

Curriculum Vitae  
**Ryan Smith, Ph.D.**

Contact Information

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Research Interests/Goals

I am interested in the neural, cognitive, and computational basis of interactions between interoception, emotion, and decision-making. More specifically, I am interested in how interoceptive/emotional states influence the computational processes underlying prospective planning and information-seeking under uncertainty. I am also interested in the role of distinct conscious vs. unconscious aspects of these mechanisms. Using predictive processing models of perception and both reinforcement learning and active inference models of decision-making, I aim to characterize how emotions promote both proximal vs. distal planning processes and strong vs. weak information-seeking drives, and how these influences may become maladaptive within affective and substance use disorders – with the hope of identifying mechanisms that could represent novel treatment targets.

Education

2012 - 2015	University of Arizona Major: Psychology (Cognition & Neural Systems Program) Minor: Philosophy Degree: PhD Advisor: Richard Lane Dissertation title: Disambiguating the roles of select medial prefrontal subregions in conscious and unconscious emotional processing	Tucson, AZ
2014 - 2015	University of Arizona Major: Philosophy Degree: MA Advisor: Jenann Ismael	Tucson, AZ
2010 - 2012	University of Arizona Major: Neuroscience Degree: MS Advisor: Richard Lane Thesis title: Antidepressant effects of sertraline associated with volume increases in dorsolateral prefrontal cortex	Tucson, AZ
2007 – 2010	Arizona State University	Phoenix, AZ

Major: Psychology  
Degree: B.S., Summa Cum Laude

## Employment

2022-Present	Laureate Institute for Brain Research & University of Tulsa Research Associate Professor & Principal Investigator	Tulsa, OK
2019-2021	Laureate Institute for Brain Research Associate Investigator	Tulsa, OK
2018-2019	University College London Visiting Fellowship Lab of Dr. Karl Friston	London, UK
2016-2018	Pima Community College Adjunct Teaching Faculty	Tucson, AZ
2015-2018	University of Arizona College of Medicine, Department of Psychiatry Postdoctoral Fellow Lab of Dr. W.D. "Scott" Killgore	Tucson, AZ
2012-2015	University of Arizona Psychology Graduate Program Graduate Research/Teaching Assistant	Tucson, AZ
2010-2012	University of Arizona Neurosciences Graduate Program Graduate Research Assistant	Tucson, AZ
2009 - 2010	Barrow Neurological Institute Neuropsychology/ Neuroimaging Lab Assistant Researcher	Phoenix, AZ
2007-2008	Barrow Neurological Institute Neuro-Oncology Lab Assistant Researcher	Phoenix, AZ

## Research Experience

2022-Present	Laureate Institute for Brain Research Principal Investigator	Tulsa, OK
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2019-2021	Laureate Institute for Brain Research Associate Investigator	Tulsa, OK
2018-2019	University College London Visiting Fellowship Lab of Dr. Karl Friston	London, UK
2015-2018	University of Arizona College of Medicine, Department of Psychiatry Postdoctoral Fellow Lab of Dr. W.D. "Scott" Killgore	Tucson, AZ
2012-2015	University of Arizona Psychology Graduate Program Graduate Research Assistant Advisor: Richard Lane	Tucson, AZ
2010-2012	University of Arizona Neurosciences Graduate Program Graduate Research Assistant Advisor: Richard Lane	Tucson, AZ
2009 - 2010	Barrow Neurological Institute Neuropsychology/ Neuroimaging Lab Assistant Researcher Advisor: Dr. Leslie C. Baxter	Phoenix, AZ
2007-2008	Barrow Neurological Institute Neuro-Oncology Lab Assistant Researcher Advisor: Dr. Adrienne C. Scheck	Phoenix, AZ

## Additional Training

January 7-9, 2016. **FMRI Acquisition and Analyses Course**. Mind Research Network (Albuquerque, NM).

April 6-10, 2016. **"Learning the CONN Toolbox" workshop**. Martinos Center for Biomedical Imaging (Charlestown, MA).

August 26, 2016. **Writing/Designing Winning NIH Proposals workshop**. Grant Training Center (Tucson, AZ).

August 28-September 2, 2017. **Computational Psychiatry Course**. University of Zurich (Zurich, Switzerland).

October 1, 2018-February 1, 2019. **Visiting Fellowship in Computational Neuroscience Methods**. University College London (London, England).

