

Brain Network: Applications

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Outline


- ➔ Applications to Cognitive Science
- Applications to Brain Disorders

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Rumination

Rumination (反刍思维/过度思考)

Repetitive thinking about negative personal concerns and/ or about the implications, causes, and meanings of a negative mood



Susan Nolen-Hoeksema
 (1959 – 2013)



Features


- Self-perpetuate
- Recycled
- Long-lasting

Nolen-Hoeksema et al., 2008. Perspect Psychol Sci


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Rumination and MDD

Rumination



Depression

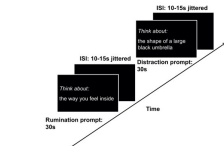


Rumination is not only a defining feature, but also a risk factor for MDD

Koster et al., 2011. Clinical Psychol Rev

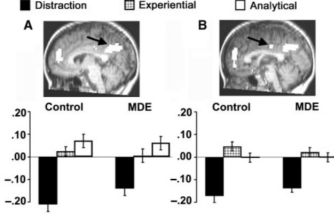
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Rumination and task-fMRI: DMN



Rumination
 "Think: Why these things happen to me?"

Distraction
 "Think: A big black umbrella"

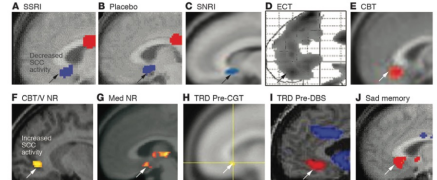


Johnson et al., 2009. SCAN

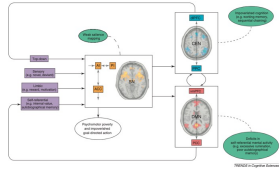
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From locality to network

Locality: subgenual anterior cingulate cortex (sgACC)

