking Story Results

Reported willingness to donate to hitchhiking awareness was predicted by a prominent cluster of insula connectivity to the anterior prefrontal cortex (86.1%) while listening to the hitchhiking story.

The reported willingness to donate to cancer awareness was predicted by insula connectivity to clusters in precentral gyrus (91.6%) precuneus (88.8%) and superior temporal gyrus (83.3%).

Conclusions

While insula connectivity during story listening was predictive of reported intentions to give to charity, it was not predictive in a story-specific manner. Functional connectivity while listening to the cancer story was not only predictive of reported willingness to donate to cancer but also to hitchhiking, and the same was true of functional connectivity while listening to the hitchhiking story. This may suggest that these patterns of connectivity are not representative of connecting with the story's content, but rather of a more general empathetic process related to stable personality traits that vary across people.