## Publications (1-111)

1. **Smith R**, Smith KA, Biggs CA, Scheck AC. In vitro biological dosimeter modeling of the glioblastoma response to radiation delivered by the Gamma Knife. Laboratory investigation. *J Neurosurg.* 2010;113 Suppl:222-7.
2. **Smith R**, Fadok RA, Purcell M, Liu S, Stonnington C, Spetzler RF, et al. Localizing sadness activation within the subgenual cingulate in individuals: a novel functional MRI paradigm for detecting individual differences in the neural circuitry underlying depression. *Brain Imaging Behav.* 2011;5(3):229-39.
3. Lane RD, Weidenbacher H, **Smith R**, Fort C, Thayer JF, Allen JJ. Subgenual anterior cingulate cortex activity covariation with cardiac vagal control is altered in depression. *Journal of affective disorders.* 2013;150(2):565-70.
4. **Smith R**, Chen K, Baxter L, Fort C, Lane RD. Antidepressant effects of sertraline associated with volume increases in dorsolateral prefrontal cortex. *Journal of affective disorders.* 2013;146(3):414-9.
5. **Smith R**. Explanation, understanding, and control. *Synthese.* 2014;191(17):4169-200.
6. **Smith R**. Do Brains Have an Arrow of Time? *Philosophy of Science.* 2014;81(2):265-75.
7. **Smith R**, Allen JJ, Thayer JF, Fort C, Lane RD. Increased association over time between regional frontal lobe BOLD change magnitude and cardiac vagal control with sertraline treatment for major depression. *Psychiatry Res.* 2014;224(3):225-33.
8. **Smith R**, Fass H, Lane RD. Role of medial prefrontal cortex in representing one's own subjective emotional responses: a preliminary study. *Conscious Cogn.* 2014;29:117-30.
9. Lane RD, Weihs KL, Herring A, Hishaw A, **Smith R**. Affective agnosia: Expansion of the alexithymia construct and a new opportunity to integrate and extend Freud's legacy. *Neurosci Biobehav Rev.* 2015;55:594-611.
10. **Smith R**, Allen JJ, Thayer JF, Lane RD. Altered functional connectivity between medial prefrontal cortex and the inferior brainstem in major depression during appraisal of subjective emotional responses: A preliminary study. *Biol Psychol.* 2015;108:13-24.
11. **Smith R**, Braden BB, Chen K, Ponce FA, Lane RD, Baxter LC. The neural basis of attaining conscious awareness of sad mood. *Brain Imaging Behav.* 2015;9(3):574-87.
12. **Smith R**, Lane RD. The neural basis of one's own conscious and unconscious emotional states. *Neurosci Biobehav Rev.* 2015;57:1-29.
13. Alkozei A, **Smith R**, Killgore WD. Exposure to blue wavelength light modulates anterior cingulate cortex activation in response to 'uncertain' versus 'certain' anticipation of positive stimuli. *Neurosci Lett.* 2016;616:5-10.
14. Alkozei A, **Smith R**, Pisner DA, Vanuk JR, Berryhill SM, Fridman A, et al. Exposure to Blue Light Increases Subsequent Functional Activation of the Prefrontal Cortex During Performance of a Working Memory Task. *Sleep.* 2016;39(9):1671-80.

15. Braden BB, Pipe TB, **Smith R**, Glaspy TK, Deatherage BR, Baxter LC. Brain and behavior changes associated with an abbreviated 4-week mindfulness-based stress reduction course in back pain patients. *Brain Behav.* 2016;6(3):e00443.
16. **Smith R**. The relationship between consciousness, understanding, and rationality. *Philosophical Psychology.* 2016;29(7):943-57.
17. **Smith R**, Alkozei A, Lane RD, Killgore WDS. Unwanted reminders: The effects of emotional memory suppression on subsequent neuro-cognitive processing. *Conscious Cogn.* 2016;44:103-13.
18. **Smith R**, Allen JJB, Thayer JF, Lane RD. Regional Frontal Lobe Response Magnitudes During Affective Shifting Covary With Resting Heart Rate Variability in Healthy Volunteers. *Journal of Psychophysiology.* 2016;30(4):165-74.
19. **Smith R**, Baxter LC, Thayer JF, Lane RD. Disentangling introspective and exteroceptive attentional control from emotional appraisal in depression using fMRI: A preliminary study. *Psychiatry Res Neuroimaging.* 2016;248:39-47.
20. **Smith R**, Lane RD. Unconscious emotion: A cognitive neuroscientific perspective. *Neurosci Biobehav Rev.* 2016;69:216-38.
21. Alkozei A, Killgore WDS, **Smith R**, Dailey NS, Bajaj S, Haack M. Chronic Sleep Restriction Increases Negative Implicit Attitudes Toward Arab Muslims. *Sci Rep.* 2017;7(1):4285.
22. Alkozei A, **Smith R**, Dailey NS, Bajaj S, Killgore WDS. Acute exposure to blue wavelength light during memory consolidation improves verbal memory performance. *PLoS One.* 2017;12(9):e0184884.
23. Alkozei A, **Smith R**, Killgore W. Grateful people are happy and healthy - but why? *Frontiers for Young Minds.* 2017;5:55.
24. Alkozei A, **Smith R**, Killgore WDS. Gratitude and Subjective Wellbeing: A Proposal of Two Causal Frameworks. *Journal of Happiness Studies.* 2017;19(5):1519-42.
25. Bajaj S, Vanuk JR, **Smith R**, Dailey NS, Killgore WDS. Blue-Light Therapy following Mild Traumatic Brain Injury: Effects on White Matter Water Diffusion in the Brain. *Front Neurol.* 2017;8:616.
26. Killgore WDS, **Smith R**, Olson EA, Weber M, Rauch SL, Nickerson LD. Emotional intelligence is associated with connectivity within and between resting state networks. *Soc Cogn Affect Neurosci.* 2017;12(10):1624-36.
27. Panksepp J, Lane RD, Solms M, **Smith R**. Reconciling cognitive and affective neuroscience perspectives on the brain basis of emotional experience. *Neurosci Biobehav Rev.* 2017;76(Pt B):187-215.
28. Pisner DA, **Smith R**, Alkozei A, Klimova A, Killgore WD. Highways of the emotional intellect: white matter microstructural correlates of an ability-based measure of emotional intelligence. *Soc Neurosci.* 2017;12(3):253-67.
29. **Smith R**. A neuro-cognitive defense of the unified self. *Conscious Cogn.* 2017;48:21-39.
30. **Smith R**, Alkozei A, Bao J, Smith C, Lane RD, Killgore WDS. Resting state functional connectivity correlates of emotional awareness. *Neuroimage.* 2017;159:99-106.
31. **Smith R**, Alkozei A, Killgore WDS. How Do Emotions Work? *Frontiers for Young Minds.* 2017;5.