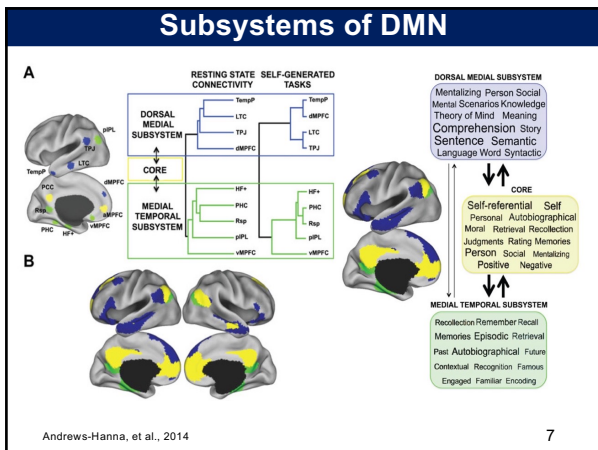


Network: triple networks

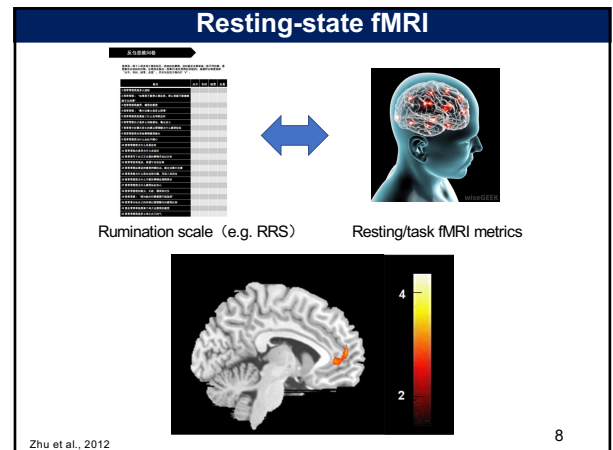


Mayberg, 2009; Menon, 2011. Trends in Cognitive Sciences

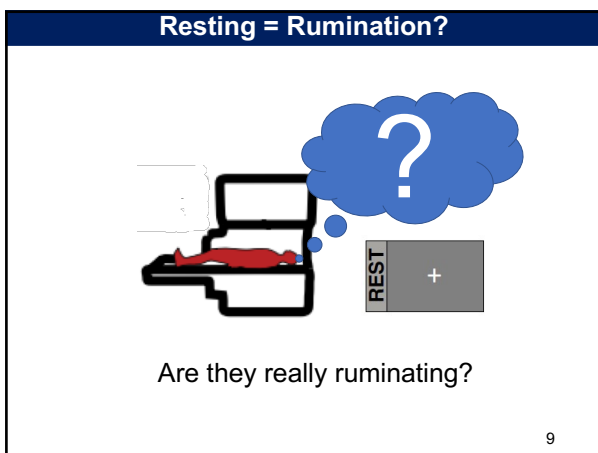
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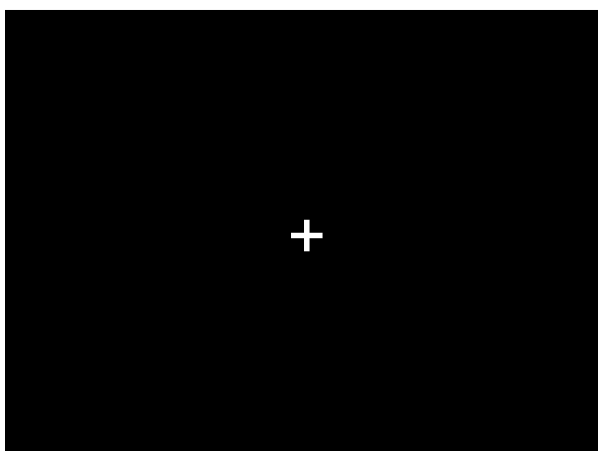
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Rumination state

- A subject-driven, relatively long period of mental state
- Continuous and dynamic thinking style following the instructions

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想一想：

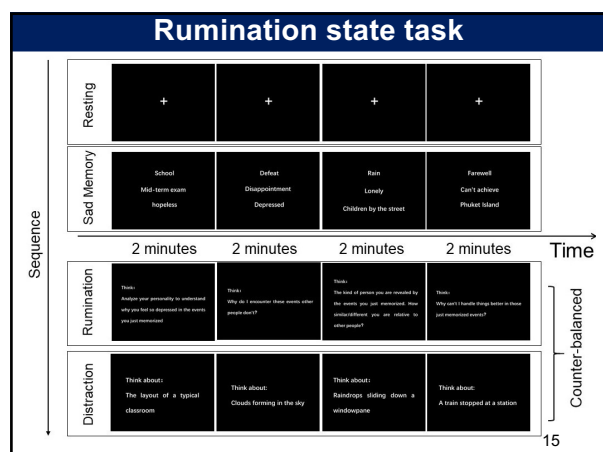
为什么这些事情偏偏发生在我的身上？

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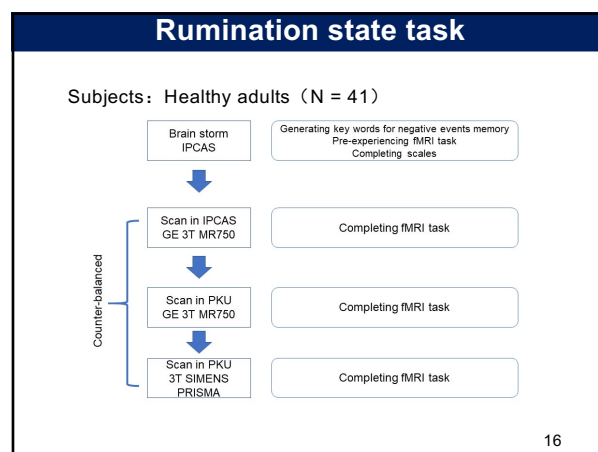
想一想：

