

stages of planning. This is a property of the human language system, and the extent to which it may be a property of non-human primates is not yet fully clear. In any case, such conflict may be an important aspect of the operation of at least the human mind, because it is so essential for humans to correctly decide, at every moment, whether to invest in a relationship or a group that may offer long-term benefits, or whether to directly pursue immediate benefits (Rolls, 2008b, 2011, 2014).

### DECISION-MAKING MECHANISMS IN THE BRAIN, AND HOW THEY ARE INFLUENCED BY “NOISE” IN THE BRAIN

Recently, a theoretical foundation for understanding decision-making in the brain has been emerging (Deco et al., 2013; Deco et al., 2009; Rolls, 2008b, 2014, 2016a; Rolls & Deco, 2010; Wang, 2002). A fundamental part of the architecture is a neural network that has positive internal feedback between its neurons, and that can fall into one of a number of states, each one of which corresponds to a decision, and consists of one winning population of neurons that is firing at a high rate and inhibits the other populations. When the decision process starts, if the inputs are relatively equal, the state that is reached is influenced by the “noisy”—that is, random—spike timings of the firings of the neurons in the different populations. This type of noise in decision-making processes may occur at many different stages of brain processing, and may even influence the way in which decisions are influenced on different occasions between the unconscious emotional system and the rational decision-making processes (Rolls, 2004, 2005a, 2007a, 2007b, 2008a, 2008b, 2014, 2016a; Rolls & Deco, 2010). I emphasize that by “rational” I mean here “reasoned.” In this way, noise in the brain may influence what behavioral actions or responses are made to emotional stimuli, including, for example, whether actions are based on activity in the emotional or the reasoning brain systems.

## 8.9 AFTERWORD

### *How Do Emotion and Cognition Interact?*

Alexander J. Shackman and  
Regina C. Lapate

**E**motion and cognition seem fundamentally different. Emotion is hot, bright, and

quick; infused with **feelings** of pleasure or pain and manifesting in readily discerned changes in the body. In contrast, cognition is cold, gray, and slow; devoid of substantial hedonic, motivational, or somatomotor features. These differences in phenomenology and psychophysiology led classical thinkers and philosophers to treat emotion and cognition as distinct, often warring, mental faculties. And yet the two decades since the publication of the first edition of *The Nature of Emotion* have witnessed the emergence and widespread adoption of **powerful** new tools for objectively assaying both the mind and the brain. What have these new data taught us about the interplay of emotion and cognition?

At the broadest level, Okon-Singer and colleagues remind us that emotional cues, states, moods, traits, and disorders can, and often do, influence key components of cognition, including attention, working memory, and cognitive control. Drawing on biased-competition models of cognition (Desimone & Duncan, 1995; Miller & Cohen, 2001), Pessoa suggests that affect can prejudice the competition for limited cognitive resources at virtually every level of the information-processing hierarchy, from perception to “executive” cognition. Berggren and Derakshan argue that emotionally salient stimuli enjoy privileged access to attention and memory. Clore tells us that mood and affect confer “positive or negative value on whatever is in mind at the time”; that mood and emotion represent a kind of information that can bias judgments, evaluations, and choices in valence-congruent ways (see also Nettle & Bateson, 2012). Cools et al. make a related point, highlighting evidence that emotionally salient stimuli (e.g., emotional faces, Pavlovian cues) can bias instrumental approach and avoidance in a valence-congruent manner (i.e., positive stimuli facilitate approach and inhibit avoidance, whereas negative stimuli exert the opposite effect).

### EMOTION CAN INFLUENCE COGNITION

#### Emotion Hijacks Attention

Several contributors emphasized the consequences of emotion for selective attention. Clore focuses on mood and affect, suggesting that a key function of affect is to capture attention, and that “whatever seizes one’s attention then becomes input for other mental processes.” Okon-Singer et al. make a conceptually similar point: “Once lodged in working memory, threat-related information is poised to

bias the stream of information processing . . . long after it is no longer present in the real world.”

