ABSTRACT

Interoception, the ability to detect internal bodily cues, is involved in emotion. The hemispheric contribution toward these abilities remains unclear. Semantic dementia with predominantly left (i.e., left-SD) or right (i.e., right-SD) anterior temporal lobe atrophy provide an opportunity to study the hemispheric involvement of these abilities. Here, we used established tasks of interoception and emotion in left-SD (n = 8), right-SD (n = 6), and controls (n = 21). We found worse interoception in right-SD only. Worse emotion recognition was predicted by a diagnosis of right-SD, left-SD, and worse interoception. Our neuroimaging analyses confirmed a common neurobiological basis for interoception and emotion in the right hemisphere, including the insula and thalamus. Our study highlights the role of interoception in emotion recognition and suggests that interoception may represent a potential biomarker of disease progression.
BACKGROUND

- The hemispheric contributions toward interoception, the perception of internal bodily cues, and emotion recognition remains unclear.
- Semantic dementia cases present with either left-dominant (i.e., left-SD) or right-dominant (i.e., right-SD) anterior temporal lobe atrophy.
- Both left-SD and right-SD experience difficulties with emotion recognition, to varying degrees.
- Only one study to date has shown impaired interoception in left-SD, associated with the right insula, amygdala, and anterior cingulate cortex.
- No study has investigated interoception in right-SD, despite the pathological changes in the right hemisphere in this syndrome.

AIMS

This study investigated interoception and emotion in left-SD and right-SD. We hypothesised right-SD would show worse interoception and emotion recognition, associated due to right hemisphere involvement.
METHODS

Participants
Healthy Controls: N = 21  Left-SD: N = 8  Right-SD: N = 6

1. Interoception/Exteroception tasks
- Two 2-minute tasks, with simultaneous ECG recorded
- Participants responded via button press:

Exteroception – “when you hear the recorded heartbeat”

Interoception – “when you feel your heartbeat”

Task accuracy
- Mean distance (md) index
- Frequency of event compared with frequency of response
- Lower md index = better performance

2. Emotion recognition task
Facial Affect Selection Task (FAST)

Participants matched the face to the verbal label, e.g.,
“Point to the happy face”
42 stimuli: Happy, sad, fear, disgust, anger, surprise and neutral

3. Neuroimaging
- Structural MRI T1 collected
- Voxel-based morphometry (VBM) analyses used to identify neural correlates of interoception and emotion.
SUMMARY

- **Worse interoception** in right-SD than left-SD & controls (both $p$’s < .001)
- Predictors of worse emotion recognition included diagnosis of right-SD ($p = .002$), left-SD ($p = .005$), and **worse interoception** ($p = .004$)

**RESULTS**

Figure 1. Performance between groups on (A) Interoception, (B) Exteroception, (C) Emotion recognition, and (D) Scatterplot between emotion recognition and interoception. *$p < .05$; **$p < .01$; ***$p < .001$
Worse interoception involved reduced integrity of structures such as the right insula, temporal gyrus (superior and middle), thalamus, hippocampus, and temporal pole.

Worse emotion recognition involved reduced structural integrity of widespread frontal and temporal brain regions, such as the orbitofrontal cortex and amygdala.

Both worse interoception and emotion recognition involved reduced structural of the right insula, temporal pole, hippocampus, thalamus, temporal fusiform cortex.

Note. All contrasts are in patients and controls combined and are reported voxelwise uncorrected for multiple comparisons, $p < .001$, $t(31) > 3.37$. 
CONCLUSION

- Our study is the first to show interoceptive deficits in right-SD patients, providing further evidence for impairment in this dementia syndrome beyond the domain of language.

- Whilst both left-SD and right-SD showed impaired emotion recognition, difficulties connecting with the body may represent a candidate mechanism for emotion recognition difficulties in right-SD patients.

- Our neuroimaging results support the role of the right hemisphere in interoception and emotion recognition, with key structures such as the right insula, temporal pole, hippocampus, and thalamus involved in both processes.

- Longitudinal studies of interoception are needed to understand when interoceptive deficits arise in the disease course.

REFERENCES

@_JLHazelton  jessica.hazelton@sydney.edu.au