天空布满云彩

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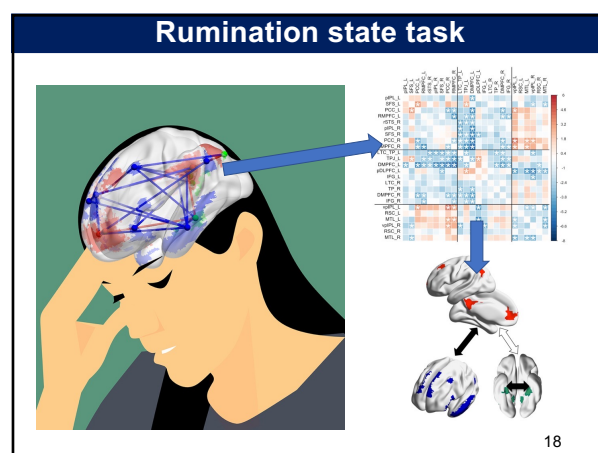
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Rumination state task

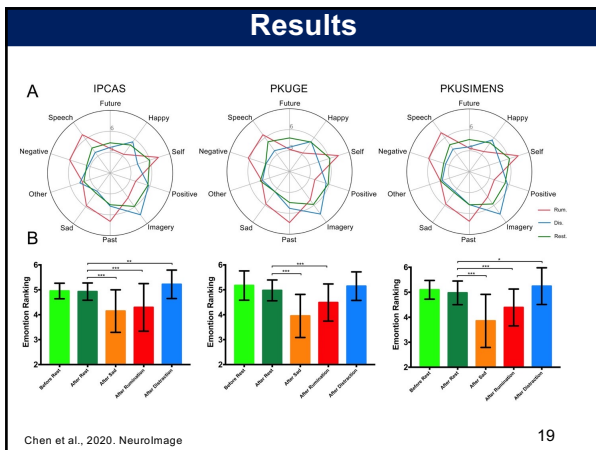
1. 我刚才的思维内容是关于过去的事情。
2. 我刚才的思维内容是关于以后的事情。
3. 我刚才的思维内容是关于我自己的。
4. 我刚才的思维内容是关于他人的。
5. 我刚才的思维内容是正性的、积极的事件。
6. 我刚才的思维内容是负性的、消极的事件。
7. 我刚才以图像或意象的形式进行思维。
8. 我刚才以内部言语的形式进行思维。
9. 刚才的思维漫游让我感到开心。
10. 刚才的思维漫游让我感觉悲伤。