Berggren and Derakshan, Moaz and Bar-Haim, and Okon-Singer et al. focus on the perception of emotionally salient stimuli, such as faces. Staking out broadly similar positions, these authors tell us that emotional cues grab attention, that there are marked individual differences in the amount of attention allocated to such cues, and that hypervigilance for potentially threat-relevant information is a key feature of dispositional and some forms of pathological anxiety (Shackman, Kaplan et al., 2016). Moaz and Bar-Haim and Okon-Singer et al. remind us that, in some cases, more complex patterns of initial vigilance followed by attentional avoidance have been observed. In particular, Moaz and Bar-Haim emphasize that behavioral evidence of avoidance (i.e., response time on probe tasks) has been consistently found in individuals exposed to physical threat in the laboratory (i.e., electric shock) and in the real world (i.e., rocket attack). On the other hand, Berggren and Derakshan and Okon-Singer et al. highlight electrophysiological work demonstrating that threat of shock non-specifically enhances early visual processing, consistent with heightened vigilance. Addressing this apparent impasse will require experiments that pair electrophysiology with reliable behavioral indexes of attention (Rodebaugh et al., 2016). From a neurobiological perspective, Pessoa, Berggren and Derakshan, and Okon-Singer et al. suggest that emotion’s influence on attention reflects the operation of circuits emanating from the amygdala. To this, Pessoa adds the orbitofrontal cortex and insula, cortical regions that, like the amygdala, are poised to influence the sensory processing stream via projections to neuromodulatory systems nestled in the basal forebrain. He also highlights the importance of the pulvinar and frontoparietal network for biasing competition in favor of emotionally salient stimuli.

### Emotion Sculptures Episodic Memory

Clore as well as Berggren and Derakshan describe several ways in which emotion can sculpt episodic memory (see also Yonelinas & Ritchey, 2015). Clore, in particular, argues that “emotion guides memory not only through attention at encoding and arousal during consolidation, but also through the way in which emotion schemas provide structure and confer meaning on events.” Each emotion revolves around a distinctive antecedent or schema (e.g., loss for sadness, danger for fear; Frijda, 1994a, 1994b; Lazarus, 1994), and Clore

suggests that these narratives can profoundly bias what gets stored, recalled, and inferred about emotional experiences.

### Anxiety Disrupts Higher-Order Cognition

Berggren and Derakshan and Okon-Singer et al. review evidence that background states of stress and anxiety can disrupt ongoing cognitive performance, including the short-term retention of information in working memory (Moran, 2016). Berggren and Derakshan emphasize that, like anxious states, anxious traits also tend to have deleterious consequences for higher-order cognition (see also Derakshan & Eysenck, 2009; Eysenck, Derakshan, Santos, & Calvo, 2007). Pessoa notes that “emotion interferes with a wide range of cognitive operations because executive functions share common mechanisms—emotion acts on this common pool” of cognitive resources. He also reminds us that emotional states can have radically different consequences for cognition, depending on whether the emotion is integral or incidental to on-going goals (i.e., irrelevant or relevant to ongoing goals and tasks). Fear elicited by an approaching predator, for example, enhances our attention to the impending danger (Davis & Whalen, 2001). In contrast, incidental states of fear or stress would generally be expected to disrupt ongoing cognition and impair performance (Arnsten, 1998, 2009), as with test and examination anxiety (e.g., Beilock & Carr, 2005).

### COGNITION CAN INFLUENCE EMOTION

Clore argues that reasoning and logic can be used to regulate affect. Okon-Singer et al. suggest that circuits involved in attention, working memory, and cognitive control play a crucial role in the regulation of emotion and the management of other aspects of motivated behavior, such as temptation and craving (see Question 7). Berggren and Derakshan appear to adopt a broadly similar position. Pessoa as well as Moaz and Bar-Haim suggest that the links between cognition and emotion are intimate and bidirectional. Along these lines, Berggren and Derakshan highlight evidence that elevated demands for cognitive resources can actually reduce the disruptive influence of threat-related cues, suggesting competition for a shared pool of attentional resources. Rolls suggests that higher-order cognitive systems can promote negative affect: “In humans, grief may be particularly and especially potent because it becomes represented in a system that can plan ahead, and

understand the enduring implications of the loss” (see Question 7). Moaz and Bar-Haim and Okon-Singer et al. remind us that that attentional biases to threat-related cues are plastic, that these biases can be systematically retrained (e.g., Attention Bias Modification), and that such manipulations can have enduring consequences for both normal and pathological anxiety (but see MacLeod & Grafton, 2016; Mogg & Bradley, 2018; Mogg, Waters, & Bradley, 2017).