32. **Smith R**, Alkozei A, Killgore WDS. Contributions of self-report and performance-based individual differences measures of social cognitive ability to large-scale neural network functioning. *Brain Imaging Behav.* 2017;11(3):685-97.
33. **Smith R**, Lane RD, Alkozei A, Bao J, Smith C, Sanova A, et al. Maintaining the feelings of others in working memory is associated with activation of the left anterior insula and left frontal-parietal control network. *Soc Cogn Affect Neurosci.* 2017;12(5):848-60.
34. **Smith R**, Thayer JF, Khalsa SS, Lane RD. The hierarchical basis of neurovisceral integration. *Neurosci Biobehav Rev.* 2017;75:274-96.
35. Wright R, Riedel R, Sechrest L, Lane RD, **Smith R**. Sex differences in emotion recognition ability: The mediating role of trait emotional awareness. *Motivation and Emotion.* 2017;42(1):149-60.
36. Alkozei A, Haack M, Skalamera J, **Smith R**, Satterfield BC, Raikes AC, et al. Chronic sleep restriction affects the association between implicit bias and explicit social decision making. *Sleep Health.* 2018;4(5):456-62.
37. Alkozei A, Killgore WDS, **Smith R**, Dailey NS, Bajaj S, Raikes AC, et al. Chronic sleep restriction differentially affects implicit biases toward food among men and women: preliminary evidence. *J Sleep Res.* 2018;27(4):e12629.
38. Alkozei A, **Smith R**, Killgore WDS. Implicit self-esteem is associated with higher levels of trait gratitude in women but not men. *The Journal of Positive Psychology.* 2018;14(5):587-92.
39. Bajaj S, Raikes A, **Smith R**, Dailey NS, Alkozei A, Vanuk JR, et al. The Relationship Between General Intelligence and Cortical Structure in Healthy Individuals. *Neuroscience.* 2018;388:36-44.
40. Dailey NS, **Smith R**, Bajaj S, Alkozei A, Gottschlich MK, Raikes AC, et al. Elevated Aggression and Reduced White Matter Integrity in Mild Traumatic Brain Injury: A DTI Study. *Front Behav Neurosci.* 2018;12:118.
41. Dailey NS, **Smith R**, Vanuk JR, Raikes AC, Killgore WDS. Resting-state functional connectivity as a biomarker of aggression in mild traumatic brain injury. *Neuroreport.* 2018;29(16):1413-7.
42. Lane RD, Anderson FS, **Smith R**. Biased competition favoring physical over emotional pain: A possible explanation for the link between early adversity and chronic pain. *Psychosom Med.* 2018;80:880-90.
43. Raikes AC, Bajaj S, Dailey NS, **Smith RS**, Alkozei A, Satterfield BC, et al. Diffusion Tensor Imaging (DTI) Correlates of Self-Reported Sleep Quality and Depression Following Mild Traumatic Brain Injury. *Front Neurol.* 2018;9:468.
44. **Smith R**, Alkozei A, Bao J, Killgore WDS. Successful Goal-Directed Memory Suppression is Associated With Increased Inter-Hemispheric Coordination Between Right and Left Frontoparietal Control Networks. *Psychol Rep.* 2018;121(1):93-111.
45. **Smith R**, Alkozei A, Killgore WDS. Conflict-related dorsomedial frontal cortex activation during healthy food decisions is associated with increased cravings for high-fat foods. *Brain Imaging Behav.* 2018;12(3):685-96.
46. **Smith R**, Alkozei A, Killgore WDS, Lane RD. Nested positive feedback loops in the maintenance of major depression: An integration and extension of previous models. *Brain Behav Immun.* 2018;67:374-97.

47. **Smith R**, Bajaj S, Dailey NS, Alkozei A, Smith C, Sanova A, et al. Greater cortical thickness within the limbic visceromotor network predicts higher levels of trait emotional awareness. *Conscious Cogn*. 2018;57:54-61.
48. **Smith R**, Killgore WDS, Alkozei A, Lane RD. A neuro-cognitive process model of emotional intelligence. *Biol Psychol*. 2018;139:131-51.
49. **Smith R**, Killgore WDS, Lane RD. The structure of emotional experience and its relation to trait emotional awareness: A theoretical review. *Emotion*. 2018;18(5):670-92.
50. **Smith R**, Lane RD, Alkozei A, Bao J, Smith C, Sanova A, et al. The role of medial prefrontal cortex in the working memory maintenance of one's own emotional responses. *Sci Rep*. 2018;8(1):3460.
51. **Smith R**, Lane RD, Sanova A, Alkozei A, Smith C, Killgore WDS. Common and Unique Neural Systems Underlying the Working Memory Maintenance of Emotional vs. Bodily Reactions to Affective Stimuli: The Moderating Role of Trait Emotional Awareness. *Front Hum Neurosci*. 2018;12:370.
52. **Smith R**, Sanova A, Alkozei A, Lane RD, Killgore WDS. Higher levels of trait emotional awareness are associated with more efficient global information integration throughout the brain: a graph-theoretic analysis of resting state functional connectivity. *Soc Cogn Affect Neurosci*. 2018;13(7):665-75.
53. Alkozei A, **Smith R**, Demers LA, Weber M, Berryhill SM, Killgore WDS. Increases in Emotional Intelligence After an Online Training Program Are Associated With Better Decision-Making on the Iowa Gambling Task. *Psychol Rep*. 2019;122(3):853-79.
54. Alkozei A, **Smith R**, Kotzin MD, Waugaman DL, Killgore WDS. The Association Between Trait Gratitude and Self-Reported Sleep Quality Is Mediated by Depressive Mood State. *Behav Sleep Med*. 2019;17(1):41-8.
55. Bajaj S, Raikes AC, **Smith R**, Vanuk JR, Killgore WDS. The Role of Prefrontal Cortical Surface Area and Volume in Preclinical Suicidal Ideation in a Non-Clinical Sample. *Front Psychiatry*. 2019;10:445.
56. **Smith R**, Alkozei A, Killgore WDS. Parameters as Trait Indicators: Exploring a Complementary Neurocomputational Approach to Conceptualizing and Measuring Trait Differences in Emotional Intelligence. *Front Psychol*. 2019;10:848.
57. **Smith R**, Gudleski GD, Lane RD, Lackner JM. Higher Emotional Awareness Is Associated With Reduced Pain in Irritable Bowel Syndrome Patients: Preliminary Results. *Psychol Rep*. 2020;123(6):2227-47.
58. **Smith R**, Kaszniak AW, Katsanis J, Lane RD, Nielsen L. The importance of identifying underlying process abnormalities in alexithymia: Implications of the three-process model and a single case study illustration. *Conscious Cogn*. 2019;68:33-46.
59. **Smith R**, Parr T, Friston KJ. Simulating Emotions: An Active Inference Model of Emotional State Inference and Emotion Concept Learning. *Frontiers in Psychology*. 2019;10:2844.
60. **Smith R**, Quinlan D, Schwartz GE, Sanova A, Alkozei A, Lane RD. Developmental Contributions to Emotional Awareness. *J Pers Assess*. 2019;101(2):150-8.
61. **Smith R**, Ahern GL, Lane RD. The role of anterior and midcingulate cortex in emotional awareness: A domain-general processing perspective. *Handb Clin Neurol*. 2019;166:89-101.