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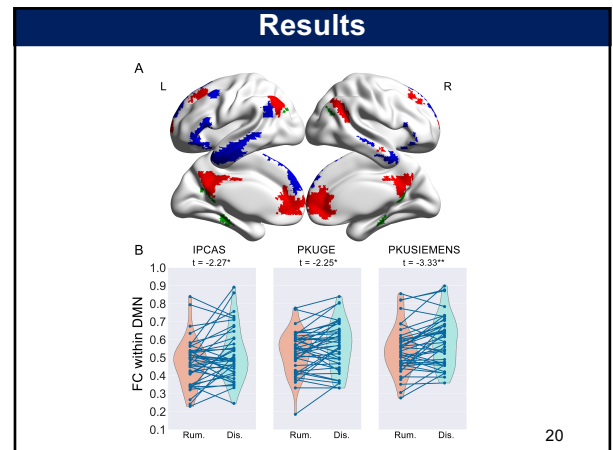
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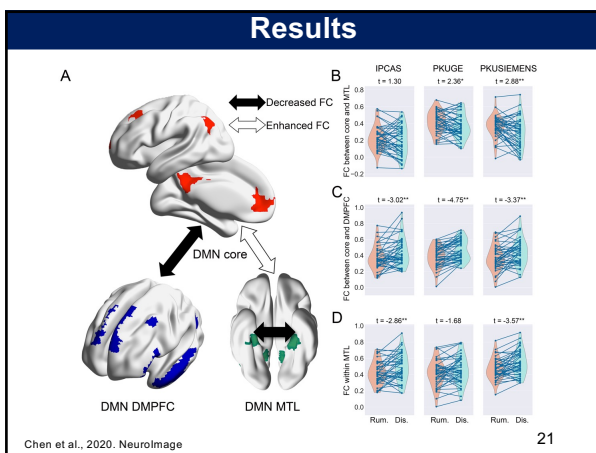
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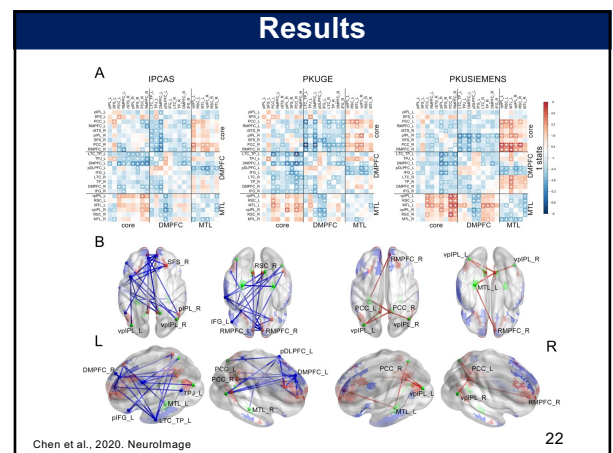
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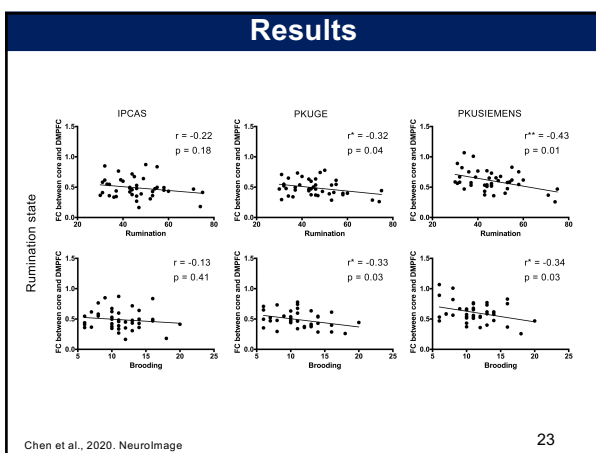
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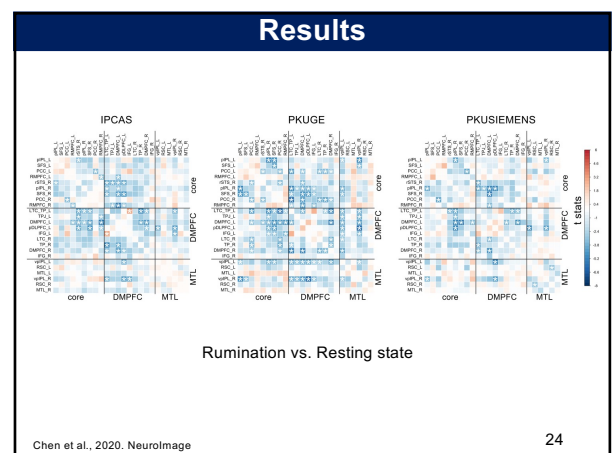
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Key findings

- DMN shows decreased connectivity during induced rumination
- Rumination increases the core-MTL subsystem FC
- Rumination decreases the core-DMPFC subsystem FC and the within-MTL subsystem FC
- Results can be reproduced across 3 different scanners

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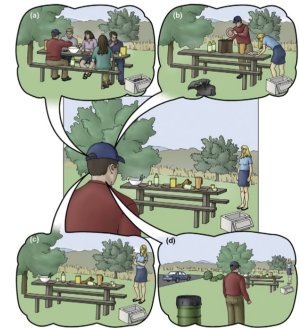
DMN: functions



Randy L. Buckner

- Remembering the past
- Projection
- Navigation
- Theory of mind

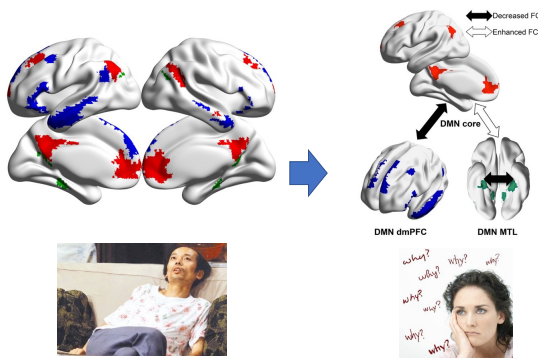
So-called "internal mentation"