### “EMOTION” AND “COGNITION” MAY NOT BE FULLY DISSOCIABLE

An important question that emerges from the responses in this section is whether emotion and cognition are really separable (see also the responses to Questions 1, 4, and 5). Rolls seems to adopt a traditional, dichotomous position, focusing on an emotional system and a separate reasoning system (which can generate complex, multi-step plans). Berggren and Derakshan stake out an intermediate position. From their perspective, emotion and cognition reflect separable systems, but these systems are massively interconnected and capable of extensive, bidirectional regulation. Okon-Singer and colleagues go a step further, noting that “the distinction between ‘the emotional brain’ and ‘the cognitive brain’ is blurry and context-dependent . . . emotion and cognition are deeply interwoven in the fabric of the brain.” Pessoa, Moaz and Bar-Haim, and Touroutoglou and Barrett adopt even more hardline positions. Moaz and Bar-Haim, for example, argue that “a clear cut distinction between cognition and emotion is illusive . . . most of the relevant processes and conditions involve intricate blends that could be classified as both emotional and cognitive.” Adopting a network perspective—wherein certain cognitive processes (e.g., vigilance for threat) tend to amplify emotional responses and vice versa (Borsboom & Cramer, 2013; Fried & Cramer, 2017; Grupe & Nitschke, 2013)—Moaz and Bar-Haim tell us that “cognition and emotion reflect part of a complex network that is not readily decomposable into specific sub-elements, and certainly not into the overly inclusive concepts of cognition and emotion.” Likewise, Pessoa emphasizes that “emotion and cognition interact so strongly that a demarcation between them turns out to be

a fruitless enterprise.” In short, there seems to be a growing consensus around the position staked out by Davidson in the first edition of *The Nature of Emotion*:

The same basic [brain] structures participate in a myriad of information-processing types. It is therefore unlikely that the neural representation of emotion will be entirely distinct from other types of processing, such as cognition. Indeed the frontal lobes have been identified as a region critically important to both emotion and cognition. This fact . . . implies that the [conceptual] separation between these forms of processing may be artificial. (Davidson, 1994, p. 242)

### THE IMPORTANCE OF UNDERSTANDING THE INTERPLAY OF EMOTION AND COGNITION

Developing a deeper understanding of the ways in which cognition—attention, learning, and memory—and emotion influence one another is both theoretically and practically important. There is a growing recognition that some of the most common and most debilitating psychiatric disorders are marked by prominent disturbances of both cognition and emotion. Moaz and Bar-Haim, for example, remind us that “cognitive and emotional concepts are intertwined in the diagnostic fabric” of post-traumatic stress disorder, that prototypically cognitive and emotional treatments are both effective, and that interventions targeting one domain have positive consequences for the other. Establishing the psychological and neurobiological pathways underlying this recurrent interplay is critically important, not just for clarifying the nature of the emotion, but also for developing more effective and precise treatments for a range of mental illnesses, including anxiety, depression, and schizophrenia.

### ACKNOWLEDGMENTS

This work was supported by the National Institutes of Health (DA040717, MH107444) and the University of Maryland. Authors declare no conflicts of interest.

SECOND EDITION

THE NATURE OF EMOTION

*Fundamental Questions*

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OXFORD  
UNIVERSITY PRESS

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Published in the United States of America by Oxford University Press  
198 Madison Avenue, New York, NY 10016, United States of America.

© Oxford University Press 2018

First Edition published in 1994  
Second Edition published in 2018

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Library of Congress Cataloging-in-Publication Data  
To Come  
ISBN 978-0-19-061257-3

1 3 5 7 9 8 6 4 2

Printed by Sheridan Books, Inc., United States of America

# NOTES

## INTRODUCTION

1. For example, the International Society of Research on Emotion (ISRE); Society for Affective Science (SAS); and Social & Affective Neuroscience Society (SANS).

2. *Cognition and Emotion; Cognitive, Affective, & Behavioral Neuroscience; Emotion; Emotion Review; IEEE Transactions on Affective Computing; Motivation and Emotion; and Social Cognitive and Affective Neuroscience.*

## CHAPTER 1.1

1. All the transcriptions of James's words are drawn from Volume II of *The Principles of Psychology*, in the Dover Edition, 1950. Italicized passages are as published by James.

## CHAPTER 1.5

1. Davidson, D., personal communication, April 16, 1978.

2. Personal communication, November 1, 2014.

## CHAPTER 1.9

1. Ekman and Davidson made a similar point in the first edition of this volume: "Is there a sine qua non for emotion? The answer at this time must be No. The investigator must use multiple methods to study emotion, including, wherever possible, measures of behavior, subjective experience, and physiology" (p. 414).

