



Love, Emotions, and the Highly Sensitive Brain

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1. What is Sensory Processing Sensitivity?

Sensory Processing Sensitivity

Sensory processing sensitivity is one of two behavioral strategies seen in over 100 species (Wolf et al., 2009):

Observing carefully before acting

versus

Being the first to act

Responsive, reflective, reactive, sensitive

versus

Impulsive, low reactivity



Sensory Processing Sensitivity

Traits of highly sensitivity individuals:

- ▶ process information more deeply
- ▶ Sensory/environmental sensitivity
- ▶ aware of subtleties
- ▶ more easily overstimulated/aroused
- ▶ “spiritual”
- ▶ vulnerable to depression and anxiety
- ▶ Prone to “pause to check” in a novel situation



Implications for Emotional Responses

- High SPS individuals showed stronger emotional reactions to learning they had done very well or very poorly on an aptitude test.
(Aron, Aron, & Davies, 2005)
- “Inhibited” adolescents showed greater neural activity in reward centers when they believed their selection of an action would lead to a reward.
(Bar-Haim et al., 2009)
- In interpersonal contexts, individuals high on SPS report having strong responses to others’ moods.
(Aron & Aron, 1997)

Research Questions

Self-report studies have shown that high-SPS individuals are strongly affected by others' moods.

Is there neural evidence of HSPs responsivity to others' emotions, specifically a partner?

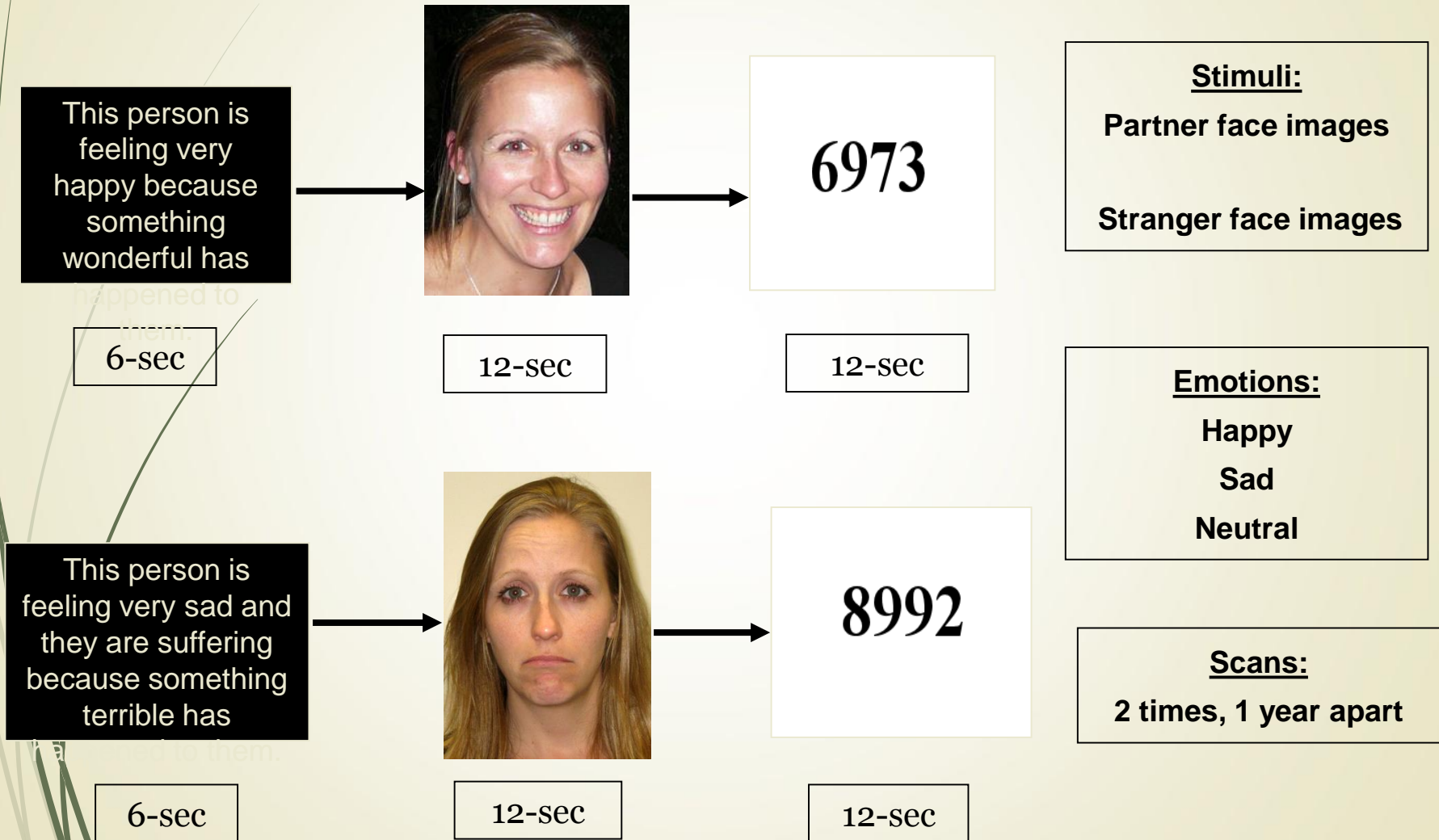
If so, can this shed light on the nature of SPS and its function?