Buckner and Carroll, 2006

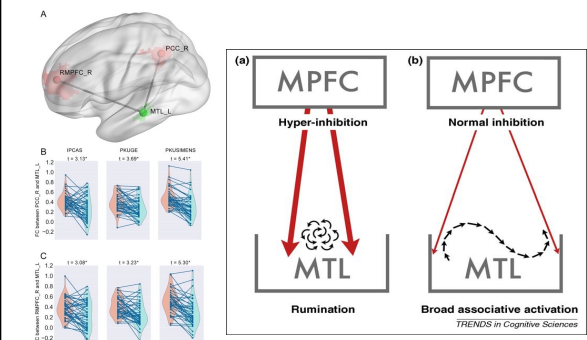
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A specific DMN pattern underlying rumination



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Discussion



Bar, 2009. Trends in cognitive sciences

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Applications to Depression

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DOI: 10.1002/nbm.25391

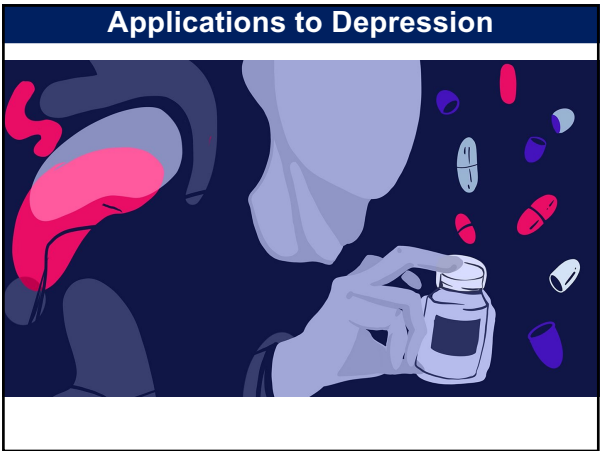
RESEARCH ARTICLE

WILEY

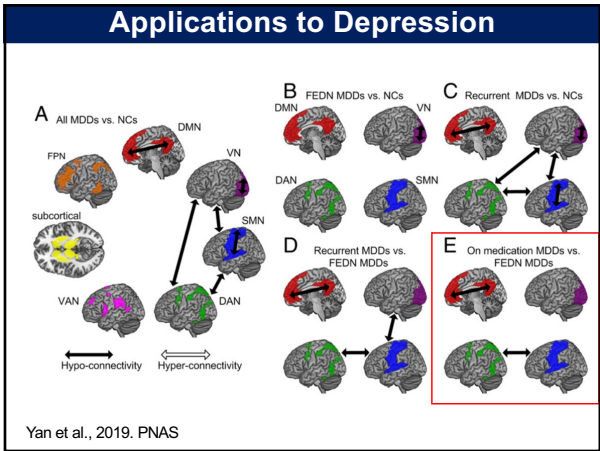
Eight-week antidepressant treatment reduces functional connectivity in first-episode drug-naïve patients with major depressive disorder

Le Li^{1,2} | Yun-Ai Su³ | Yan-Kun Wu³ | Francisco Xavier Castellanos^{4,5} | Ke Li⁶ | Ji-Tao Li³ | Tian-Mei Si³ | Chao-Gan Yan^{1,7,8,9}