## CHAPTER 3.3

1. Anatomically, the amygdala is poised to assemble a broad spectrum of emotional reactions via projections to the brain regions that proximally mediate many of the behavioral (e.g., passive and active avoidance), peripheral physiological (e.g., cardiovascular and neuroendocrine activity), and cognitive (e.g., vigilance) features of momentary negative affect (Shackman et al., 2016; Fox & Shackman, in press).

2. Although these findings highlight the contributions of the amygdala to trait-like differences in threat reactivity, it is by no means the only relevant region. Mechanistic and imaging work highlights the important contributions of a distributed circuit encompassing the anterior hippocampus, anterior insula/orbitofrontal cortex, and periaqueductal gray (PAG) (Fox & Kalin, 2014; Fox, Oler, Shackman, et al., 2015; Fox, Oler, Tromp, Fudge, & Kalin, 2015; Fox et al., 2010; Fox, Shelton, Oakes, Davidson, & Kalin, 2008; Kalin, Shelton, & Davidson, 2007; Oler et al., 2010; Shackman et al., 2013). Like the amygdala, activity in each of these regions predicts trait-like individual differences in stressor reactivity.

3. Relations between temperament and resting-state brain activity are not limited to the amygdala—dispositionally negative monkeys, children, and adults also show greater resting-state activity in the electroencephalogram (EEG) over the right compared to the left prefrontal cortex (PFC) (Oler et al., 2016; Wacker, Chavanon, & Stemmler, 2010). Like the negative phenotype, individual differences in resting prefrontal EEG asymmetry emerge early in life and are relatively stable over time, reliable, heritable, and predictive of the intensity of emotional reactions to aversive stimuli (Fox, Henderson, Marshall, Nichols, & Ghera, 2005; Smit, Posthuma, Boomsma, & De Geus, 2007; Towers & Allen, 2009; Wheeler, Davidson, & Tomarken, 1993). Like the dispositional-negativity phenotype, resting prefrontal EEG asymmetry: (a) prospectively predicts the first onset of mood disorders (Nusslock et al., 2011), (b) is exaggerated in patients with anxiety and mood disorders (Thibodeau, Jorgensen, & Kim, 2006; Nusslock et al., 2018), and is normalized by anxiolytic drugs (Oler et al., 2016). Furthermore, direct neurofeedback manipulations of prefrontal EEG attenuate negative affect elicited by subsequent exposure to aversive stimuli (Allen, Harmon-Jones, & Cavender, 2001). With the pharmacological evidence, this suggests that the neural mechanisms responsible for generating this electrophysiological marker causally

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contribute to trait-like individual differences in threat reactivity. Recent efforts to pinpoint the source of the scalp-recorded EEG asymmetry have highlighted the importance of the dorsolateral prefrontal cortex (dlPFC; Shackman, McMenamin, Maxwell, Greischar, & Davidson, 2009), consistent with this region's well-established role in regulating momentary affect (Buhle et al., 2014).

4. Individual differences in BST activity may reflect altered communication with the orbitofrontal cortex (OFC). Large-scale imaging studies in monkeys ( $n = 592$ ) demonstrate that threat-related metabolic activity in the OFC is heritable and predictive of trait-like differences in dispositional negativity (Fox, Oler, Shackman, et al., 2015). Moreover, selective OFC lesions are associated with decreased passive avoidance of uncertain threat and reduced BST activity in monkeys (Fox et al., 2010; Kalin et al., 2007), paralleling the consequences of naturally occurring OFC insults for BST activity in humans (Motzkin et al., 2015).

5. Deficient filtering of threat-related information from fronto-parietal working memory circuits, leading to elevated rumination over the past and increased worry about the future, may also contribute to context-independent negative affect (Stout, Shackman, Johnson, & Larson, 2014; Stout, Shackman, & Larson, 2013; Stout, Shackman, Pedersen, Miskovich, & Larson, 2017).

## CHAPTER 5.3

1. Our friend and colleague, Dr. Jaak Pansepp (June 5, 1943–April 18, 2017), passed away just before this volume was published.

## CHAPTER 5.9

1. This position is reminiscent of Lazarus' suggestion that "Emotion and cognition are each so complex and their mechanisms are spread so widely over the central and peripheral nervous system that, in my opinion, it is difficult to argue convincingly for separate systems as though there were a special brain organ for each" (Lazarus, 1991, p. 357).