62. **Smith R**, Weihs KL, Alkozei A, Killgore WDS, Lane RD. An Embodied Neurocomputational Framework for Organically Integrating Biopsychosocial Processes: An Application to the Role of Social Support in Health and Disease. *Psychosomatic Medicine*. 2019;81(2):125-45.
63. **Smith R**, Khalsa SS, Paulus MP. An Active Inference Approach to Dissecting Reasons for Nonadherence to Antidepressants. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*. 2021;6(9):919-34.
64. **Smith R**, Lane RD, Parr T, Friston KJ. Neurocomputational mechanisms underlying emotional awareness: Insights afforded by deep active inference and their potential clinical relevance. *Neuroscience & Biobehavioral Reviews*. 2019;107:473-91.
65. Alkozei A, **Smith R**, Waugaman D, Kotzin M, Bajaj S, Killgore WDS. The mediating role of interpretation bias on the relationship between trait gratitude and depressive symptoms. *International Journal of Applied Positive Psychology* 2020.
66. Lane RD, **Smith R**, Nadel L. Neuroscience of Enduring Change and Psychotherapy. In: Lane RD, Nadel L, editors. *Neuroscience of Enduring Change: Implications for Psychotherapy*: Oxford University Press; 2020.
67. **Smith R**, Lane R, Nadel L, Moutoussis M. A computational neuroscience perspective on the change process in psychotherapy. In: Lane R, Nadel L, editors. *Neuroscience of Enduring Change: Implications for Psychotherapy*: Oxford University press; 2020.
68. **Smith R**. Subjective Experience and Its Neural Basis. In: Zeise M, editor. *Neuroscience for Psychologists*. 1 ed: Cham: Springer; 2021. p. 253-84.
69. **Smith R**. The three-process model of implicit and explicit emotion. In: Lane R, Nadel L, editors. *Neuroscience of Enduring Change: Implications for Psychotherapy*: Oxford University Press; 2020.
70. **Smith R**, Schwartenbeck P, Stewart JL, Kuplicki R, Ekhtiari H, Investigators T, et al. Imprecise Action Selection in Substance Use Disorder: Evidence for Active Learning Impairments When Solving the Explore-exploit Dilemma. *Drug and Alcohol Dependence*. 2020;215:108208.
71. **Smith R**, Steklis HD, Steklis NG, Weihs KL, Lane RD. The evolution and development of the uniquely human capacity for emotional awareness: A synthesis of comparative anatomical, cognitive, neurocomputational, and evolutionary psychological perspectives. *Biological Psychology*. 2020;154:107925.
72. **Smith R**, Schwartenbeck P, Parr T, Friston KJ. An Active Inference Approach to Modeling Structure Learning: Concept Learning as an Example Case. *Front Comput Neurosci*. 2020;14:41.
73. **Smith R**, Kuplicki R, Teed A, Upshaw V, Khalsa SS. Confirmatory Evidence that Healthy Individuals Can Adaptively Adjust Prior Expectations and Interoceptive Precision Estimates. In: Verbelen T, Lanillos P, Buckley C, De Boom C, editors. *Active Inference. Communications in Computer and Information Science. Communications in Computer and Information Science*, vol 1326: Springer, Cham.; 2020. p. 156-64.
74. Hesp C, **Smith R**, Parr T, Allen M, Friston KJ, Ramstead MJD. Deeply felt affect: the emergence of valence in deep active inference. *Neural Comput*. 2021;33(2):398-446.