Sample

- 18 individuals (10 women) soon-to-be or recently married (both partners first-time marriage)
- Ages 21-32 (M age= 27.50, SD = 3.13)
- Relationship length (M = 5.88, SD = 2.88)
- Most were college-educated
(M years of education = 16, SD = 1.09)

fMRI Design

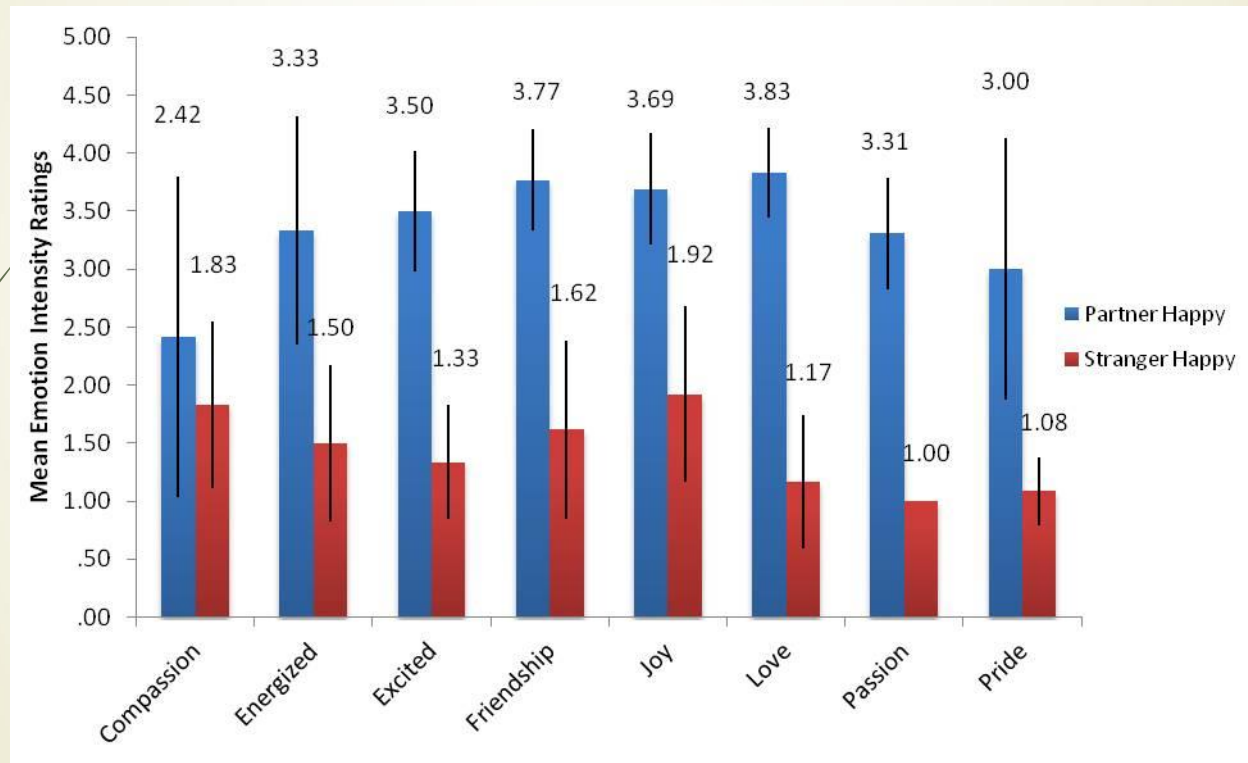


Highly Sensitive Person (HSP) Scale

(Sample Items)