## CHAPTER 6.3

1. Note that in this essay I will not discuss the first portion of Wakefield's definition related to cultural factors. Those interested are referred to (Lutz & White, 1986; Markus & Kitayama, 1991)

## CHAPTER 7.4

1. President George W. Bush, war, 2001 Remarks to State Department Employees. URL: <http://www.sourcewatch.org/index.php?title=Evildoers>.

2. <http://www.businessinsider.com/ted-cruz-defunding-obamacare-nazi-germany-filibuster-2013-9>.

3. Thanks to Ben Converse for this formalization.

## CHAPTER 8.1

1. The terms "threat-related" or "threat-relevant" encompass a broad range of stimuli, including clear and immediate dangers (e.g., cues paired with shock), novel situations or individuals, uncertain or diffuse dangers (e.g., darkness), aversive stimuli (e.g., unpleasant images or films), and angry and fearful facial expressions. Angry faces signal a direct threat to the observer and prompt the mobilization of defensive responses, as indexed by potentiation of the startle reflex (Dunning et al., 2010; Hess, Sabourin, & Kleck, 2007; Springer et al., 2007), facilitation of avoidance-related movements (Marsh, Ambady, & Kleck, 2005), and increased fear ratings (Dimberg, 1988). In contrast, fearful faces signal the presence, but not the source of potential threat, and promote heightened vigilance in the absence of defensive mobilization. That is, static images of fearful faces do not amplify the startle reflex (Grillon & Charney, 2011; Springer et al., 2007) or autonomic measures (Dunsmoor, Mitroff, & LaBar, 2009). But they can increase subjective feelings of anxiety (Blairy, Herrera, & Hess, 1999) and are perceived as more threatening and arousing than neutral or happy faces (Grillon & Charney, 2011; Wieser & Keil, 2014).

## CHAPTER 10.1

1. It is worth noting that Darwin (1872) stated that these opposing forms sometimes may not serve any function.

2. Calculated by using 20 facial action coding units, bilaterally where applicable, each of which may contract independently at five different levels of intensity.

3. An immediate physical utility distinguishes itself from the more distant social utility. Expression forms selected for social utility could also be considered "evolutionary" and functionally "ego-centric." However, purely symbolic associated forms for social utility need not have any physical consequences.

## CHAPTER 12.4

1. Surprise may also be considered to contain the fundamental property of unexpectedness that characterizes fear.

## CHAPTER 12.5

1. Such as 2-alternative forced choice (2AFC) stimulus identification procedures: In 2AFC, the participant is asked to indicate a particular property of the stimulus in trials of "invisible" stimulus presentation (even if they claim they did not see the stimulus and thus are guessing)—for example, observers may report on whether a face was upright or upside down; or whether a facial expression was happy vs. fearful. This is in contrast with methods relying on subjective reports, such as when a participant is asked to

say “yes” or “no” to whether they saw a face. Different individuals have different response biases (e.g., different propensities to indicate that a stimulus is present given a particular sensory experience). Therefore, subjective measures may be confounded by response biases and are typically regarded as less conservative than 2AFC procedures (Wiens, 2006).

2. Note that the magnitude of amygdalar activation does not appear to be reliably modulated by conscious access to an emotional stimulus (Costafreda, Brammer, David, & Fu, 2008).

3. Replications cited include those of investigators adopting important procedural variations, such as alterations in the specific awareness manipulation method (including the original backward masking method, as well as interocular suppression and crowding), and the type of neutral target to be rated (originally a Chinese ideograph, and now, in several studies, a neutral face).

4. Note that awareness may not be required when cognitive control is not triggered implicitly but rather *explicitly* (Kunde et al., 2012), such as in the case of slowing down following a stop signal (van Gaal, Lamme, Fahrenfort, & Ridderinkhof, 2011), or switching a task set following a cue (Lau & Passingham, 2007).

5. Indeed, symptoms of degenerative disease to the LPFC are obvious if the patient has a job requiring mental flexibility and decision making, but not if s/he has a routinized job or lifestyle (Knight & D’Esposito, 2003).

#### CHAPTER 13.2

1. Here we use the term *emotion* as a catch-all. There are, of course, many affective states, which range from mood, to arousal, to true emotions. There is every reason to believe that all of these influence rationality and preferences in some way. We use the expression “emotion” in this brief essay as an exemplar for understanding how affective states in general influence decision-making.