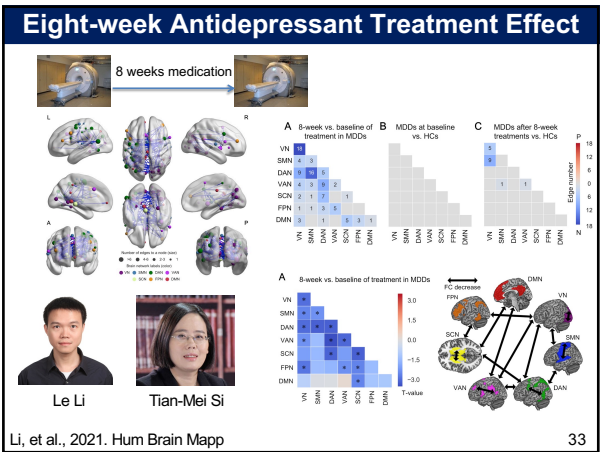
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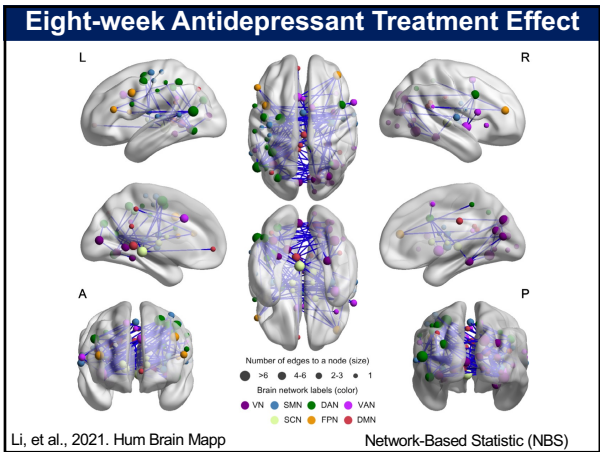
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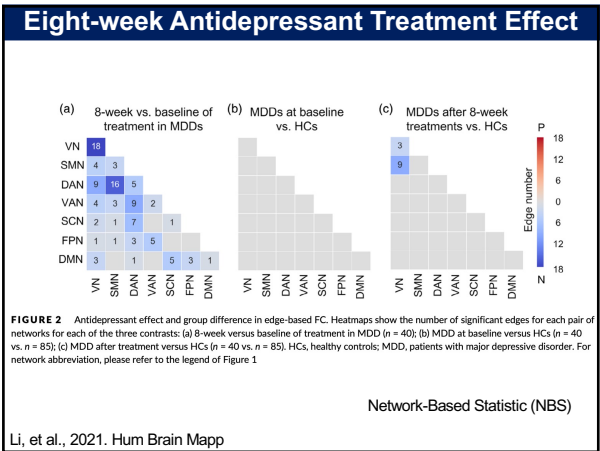
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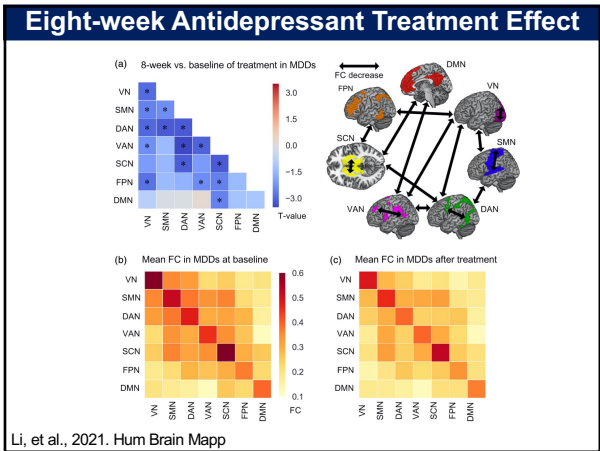
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Eight-week Antidepressant Treatment Effect

	VN	SMN	DAN	VAN	SCN	FPN	DMN
VN	-2.93 [*]						
SMN	-2.55 [*]	-2.32 [*]					
DAN	-2.98 [*]	-3.17 [*]	-3.17 [*]				
VAN	-2.34 [*]	-1.44	-3.44 [*]	-3.04 [*]			
SCN	-2.09	-1.52	-3.11 [*]	-2.13	-3.15 [*]		
FPN	-2.79 [*]	-1.43	-1.60	-2.37 [*]	-2.59 [*]	-1.48	
DMN	-0.83	-0.11	-0.11	0.24	-2.55 [*]	-1.25	-1.13

Note: T values of paired-sample T tests are shown.
Abbreviations: DAN, dorsal attention network; DMN, default mode network; FPN, frontoparietal network; VAN, ventral attention network; VN, visual network; SCN, subcortical network; SMN, somatosensory network.
^{*}Significant after False Discovery Rate correction to $p < .05$ (two-tailed) among seven within-network and 21 between-network connections.

Li, et al., 2021. Hum Brain Mapp

Further Help



The R-fMRI Course V3.0

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<http://rfmri.org/Course>



The R-fMRI Journal Club



Official Account: RFMRILab

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Thanks for your attention!