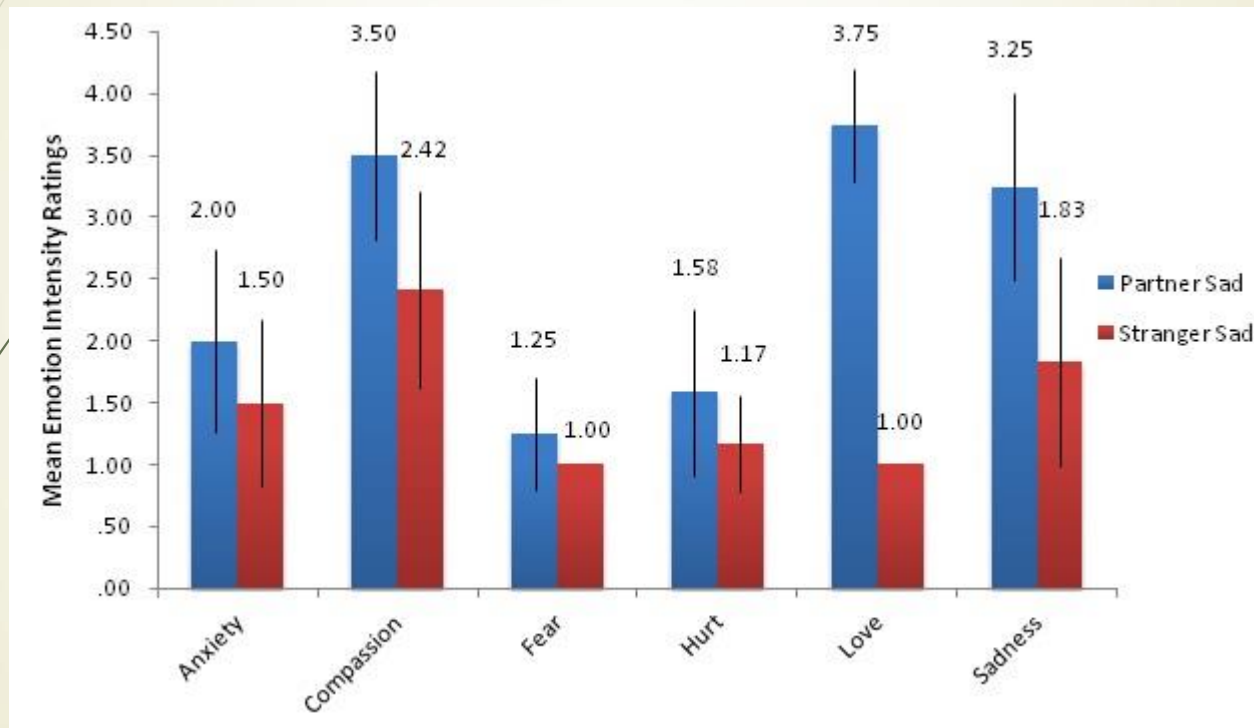
- ▶ Do you find it unpleasant to have a lot going on at once?
- ▶ Do you find yourself needing to withdraw during busy days, into bed or into a darkened room or any place where you can have some privacy and relief from stimulation?
- ▶ Are you easily overwhelmed by things like bright lights, strong smells, coarse fabrics or sirens close by?
- ▶ Are you bothered by intense stimuli, like loud noises or chaotic scenes?
- ▶ Do other people's moods affect you?
- ▶ Are you made uncomfortable by loud noises?
- ▶ Are you annoyed when people try to get you to do too many things at once?
- ▶ When you must compete or be observed while performing a task do you become so nervous or shaky that you do much worse than you would

HSPs: Stronger Responses to Partner-vs-Stranger Happiness



Acevedo, Aron, Aron, Collins, Sangster, & Brown, 2014, *Brain and Behavior*
(Findings are for T2)

