OMB No. 0925-0001 and 0925-0002 (Rev. 10/2021 Approved Through 09/30/2024)

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.  
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: David Victor Smith

eRA COMMONS USER NAME (credential, e.g., agency login):

POSITION TITLE: Assistant Professor of Psychology & Neuroscience

EDUCATION/TRAINING

| INSTITUTION AND LOCATION | DEGREE  (if applicable) | Completion Date  MM/YYYY | FIELD OF STUDY |
| --- | --- | --- | --- |
| University of South Carolina (Columbia, SC) | B.S. | 05/2006 | Experimental Psychology |
| Duke University (Durham, NC) | Ph.D. | 05/2012 | Cognitive Neuroscience |
| Rutgers University (Newark, NJ) | Postdoc | 12/2016 | Social Neuroscience |

**A. Personal Statement**

My research to date has centered on characterizing the neurobiological mechanisms that construct our preferences and shape our choices. Over the course of my career, I have gained substantial experience in conceptual issues relating to cognitive and social neuroscience. For instance, my work has contributed to neuroscientific and behavioral models of decision making and reward processing. In addition, I also have developed extensive analytical expertise in neuroimaging, particularly multivariate pattern analysis and brain connectivity approaches that examine brain-behavior relationships. These analytical approaches are crucial for understanding how the striatum and its connections with prefrontal cortex contribute to decision making and reward processing.

My background in neuroimaging methods and reward processing make me well suited to serve as a consultant on William (Billy) Mitchell’s F99/K00 application. As a trainee, I was supported by F31 and F32 awards from NIMH, which have played a significant role in shaping my career. Since starting my lab at Temple University in 2017, I have led four NIH-funded projects and I have helped train other NRSA Fellows at Temple, including a previous F99/K00 award recipient. I have served on numerous dissertation committees, supervised Master’s and undergraduate theses, and published with trainees at all levels, from a wide range of backgrounds. I take mentorship very seriously. As a first-generation college student who grew up in a low-income area of South Carolina, I would not be where I am today without excellent mentors. I understand the crucial role mentorship plays in fostering the careers of others from similar first-generation, low-income backgrounds like Billy. In recognition of my mentorship efforts, I was recognized by my department with an Excellence in Mentoring Award. I look forward to consulting Billy on his proposed project in matters related to multivariate data analysis, interpretation, and open science principles (e.g., data sharing, pre-registration).

Ongoing and recently completed projects that I would like to highlight include:

**NIH R03-DA046733** (PI: Smith) 5/1/2019-4/30/2021 (NCE)

Aberrant Reward Sensitivity: Mechanisms Underlying Substance Use

This R03 project examined how neural responses to social and nonsocial rewards are associated with reward sensitivity and substance use.

**NIH R21-MH113917** (PI: Smith) 7/1/2017-4/30/2021 (NCE)

Remote Modulation of Reward Circuits with Noninvasive Brain Stimulation

This R21 project integrated noninvasive brain stimulation with measures of brain connectivity during reward processing. The overarching goal was to determine whether stimulation applied to cortical regions results in downstream modulation of the striatum.

**NIH RF1-AG067011** (PI: Smith) 4/15/2021-3/30/2026

Social Reward Processing Across the Lifespan: Identifying Risk Factors for Financial Exploitation

The goal of this R01 project is to characterize neural, behavioral, sociodemographic, and health-related risk factors for financial exploitation. The project will also examine vulnerable individuals at greatest risk for financial exploitation (i.e., individuals with mild cognitive impairment) and follow their trajectory over time.

**B. Positions, Scientific Appointments, and Honors**

Employment:

2017-present Assistant Professor, Dept. of Psychology & Neuroscience, Temple University, Phila., PA.

2012-2016 Postdoctoral Fellow, Department of Psychology, Rutgers University, Newark, NJ.

2006-2012 Graduate Student, Center for Cognitive Neuroscience, Duke University, Durham, NC.

Other Experience and Professional Memberships:

Member: Cognitive Neuroscience Society; Society for Neuroscience; Organization for Human Brain Mapping; Society for Neuroeconomics; Social & Affective Neuroscience Society; Association for Psychological Science; and Society of Biological Psychiatry.

Ad hoc manuscript reviewer for 55 journals (verified on Publons)

Ad hoc grant reviewer: Israel Science Foundation; FWF Austrian Science Fund; Wellcome Trust; Scientific Research Network on Decision Neuroscience & Aging; and National Science Foundation; National Institutes of Health (Neural Basis of Psychopathology, Addictions and Sleep Disorders Study Section).

Review Editor: *Frontiers in Neuroscience* (2015-2017).