2. Of course, if humans do become intransitive in some emotional states, then we need to be more creative in trying to understand the structure of their behavior. Under conditions in which a decision-maker is intransitive, a simple study of preferences will prove unsupportable mathematically. The economist David Laibson’s famous dual-process beta-delta model (Laibson, 1997) is one example of a structural model for dealing meaningfully with intransitive behavior.

3. GARP stands for the “Generalized Axiom of Revealed Preference,” developed by Hendrik Houthakker as a mathematical specification for what is probably the most common definition of full transitivity. For a more detailed explanation of this approach to transitivity, see Chapter 3, pp. 52–70, in Glimcher, 2010.

4. For simplicity, we completely neglect here the fact that apples and oranges, when bundled together in groups, may cause nonlinear utility interactions. This is a hugely important point taught to first-year economics students and called “substitution.” In the references to which we point, this is developed in some detail. But in order to convey the most basic concepts, we neglect it here.

5. For an economist, this is an important distinction because significant differences in the shape of the preference function in the gain and loss domain can imply a specific form of intransitivity, an important point, which we again neglect for simplicity.

6. As pointed out first by Kahneman and Tversky (1979), people in some situations behave according to distorted rather than objectively given probabilities, which we can capture by replacing  $p$  in the *DEU* equation with a probability weighting function  $w(p)$ .

#### CHAPTER 15

1. Naturally, emotion researchers must remain mindful of measurement reliability in choosing between different within- vs. between-subjects designs (cf. Bradford, Starr, Shackman, & Curtin, 2015; Cannon, Cao, Mathalon, Gee, & NAPLS Consortium, 2018; Fox et al., 2012; Hedge, Powell, & Sumner, *in press*; Herting, Gautam, Chen, Mezher, & Vetter, *in press*).

2. From a clinical perspective, categorical approaches to diagnosing emotional disorders pose several critical barriers to discovering the nature and origins of psychopathology: rampant co-morbidity, low symptom specificity (e.g., insomnia), marked symptom heterogeneity, and poor reliability (Chmielewski, Clark, Bagby, & Watson, 2015; Clark, Cuthbert, Lewis-Fernandez, Narrow, & Reed, 2017; Fried, 2015, 2017; Fried & Nesse, 2015; Galatzer-Levy & Bryant, 2013; Goldstein-Piekarski, Williams, & Humphreys, 2016; Hasin et al., 2015; Kessler, Chiu, Demler, & Walters, 2005; Kotov et al., 2017; Krueger et al., *in press*; Olbert, Gala, & Tupler, 2014; Regier et al., 2013; Watson & Stasik, 2014). Addressing these problems requires a different kind of approach—one focused on narrower sets of transdiagnostic symptoms (e.g., anxiety, anhedonia)—as with the Hierarchical Taxonomy of Psychopathology (HiTOP) and Research Domain Criteria (RDoC) approaches (Clark et al., 2017; Kotov et al., 2017; Krueger et al., *in press*; Zald & Lahey, 2017). This ‘symptoms-not-syndromes’ dimensional approach (Fried, 2015) would also more naturally align with animal models (Fox & Kalin, 2014; Fox & Shackman, *in press*; Oler, Fox, Shackman, & Kalin, 2016). **There is compelling evidence that traditional categorical approaches to diagnosing emotional disorders present several significant barriers to understanding the underlying mechanisms, including substantial**



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symptom heterogeneity, frequent co-morbidity, and low inter-rater reliability (i.e., uncertain 'ground truth') (Fried, 2017; Galatzer-Levy & Bryant, 2013; Hasin et al., 2015; Regier et al., 2013). The adoption of narrower dimensional phenotypes is likely to provide useful (Kotov et al., 2017; Krueger et al., in press).

3. *Aggression* can be split on functional and neurobiological grounds into systems involved in defensive, offensive (predatory), and conspecific aggression, with the latter including maternal aggression and resource competition (food, mates, and territory/shelter) (Adams, 2006; Berkowitz,

1993; Nelson & Trainor, 2007). Naturally, researchers must remain mindful of measurement reliability in choosing between different experimental designs (e.g., within- vs. between-subjects); e.g., Bradford, Starr, Shackman, & Curtin, 2015; Cannon et al., 2018; Hedge, Powell, & Sumner, in press; Herting et al., in press; Larson et al., 2000; Shackman et al., 2017).

4. See also <https://www.nimh.nih.gov/research-priorities/rdoc/constructs/potential-threat-anxiety.shtml>; <https://www.nimh.nih.gov/research-priorities/rdoc/negative-valence-systems-workshop-proceedings.shtml>.

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