75. **Smith R**, Badcock P, Friston KJ. Recent advances in the application of predictive coding and active inference models within clinical neuroscience. *Psychiatry Clin Neurosci*. 2021;75(1):3-13.
76. **Smith R**, Gundel H, Lane RD. *Neurobiologie der Emotionen: Anatomie, neuronale Schaltkreise und Alexithymie (Neurobiology of Emotions: Anatomy, Neural Circuits and Alexithymia)*. Psychosomatik - Neurobiologisch fundiert und evidenzbasiert: EIN LEHR- UND HANDBUCH (Psychosomatics - Neurobiologically founded and evidence-based: A TEXTBOOK AND MANUAL): Kohlhammer Verlag; 2020.
77. **Smith R**, Lane RD. Thinking through others' emotions: Incorporating the role of emotional state inference in thinking through other minds. *Behavioral and Brain Sciences*. 2020;43:e114.
78. Valyan A, Ekhtiari H, **Smith R**, Paulus MP. Decision-making deficits in substance use disorders. In: Verdejo-Garcia A, editor. *Cognition and Addiction*: Academic Press; 2020. p. 25-61.
79. **Smith R**, Kuplicki R, Feinstein J, Forthman KL, Stewart JL, Paulus MP, et al. A Bayesian computational model reveals a failure to adapt interoceptive precision estimates across depression, anxiety, eating, and substance use disorders. *PLoS Computational Biology*. 2020;16(12):e1008484.
80. **Smith R**. Harnessing unconscious emotional learning in specific phobia. *Lancet Psychiatry*. 2020;7(11):922-3.
81. Lane RD, Solms M, Weihs KL, Hishaw A, **Smith R**. Affective agnosia: a core affective processing deficit in the alexithymia spectrum. *BioPsychoSocial Medicine*. 2020;14(1):20.
82. Ramstead MJD, Hesp C, Tschantz A, **Smith R**, Constant A, Friston K. Neural and phenotypic representation under the free-energy principle. *Neurosci Biobehav Rev*. 2021;120:109-22.
83. **Smith R**, Feinstein JS, Kuplicki R, Forthman KL, Stewart JL, Paulus MP, et al. Perceptual insensitivity to the modulation of interoceptive signals in depression, anxiety, and substance use disorders. *Sci Rep*. 2021;11(1):2108.
84. **Smith R**, Kirlic N, Stewart JL, Touthang J, Kuplicki R, Khalsa SS, et al. Greater decision uncertainty characterizes a transdiagnostic patient sample during approach-avoidance conflict: a computational modelling approach. *Journal of Psychiatry & Neuroscience*. 2021;46(1):E74-E87.
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86. May AC, Burrows K, Figueroa-Hall LK, Kirlic N, White EJ, **Smith R**, et al. Sex differences in circulating inflammatory mediators as a function of substance use disorder. *Drug Alcohol Depend*. 2021;221:108610.
87. Lane RD, Solms M, Weihs KL, Hishaw A, **Smith R**. Is the concept of affective agnosia a useful addition to the alexithymia literature? *Neurosci Biobehav Rev*. 2021;127:747-8.

88. **Smith R**, Moutoussis M, Bilek E. Simulating the computational mechanisms of cognitive and behavioral psychotherapeutic interventions: insights from active inference. *Sci Rep*. 2021;11(1):10128.
89. Parr T, Markovic D, Ramstead MJD, **Smith R**, Hesp C, Friston K. Editorial: Probabilistic Perspectives on Brain (Dys)function. *Front Artif Intell*. 2021;4(81):710179.
90. **Smith R**, Kirlic N, Stewart JL, Touthang J, Kuplicki R, McDermott TJ, et al. Long-term stability of computational parameters during approach-avoidance conflict in a transdiagnostic psychiatric patient sample. *Scientific Reports*. 2021;11(1):11783.
91. Persich MR, **Smith R**, Cloonan SA, Strong M, Killgore WDS. Emotional Intelligence Training as a Protective Factor for Mental Health During the COVID-19 Pandemic. *Depression and Anxiety*. 2021.
92. **Smith R**, Mayeli A, Taylor S, Al Zoubi O, Naegele J, Khalsa SS. Gut inference: A computational modelling approach. *Biological Psychology*. 2021;164:108152.
93. Taylor VA, Moseley I, Sun S, **Smith R**, Roy A, Ludwig VU, et al. Awareness drives changes in reward value which predict eating behavior change: Probing reinforcement learning using experience sampling from mobile mindfulness training for maladaptive eating. *J Behav Addict*. 2021.
94. Lane RD, **Smith R**. Levels of Emotional Awareness: Theory and Measurement of a Socio-Emotional Skill. *J Intell*. 2021;9(3).
95. Whyte CJ, **Smith R**. The predictive global neuronal workspace: A formal active inference model of visual consciousness. *Prog Neurobiol*. 2021;199:101918.
96. **Smith R**, Taylor S, Bilek E. Computational mechanisms of addiction: recent evidence and its relevance to addiction medicine. *Current Addiction Reports*. 2021;8:509–19.
97. Thomas M, Savitz J, Zhang Y, Burrows K, **Smith R**, Figueroa-Hall L, et al. Elevated Systemic Inflammation Is Associated with Reduced Corticolimbic White Matter Integrity in Depression. *Life (Basel)*. 2021;12(1).
98. **Smith R**, Steklis HD, Steklis N, Weihs K, Allen JJB, Lane RD. Lower emotional awareness is associated with greater early adversity and faster life history strategy. *Evolutionary Behavioral Sciences*. 2022:ebs0000282.
99. **Smith R**, Friston KJ, Whyte CJ. A step-by-step tutorial on active inference and its application to empirical data. *Journal of Mathematical Psychology*. 2022;107:102632.
100. **Smith R**, Taylor S, Wilson RC, Chuning AE, Persich MR, Wang S, et al. Lower Levels of Directed Exploration and Reflective Thinking Are Associated With Greater Anxiety and Depression. *Frontiers in Psychiatry*. 2022;12.
101. **Smith R**, Khalsa SS. Interpreting the signals within: Meaning and prediction during interoception. In: García AM, Ibáñez A, editors. *Routledge Handbook of Neurosemiotics*. New York, NY: Taylor & Francis/Routledge; 2022. p. In Press.
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103. **Smith R**, Ramstead MJD, Kiefer A. Active inference models do not contradict folk psychology. *Synthese*. 2022;200(2):81.
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106. **Smith R**, Taylor S, Stewart JL, Guinjoan SM, Ironside M, Kirlic N, et al. Slower Learning Rates from Negative Outcomes in Substance Use Disorder over a 1-Year Period and Their Potential Predictive Utility. *Computational Psychiatry*. 2022;6(1):117-41.
107. **Smith R**, Varshney L-R, Nagayama S, Kazama M, Kitagawa T, Managi S, et al. A computational neuroscience perspective on subjective wellbeing within the active inference framework. *International Journal of Wellbeing*. 2022:In Press.
108. Taylor VA, **Smith R**, Brewer JA. App-Based Mindfulness Training Predicts Reductions in Smoking Behavior by Engaging Reinforcement Learning Mechanisms: A Preliminary Naturalistic Single-Arm Study. *Sensors (Basel)*. 2022;22(14).
109. McDermott TJ, Berg H, Touthang J, Akeman E, Cannon MJ, Santiago J, et al. Striatal reactivity during emotion and reward relates to approach–avoidance conflict behaviour and is altered in adults with anxiety or depression. *Journal of Psychiatry and Neuroscience*. 2022;47(5):E311-E22.
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111. **Smith R**, Chuning AE, Tidwell CA, Allen JJB, Lane RD. Psychopathic tendencies are selectively associated with reduced emotional awareness in the context of early adversity. *PLoS One*. In Press.