Associate Editor: *PLoS ONE* (2018-2023); *Collabra: Psychology* (2022-present).

Honors (selected):

2022 Open & Reproducible Science Award, Society for Social Neuroscience

2022 Training Fellowship, ReproNim / International Neuroinformatics Coordinating Facility (INCF)

2021 College of Liberal Arts Research Award, Temple University

2019 Faculty Fellow, Public Policy Lab, Temple University.

2019 Excellence in Mentoring, Temple University, Department of Psychology Honors Program.

2018 Top Reviewer in the fields of Multidisciplinary and Neuroscience & Behavior (Publons)

2017 Top Reviewer in the field of Neuroscience (Publons)

2016 NIDA Director’s Travel Award, The College on Problems of Drug Dependence.

2016 Young Investigator Travel Award, NIDA Symposium on Persistent Maladaptive Behaviors.

2016 Rising Star, Association for Psychological Science.

2015 Merit Abstract Award, Organization for Human Brain Mapping.

2015 Ruth L. Kirschstein Postdoctoral National Research Service Award, NIMH.

2009 Fellow, Summer Institute in Cognitive Neuroscience, UC - Santa Barbara.

2009 Ruth L. Kirschstein Predoctoral National Research Service Award, NIMH.

2006 Roger Black Award for Psychological Research, University of South Carolina.

2005 Fellow, NSF Summer Research Institute, University of South Carolina.

2005 *Phi Beta Kappa*, University of South Carolina.

2004 *Phi Beta Kappa* Freshman Scholar Award, University of South Carolina.

2002 LIFE Scholarship, University of South Carolina.

**C. Contributions to Science**

**Google Scholar *h*-index: 27 (i10-index: 38; total citations: 3790)**

**\* = co-first authorship † = trainee under my supervision ^ = co-senior authorship**

**1. Brain Systems Supporting Valuation. Many of our decisions force us to compare a wide range of disparate rewards—from the economic incentive of money to the social incentive of praise from a peer. How do we compare distinct incentives and choose between them? Although economists have theorized that these decisions require each incentive to be transformed into a common currency, evidence for such signals in the brain have remained elusive. In my early work, we addressed this problem in a series of experiments involving economic and social rewards. We provided the first evidence that a neural common currency signal was represented in a posterior region of ventromedial prefrontal cortex (VMPFC). Strikingly, VMPFC responses to economic and social rewards predicted individual differences in subjective value for those goods. In a follow up study, we strengthened the link between VMPFC and subjective value by demonstrating that changes in VMPFC responses following total sleep deprivation predicted concomitant changes in subjective value. We have also shown how common currency signals within VMPFC rely on connectivity with other brain regions. Our recent work has extended these findings by showing how relative valuation for social and nonsocial rewards is linked to risk factors associated with substance use. Taken together, these studies illustrate how VMPFC plays a central role in choice, thus providing a foundation for understanding neurological diseases and psychopathologies characterized by aberrant decision making and reward processing.**

1. **Smith DV**, Hayden BY, Truong T-K, Song AW, Platt ML, Huettel SA (2010). Distinct Value Signals in Anterior and Posterior Ventromedial Prefrontal Cortex. *Journal of Neuroscience*, 30(7), 2490-2495. PMCID: PMC2856318
2. Libedinsky C, **Smith DV**, Teng CS, Namburi P, Chen V, Huettel SA, Chee MLW (2011). Sleep Deprivation Alters Valuation Signals in the Ventromedial Prefrontal Cortex. *Frontiers in Behavioral Neuroscience*, *5*:70. PMCID: PMC3199544
3. **Smith DV**, Clithero JA, Boltuck SE, Huettel SA (2014). Functional Connectivity with Ventromedial Prefrontal Cortex Reflects Subjective Value for Social Rewards. *Social Cognitive and Affective Neuroscience*, 9(12), 2017-2025. PMCID: PMC4249475
4. Wyngaarden JB†\*, Johnston CR\*, Sazhin D†, Dennison JB†, Zaff O†, Fareri D, McCloskey M, Alloy LB, **Smith DV**^, Jarcho JM^ (2023). Substance use is related to differential activation and connectivity for social relative to monetary rewards. Preprint available on *bioRxiv*. doi: 10.1101/2023.01.17.524305.