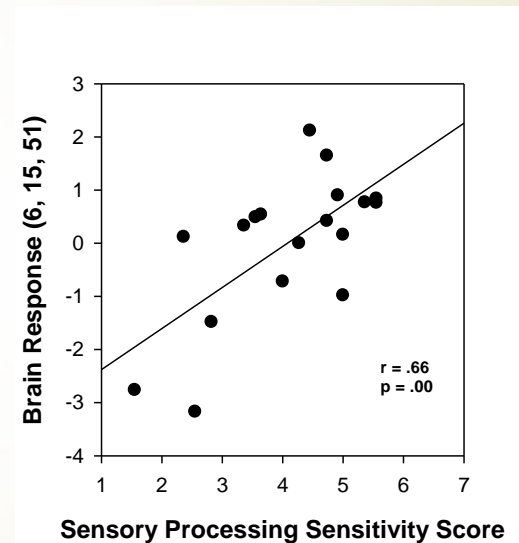
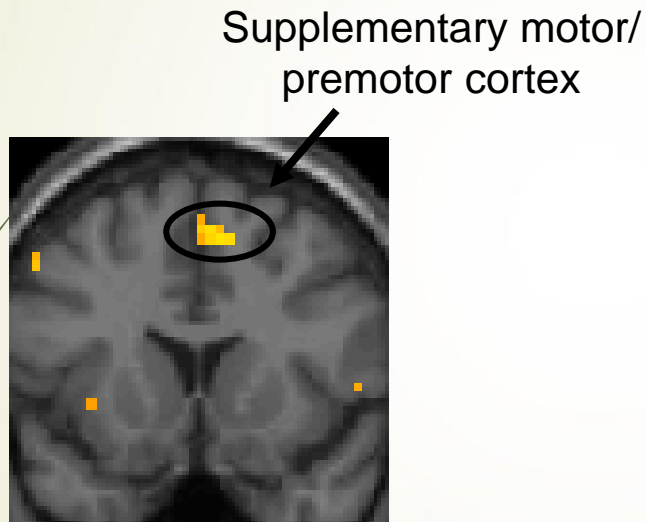
HSPs: Stronger Responses to Partner-vs-Stranger Sadness



Acevedo, Aron, Aron, Collins, Sangster, & Brown, 2014, *Brain and Behavior*
(Findings are for T2)

SPS and Neural Activity for Happy and Sad, Partner & Stranger

(Across all conditions)

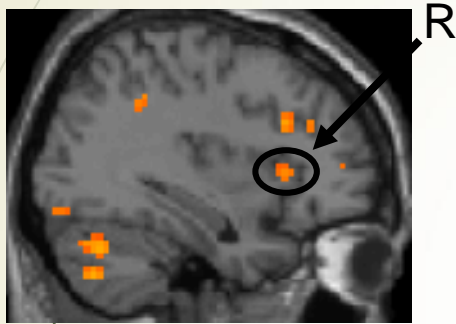


Premotor area: unconscious behavioral control and action planning

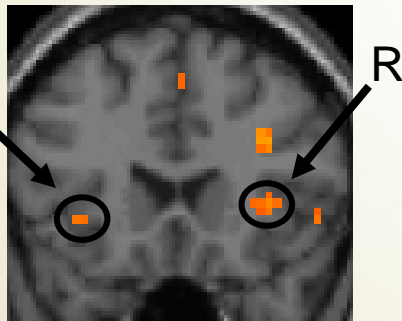
(Cross, Hamilton, & Grafton, 2006)

SPS and Empathy: Anterior Insula (AI) Activation

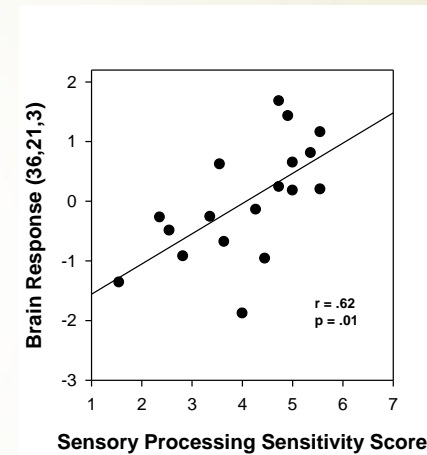
Seen for partner and stranger
happy conditions