#### **Links to Published Work in My Bibliography:**

<http://www.ncbi.nlm.nih.gov/sites/myncbi/ryan.smith.2/bibliography/48374896/public/?sort=date&direction=ascending>

#### Scholarly Journal Reviewer

*Philosophical Psychology* (Since 2014)

*Psychiatry Research: Neuroimaging* (Since 2015)

*Behavioural Brain Research* (Since 2016)

*Psychophysiology* (Since 2016)

*Frontiers in Human Neuroscience* (Since 2016)

*Brain Structure and Function* (Since 2017)

*Scientific Reports* (Since 2017)

*Social Cognitive and Affective Neuroscience* (Since 2017)

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*Cognitive Affective and Behavioral Neuroscience* (Since 2017)

*Cerebral Cortex* (Since 2017)

*Brain Connectivity* (Since 2017)

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*Autonomic Neuroscience, a specialty of Frontiers in Neurology, Neuroscience and*

*Physiology* (Since 2018)

*The Lancet Psychiatry* (Since 2018)

*Social Neuroscience* (Since 2019)

*Human Brain Mapping* (Since 2019)  
*Quarterly Journal of Experimental Psychology* (Since 2020)  
*Biological Psychology* (Since 2020)  
*Journal of Abnormal Psychology* (Since 2020)  
*PLOS Computational Biology* (Since 2021)  
*Biological Psychiatry* (Since 2021)  
*Computational Psychiatry* (Since 2021)  
*Neuroscience of Consciousness* (Since 2021)  
*Cortex* (Since 2021)  
*Proceedings of the National Academy of Sciences* (Since 2021)  
*Neuroscience & Biobehavioral Reviews* (Since 2022)  
*Depression & Anxiety* (Since 2022)  
*Journal of Psychopathology and Clinical Science* (Since 2022)  
*Nature Communications* (Since 2022)

## Grant Reviewer

*Medical Research Council, UK Research and Innovation* (Since 2021)  
*Austrian Science Fund (FWF), Austria* (Since 2022)  
*Fulbright Grant Award, Poland* (Since 2022)  
*Wellcome Trust/DBT India Alliance Fellowship* (Since 2022)

## Editorial Contributions

*Editorial Board Member (Review Editor) - Autonomic Neuroscience, a specialty section of Frontiers in Neuroscience, Neuroscience and Physiology (2018-2022)*

*Editorial Board Member - Journal of Emotion and Psychopathology (2021-)*

*Editorial Board Member (Associate Editor) - Autonomic Neuroscience, a specialty section of Frontiers in Neurology, Neuroscience and Physiology (2022-)*

## Courses Taught

- 1. Introduction to Biopsychology (PSY 302 SSI14 001).** University of Arizona, Summer 2014.
  - a. Summer undergraduate course.
  - b. Taught online (fourteen 120-minute recorded audio/video lectures).
  - c. Covered the entire textbook of *Cognitive Neuroscience: The Biology of the Mind (4<sup>th</sup> edition)*, by Gazzaniga, Ivry, and Mangun.
- 2. Human Memory (PSY 326 SP15 791).** University of Arizona, Spring 2015.
  - a. Spring undergraduate course.
  - b. Taught in-person (sixteen 150-minute lectures).

- c. Covered the entire textbook of *Memory (2<sup>nd</sup> edition)*, by Baddeley, Eysenck, and Anderson.
- 3. **Research Methods (PSY 289).** Pima Community College, Fall 2016.
  - a. Fall undergraduate course.
  - b. Taught in-person (thirty-two 150-minute lectures).
  - c. Covered the entire textbook of *Research Methods (5<sup>th</sup> edition)*, by Gravetter and Forzano.
- 4. **Introduction to Psychology (PSY 101).** Pima Community College, Spring 2017.
  - a. Spring undergraduate course.
  - b. Taught in person (thirty-two 110-minute lectures).
  - c. Covered the entire textbook of *Psychology: An Exploration 3<sup>rd</sup> edition*, by Ciccarelli and White.
- 5. **Research Methods (PSY 289).** Pima Community College, Fall 2017.
  - a. Fall undergraduate course.
  - b. Taught in-person (thirty-two 150-minute lectures).
  - c. Covered the entire textbook of *Research Methods (5<sup>th</sup> edition)*, by Gravetter and Forzano.
- 6. **Introduction to Psychology (PSY 101).** Pima Community College, Spring 2018.
  - a. Spring undergraduate course.
  - b. Taught in person (twenty-eight 115-minute lectures).
  - c. Covered the entire textbook of *Exploring Psychology (10<sup>th</sup> edition)*, by Myers and DeWall.
- 7. **Introduction to Computational Psychiatry.** University of Arizona, College of Medicine, Summer-Fall 2018.
  - a. Psychiatry resident training course.
  - b. Taught in person (six 1-hour lectures).
  - c. Covered a range of recent journal articles on computational neuroscience and its application to psychiatric disorders.
- 8. **Methods in Computational Psychiatry.** Laureate Institute for Brain Research, January-February 2022.
  - a. Graduate student and post-doc training course.
  - b. Taught in-person (five 2-hour lectures).
  - c. Covered a range of modelling approaches in computational neuroscience and example applications within psychiatry research.