2. **Brain Connectivity Patterns Underlying Decision Making and Reward Processing.** The striatum—which receives inputs from the prefrontal cortex and the midbrain—serves as a critical nexus for reward processing. Our recent work has quantified the consistency and specificity of the brain connectivity analysis approach used here and in our other papers: psychophysiological interaction (PPI) analysis. We performed a series of meta-analyses on 284 PPI studies. Our findings indicated that brain connectivity patterns revealed via PPI are reliable across studies and are specific to the process and neural system under investigation (e.g., reward and the striatum). In an exploratory analysis, we also identified a striatal-VLPFC pathway that was robust across studies, thus supporting our earlier findings and motivating efforts to understand corticostriatal interactions further in other grant submissions. My lab has recently begun to translate these findings to clinical populations. For example, we have shown that reward-processing abnormalities in major depressive disorder are associated with blunted responses in the striatum and hyper responses in the orbitofrontal cortex, which we argue may be indicative of a dysregulated corticostriatal connectivity. We have also shown that a family history of depression is associated with alterations in task-dependent connectivity with the VMPFC. Finally, my lab—with the support of a pilot grant from the Scientific Research Network on Decision Neuroscience and Aging and an R01 from the NIA—has also begun to expand our focus to age-related differences in social and economic decision making.

1. **Smith DV**, Gseir M, Speer ME, Delgado MR (2016). Toward a Cumulative Science of Functional Integration: a Meta-Analysis of Psychophysiological Interactions. *Human Brain Mapping*, 37(8), 2904-17. PMCID: PMC4945436**4.**
2. Ng TH**†**, Alloy LB, **Smith DV** (2019). Meta-analysis of reward processing in major depressive disorder reveals distinct abnormalities within the reward circuit. *Translational Psychiatry*, 9(1):293. PMCID: PMC6848107
3. Tepfer LJ**†**, Alloy LB, **Smith DV** (2021). Family history of depression is associated with alterations in task‐dependent connectivity between the cerebellum and ventromedial prefrontal cortex. *Depression and Anxiety*, 38(5), 508-520. PMCID: PMC8085134
4. **Fareri DS, Hackett K, Tepfer LJ†, Kelly V†, Henninger N, Reeck C, Giovannetti T, Smith DV (2022). Age-Related Differences in Ventral Striatal and Default Mode Network Function During Reciprocated Trust. *NeuroImage*, 256:119267.**

**3. Methodological Innovations and Data Rigor in Neuroimaging.** Given the complexity of our decisions (and our behavior more generally), approaches to studying decision making should be a constant target of innovation. A large focus of my work has aimed to innovate analytical approaches in neuroimaging and provide tools for the community. We pioneered efforts to apply MVPA to lesion mapping, which helps clinicians to overcome several issues that plague standard univariate analyses. Our other work extends this theme of examining how multiple brain regions contribute to behavior by improving functional connectivity analyses. We used independent component analysis (ICA) combined with dual-regression analysis to estimate connectivity with large-scale neural networks. Importantly, our study demonstrated that ICA combined with dual regression predicts individual differences (i.e., sex differences) better than canonical approaches that only consider specific nodes of a neural network. We also have used this approach to validate a probabilistic atlas of the midbrain, which we have made freely available to the community to help catalyze basic and clinical research focusing on the midbrain. Finally, a doctoral trainee in my lab, Jeffrey Dennison, and I recently contributed an important team effort that quantified variability in the analyses of a single neuroimaging dataset. Taken together, these studies advance analytical procedures within the neuroimaging community and provide models for enhancing data rigor and reproducibility.

1. **Smith DV**, Clithero JA, Rorden C, Karnath H-O (2013). Decoding the Anatomical Network of Spatial Attention. *Proceedings of the National Academy of Sciences of the USA*, 110(4), 1518-1523. PMCID: PMC3557038
2. **Smith DV**, Utevsky AV, Bland AR, Clement NJ, Clithero JA, Harsch AE, Carter RM, Huettel SA (2014). Characterizing Individual Differences in Functional Connectivity Using Dual-Regression and Seed-Based Approaches. *NeuroImage*, 95(1), 1-12. PMCID: PMC4074548
3. Murty VP, Shermohammed M, **Smith DV**, Carter RM, Huettel SA, Adcock RA (2014). Resting State Networks Distinguish Human Ventral Tegmental Area from Substantia Nigra. *NeuroImage*, 100(1), 580-589. PMCID: PMC4370842
4. Botvinik-Nezer R, Holzmeister F, Camerer C, ..., Dennison JB**†**, ..., **Smith DV**, ..., Nichols TE, Poldrack RA, Schonberg T (2020). Variability in the analysis of a single neuroimaging dataset by many teams. *Nature*. 582, 84–88. PMCID: PMC Journal -- In process