A. Activation of R Anterior Insula

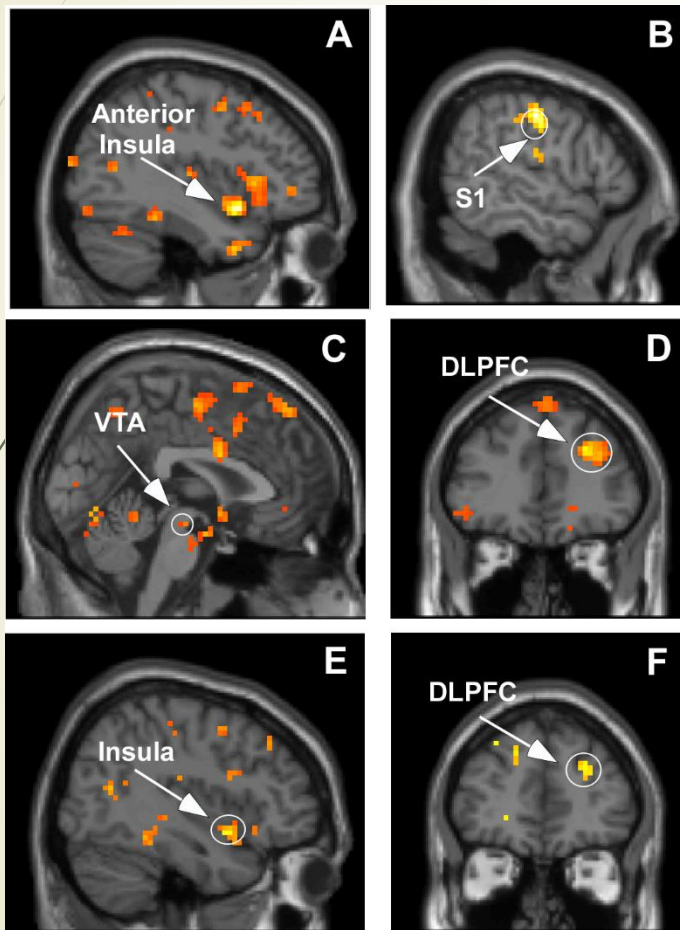


B. Activation of L and R Anterior Insula



- Emotion processing
- Feeling states represented in internal organs.
- Consistently found in studies of empathy.

HSPs: Stronger Emotional to Partners' Happiness and Sadness



P Happy-vs-S Happy

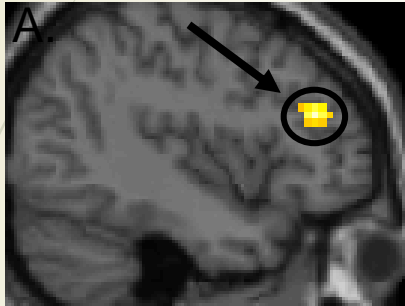
- A. AI: also seen for SHappy-Neutral and PHappy-Neutral
- B. Primary somatosensory cortex
- C. VTA: reward
- D. DLPFC: cognition

P Sad-vs-S Sad

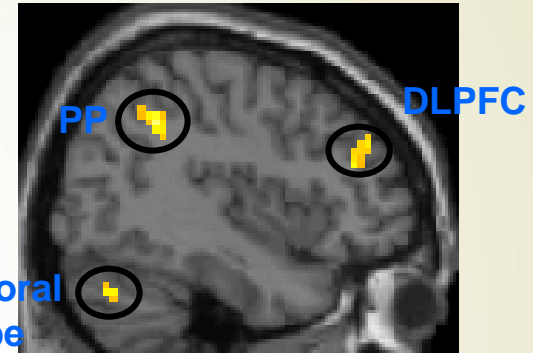
- E: Insula: empathy and moment to moment awareness
- F: DLPFC: cognition and perspective-taking

SPS: DLPC Activation to Partners

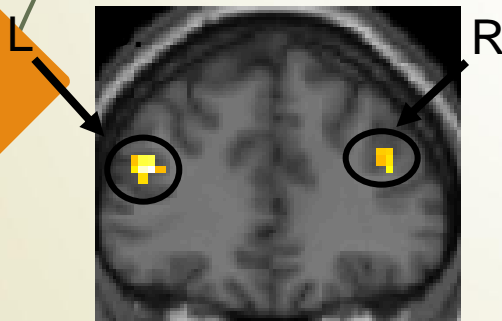
Seen for most partner conditions



A. Activation of R Dorsal lateral Prefrontal Cortex (DLPFC)



C. Activation of DLPFC, Posterior parietal (PP), and temporal lobe



B. Activation of DLPFC

DLPFC: cognitive processing, decision-making complex tasks
May reflect greater depth of processing

Temporal lobe – theory of mind and reflection

SPS: Greater Depth of Processing in Response to Others' Emotions

- 1. Across all conditions: Premotor areas – action planning and unconscious behavioral control**
- 2. MTG activation (Happy & Sad P and S vs Neutral; and Partner-vs-Stranger Sad): area that is a semantic hub for processing language, visual objects, and emotional meaning-making**
- 3. Cingulate: area where motor control, drive, and cognition interface; seen in empathy meta-analysis**

Greater attention, integration, and readiness to respond to the others' needs.

SPS: Greater Integration of Others' Emotional States

4. Insula/Anterior insula: moment-to-moment awareness, empathy, integrating feeling states in internal viscera

5: Mirror Neuron System: responds in the same way when we observe an action as when we perform it



HSPs “feel” what others feel.

Collaborators



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Thank You!

MRI tech and Research Assistants

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