## Invited Scholarly Talks

### *National*

1. October 24, 2013. **A Primer on the Brain, Emotion, and Emotional Disorders.** Arizona Center for Psychoanalytic Studies.
2. March 30, 2016. **Nested Positive Feedback Loops in Major Depression: An integration and extension of previous models.** Grand Rounds Talk, Department of Psychiatry, University of Arizona.
3. September 15-16, 2017. **Implicit and Explicit Emotion.** Conference Talk at: Neuroscience of Enduring Change: Applications to Psychotherapy, University of Arizona.

4. July 23, 2018. **The neural basis of Hierarchical Emotion Processing and Emotional Awareness: Clinical Relevance and opportunities for computational modeling.** Talk at: Laureate Institute for Brain Research.
5. November 11, 2019. **The neural basis of Hierarchical Emotion Processing and Emotional Awareness: Clinical Relevance and opportunities for computational modeling.** Principles of Neuroscience Course. University of Tulsa.
6. December 2, 2019. **An introduction to the active inference approach to computational modeling.** Brownbag lecture. Laureate Institute for Brain Research.
7. Friday April 30, 2021. **Reduced Action Precision and Biased Learning in Substance Users When Solving the Explore-Exploit Dilemma: An Active Inference Modelling Approach.** Society for Biological Psychiatry – Annual Conference. Virtual Meeting.
8. Friday Sep 17, 2021. **An introduction to computational psychiatry.** Symposium talk. American Psychosomatic Society – Annual Meeting. Webinar Series.
9. Saturday Sep 25, 2021. **Individuals with Depression, Anxiety, Eating, and Substance Use Disorders Show a Failure to Update Beliefs about the Precision of Interoceptive signals: A Bayesian Computational Modelling Study.** Symposium talk. Society for Research in Psychopathology – Annual Meeting. Virtual Meeting
10. Thursday, November 4, 2021. **Active Inference and its Application to Empirical Data.** MAPs (Methods and Primers for Computational Psychiatry and Neuroeconomics) Lecture Series. Yale University.
11. Saturday, March 19, 2022. **Lower Levels of Directed Exploration and Reflective Thinking Are Associated with Greater Anxiety and Depression.** ADAA annual meeting. Denver, CO.
12. Sunday, March 20, 2022. **Computational Measures of Cardiac Interoception in Depression and Anxiety and Their Relationship to Symptom Change over Time.** ADAA annual meeting. Denver, CO.
13. Thursday, October 20, 2022. **Testing the effects of specific psychotherapeutic interventions on computational phenotypes.** Computational Psychotherapy Meeting. Princeton University, New Jersey.

### *International*

14. October 15, 2018. **Modeling emotional awareness as hierarchical active inference.** Talk at: Functional Imaging Laboratory, University College London, England.
15. December 14, 2018. **Modeling emotional awareness as hierarchical active inference.** Talk at: University of Sussex, England.
16. January 7, 2019. **Modeling emotional awareness as hierarchical active inference.** Talk at: University of Stirling, Scotland.
17. January 14, 2019. **Modeling emotional awareness as hierarchical active inference.** Talk at: Max Planck center, University College London, England.
18. March 6, 2019. **Neurocognitive approaches in studying Emotion and Decision-making: Cognitive and computational measures.** Talk at: American psychosomatic Society conference, Vancouver, Canada.
19. March 8, 2019. **An embodied neurocomputational framework for organically integrating biopsychosocial processes.** Talk at: American psychosomatic Society conference, Vancouver, Canada.
20. March 8, 2019. **Computational Neuroscience Roundtable speaker.** American psychosomatic Society conference, Vancouver, Canada.