**4. Functional Significance of Large-Scale Neural Networks. My recent work uses analytical innovations to address key issues in neuroscience, particularly those relating to the functional significance of large-scale neural networks. One such issue centers on the role of the precuneus in large-scale neural networks. We found that the precuneus is a functional core of the default-mode network, showing increased connectivity during rest states. Strikingly, however, the same portion of precuneus exhibited increased connectivity with a fronto-parietal network during task states. These results highlight the flexibility of precuneus and underscore the importance of considering how each brain region operates as part of a larger network depending on the processing state. Connectivity with large-scale networks also plays an important role in decision making and behavioral change following feedback. Whereas previous work indicates that the medial prefrontal cortex (MPFC) promotes behavioral change, it remains unclear whether these changes are due to the default-mode network or the executive control network because the MPFC is at the intersection of both networks. Our novel analytical approach—ICA combined with dual-regression—allowed us to separate these networks and examine how each contributes to behavioral changes. We found that behavioral changes were associated with distinct patterns of connectivity: MPFC increased connectivity with the default-mode network while the temporal-parietal junction decreased connectivity with the executive control network. Our recent work integrates PPI with dual regression analysis—an approach we call network PPI (nPPI)—to further probe the functional significance of large-scale neural networks. In a recent study, we used nPPI to show that reward enhances connectivity between the default-mode network and the striatum. Taken together, these studies highlight the importance of studying the brain as a system of interacting regions. Advancing models of brain connectivity and functional integration may lead to a better understanding of the neural systems that contribute to a host of psychiatric and neurological diseases.**

1. Utevsky AV, **Smith DV**, Huettel SA (2014). Precuneus is a Functional Core of the Default-Mode Network. *Journal of Neuroscience*, 34(3), 932-940. PMCID: PMC3891968
2. **Smith DV\***, Sip KE\*, Delgado MR (2015). Functional Connectivity with Distinct Neural Networks Tracks Fluctuations in Gain/Loss Framing Susceptibility. *Human Brain Mapping*, 36(7), 2743-55. PMCID: PMC4736507
3. Utevsky AV, **Smith DV**, Young JS, Huettel SA (2017). Large-Scale Network Coupling with the Fusiform Cortex Future Social Motivation. *eNeuro*, 4(5), 1-12. PMCID: PMC5635486
4. Dobryakova E & **Smith DV** (2022, in press). Reward Enhances Connectivity between the Ventral Striatum and the Default Mode Network. *NeuroImage*. doi: 10.1016/j.neuroimage.2022.119398

**5. Linking Electrophysiology and Neurological Injury to Cognitive Processes. Although much of my work has relied on neuroimaging (i.e., fMRI), my use of this tool has been informed by other neuroscientific approaches—e.g., electroencephalography (EEG), neuropsychology, and single-unit recordings. For example, we have shown that single-unit activity in posterior cingulate, a key node of the default-mode network, tracks trial-to-trial fluctuations in engagement and cognitive control. We also have used event-related-potentials and EEG to provide insight into how spatial attention circuits rapidly modulate specific aspects of sensory processing. In addition, my work has incorporated behavioral data from patients suffering from neurological injury (e.g., strokes and other brain lesions). Observing how neurological injuries cause specific deficits in behavior and cognition has highlighted the importance of incorporating causal techniques (e.g., noninvasive brain stimulation) into my work. Taken together,** this diverse background has given me a unique perspective on my neuroimaging work and has helped me develop an integrative view of neuroscience.

1. Hayden BY, **Smith DV**, Platt ML (2009). Electrophysiological Correlates of Default-Mode Processing in Macaque Posterior Cingulate Cortex. *Proceedings of the National Academy of Sciences of the USA*, 106(14), 5948-5953. PMCID: PMC2667004
2. Hayden BY, **Smith DV**, Platt ML (2010). Cognitive Control Signals in Posterior Cingulate Cortex. *Frontiers in Human Neuroscience*, *4*:223. PMCID: PMC3001991
3. Appelbaum LG, **Smith DV**, Boehler CN, Wen C, Woldorff MG (2011). Rapid Modulation of Sensory Processing Induced by Stimulus Conflict. *Journal of Cognitive Neuroscience*, 23(9), 2620-2628. PMCID: PMC3096678
4. Jelsone-Swain L, **Smith DV**, Baylis GC (2012). The Effect of Stimulus Duration and Motor Response in Hemispatial Neglect During a Visual Search Task. *PLoS ONE*, 7(5), e37369*.* PMCID: PMC3360686

**Complete list of published work in My Bibliography (56 publications):**

<http://www.ncbi.nlm.nih.gov/sites/myncbi/david.smith.5/bibliography/41143875/public>

**Google Scholar *h*-index: 27 (i10-index: 38; total citations: 2805)**