21. November 4, 2019. **Emotion-Cognition Interactions as Deep Active Inference.** Social-Cultural, and Computational Neuroscience and Psychiatry Network Conference, Montreal, Canada.
22. November 5, 2019. **Modeling behavior in empirical studies with the Markov decision process formulation of active inference.** Social-Cultural, and Computational Neuroscience and Psychiatry Network Conference, Montreal, Canada.
23. Friday Jan 17, 2020. **Emotion-Cognition Interactions as Deep Active Inference.** University of Waterloo. Series of Artificial Intelligence (AI) colloquium. Waterloo, Canada.
24. March 26, 2020. **Investigating active inference approaches to modeling the neural basis of auditory hallucinations.** Theoretical Neurobiology Meeting. University College London, England.
25. Monday Sep 14, 2020. **Confirmatory evidence that healthy individuals can adaptively adjust prior expectations and interoceptive precision estimates.** 1st International Workshop on Active Inference (IWAI), ECML/PKDD conference 2020. Ghent, Belgium
26. Friday Sep 3, 2021. **Gut inference: a computational modeling approach.** Nested Minds Network Ltd. Liverpool, England.
27. Wednesday Sep 15, 2021. **An introduction to active inference.** Computational Psychiatry Course. Zurich, Switzerland.
28. Thursday Jan 13, 2022. **Active Learning Impairments in Substance Use Disorders when Solving the Explore-Exploit Dilemma: Longitudinal Stability and Symptom Prediction.** Transcontinental Computational Psychiatry Workgroup.
29. Thursday Feb 17, 2022. **An Active Inference Model Reveals that individuals with Substance Use Disorder Have Consistently Reduced Learning Rates in Response to Negative Outcomes Over a 1-Year Period.** Conference: The Free Energy Principle: Science, Tech and Philosophy. Humboldt University of Berlin, School of Mind and Brain.
30. Thursday June 30, 2022. **An Active Inference Model of Emotional Awareness.** Porto Affective Neuroscience Seminars 2022, Portugal.
31. Wednesday July 6, 2022. **Modeling gastrointestinal interoception as Bayesian inference: Individual differences and their neural correlates.** Psychiatry Department, Oxford, UK.
32. Wednesday July 13, 2022. **The relationship between trait emotional awareness, general reflectiveness, and socio-emotional skills.** European Conference on Personality, Madrid, Spain.
33. Wednesday July 13, 2022. **The relationship between trait emotional awareness, general reflectiveness, and socio-emotional skills.** European Conference on Personality, Madrid, Spain.
34. Friday July 15, 2022. **Modeling gastrointestinal interoception as Bayesian inference: Individual differences and their neural correlates.** Monash Centre for Consciousness & Contemplative Studies, Melbourne, Australia.
35. Saturday July 16, 2022. **A step-by-step tutorial on active inference and its application to empirical data (full day tutorial workshop).** 31st Annual Computational Neuroscience Meeting (CNS\*2022), Melbourne, Australia
36. Wednesday, Sep 14, 2022. **Simulating the Computational Mechanisms of Emotional Awareness and their Breakdown in Affective Disorders.** The Centre for Addiction and Mental Health. The Krembil Centre for Neuroinformatics (KCNI) Speaker Series
37. Saturday Sep 17, 2022. **Tutorial: Active Inference using SPM.** Computational Psychiatry Course. Zurich, Switzerland.

38. Monday, Sep 26, 2022. **A computational neuroscience perspective on subjective wellbeing.** “Coffee, Tea, and Computational Wellbeing” International Online Talk Series.
39. Friday, November 4, 2022. **Active inference as a hypothesis-generating framework for investigating resignation syndrome.** International symposium: Is Resignation Syndrome a Functional Neurological Disorder? Wellcome Centre for Human Neuroimaging, 12 Queen Square, London.

## Grants

### Principal Investigator

1. 50% effort: National Institute for General Medical Sciences (NIGMS): Center Grant Project. **Investigating the effects of aversive interoceptive states on computations underlying avoidance behavior and their neural basis.** (P20GM121312)
2. 20% effort: Wellbeing for Planet Earth Foundation: 2022-2025. **Using active inference to uncover the neurocomputational mechanisms that contribute to well-being and their potential differences across diverse populations.**

### Co-Investigator

1. 10% effort: National Institute of Mental Health (NIMH) R01. **An Approach-Avoidance, Computational Framework for Identifying Mechanisms and Predictors of Behavioral Therapy Outcome in Anxiety and Depression** (R01 MH123691).
2. 10% effort: National Institute of Mental Health (NIMH) R01. **A Neurocomputational Assay of Gastrointestinal Interoception in Anorexia Nervosa.**

## Mentorship/Service

1. Primary Mentor for:
  - a. Rowan Hodson. **PhD student.** University of Tulsa
  - b. Marishka Mehta. **PhD student.** University of Tulsa
2. Co-Mentor for:
  - a. Christopher Whyte. **PhD student.** University of Cambridge, England
    - i. Co-authored 1 published paper, 1 under revision, and 1 in preparation
  - b. Alessandra Yu. **MS student.** University College London, England
    - i. Co-authored 1 paper in preparation
  - c. Rowan Hodson. **MS student.** University of Cape Town, South Africa
  - d. Chatrin Suksasilp. **PhD student.** University College London, England
  - e. Hugh McGovern. **PhD student.** The University of Queensland, Australia



3. Lab members:
  - a. Samuel Taylor, BS. **Research Specialist.**
    - i. Co-authored 5 published papers
  - b. Annie Chuning, BS. **Project Coordinator.**
    - i. Co-authored 1 published paper
4. Local educational lectures:
  - a. November 11, 2019. **The neural basis of Hierarchical Emotion Processing and Emotional Awareness: Clinical Relevance and opportunities for computational modeling.** Principles of Neuroscience Course. University of Tulsa.
  - b. December 2, 2019. **An introduction to the active inference approach to computational modeling.** Brownbag lecture. Laureate Institute for Brain Research.
5. January-February 2022. **Methods in Computational Psychiatry Course** (5 lectures). Laureate Institute for Brain Research

## Public Outreach and Translational Work

### Articles

**Smith, R.** How Anxiety and Depression May Interfere With Decision-Making (2022). *Psychology Today*. <https://www.psychologytoday.com/us/blog/the-neuroscience-emotion-and-decisionmaking/202206/how-anxiety-and-depression-may-interfere>

**Smith, R.** Why Some Keep Using Drugs, Even Knowing It Ruins Their Lives (2022). *Psychology Today*. <https://www.psychologytoday.com/us/blog/the-neuroscience-emotion-and-decisionmaking/202207/why-some-keep-using-drugs-even-knowing-it>

**Smith, R.** Do Emotions Help or Hinder Rational Thinking? (2022). *Psychology Today*. <https://www.psychologytoday.com/us/blog/the-neuroscience-emotion-and-decisionmaking/202208/do-emotions-help-or-hinder-rational-thinking>

### Public Talks

1. Tuesday, Sep 13, 2022. **On the overlap between cognition and emotion.** Quantum Photonics Discussion Group Presentation.