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A proposed solution to integrating cognitive-affective neuroscience and neuropsychiatry in psychiatry residency training: The time is now

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ABSTRACT

Despite increasing recognition of the importance of a strong neuroscience and neuropsychiatry education in the training of psychiatry residents, achieving this competency has proven challenging. In this perspective article, we selectively discuss the current state of these educational efforts and outline how using brain-symptom relationships from a systems-level neural circuit approach in clinical formulations may help residents value, understand, and apply cognitive-affective neuroscience based principles towards the care of psychiatric patients. To demonstrate the utility of this model, we present a case of major depressive disorder and discuss suspected abnormal neural circuits and therapeutic implications. A clinical neural systems-level, symptom-based approach to conceptualize mental illness can complement and expand residents' existing psychiatric knowledge.

1. Introduction

Modern day psychiatry and neurology have shared origins. Among the most impactful examples of this shared history are the clinical efforts performed at the La Salpêtrière Hospital in France in the late 19th century, where visionaries including Jean-Martin Charcot, Sigmund Freud, Gilles de la Tourette, and Pierre Janet all worked collaboratively in their care and study of patients with conditions at the interface of brain and mind (Bogousslavsky, 2014). In a unifying statement Charcot wrote "the neurological tree has its branches; neurasthenia, hysteria, epilepsy, all the types of mental conditions, progressive paralysis, gait ataxia (Charcot, 1887)." Unfortunately, despite this shared history, a "great divide" emerged throughout the 20th century with psychiatric mental disorders being largely defined by the presence of symptoms in the absence of any grossly visible pathology and neurological disorders based in the clinical-pathologic correlate (Price et al., 2000; Martin, 2002). Significant advances in cellular-molecular and systems-level cognitive-affective neuroscience and *in vivo* neuroimaging research across psychiatric disorders have now proven this distinction to be misleading. As examples, post-mortem pathological changes in the hippocampus in schizophrenia (Harrison, 2004) and in the anterior cingulate cortex in major depressive disorder (MDD) (Ongur et al., 1998; Cotter et al., 2001) have been well characterized. Yet, despite significant advances in our knowledge of the biological basis of psychiatric disorders and calls from international leaders such as the Nobel Laureate Eric Kandel (Cowan and Kandel, 2001) for increased neuroscience and clinically-relevant neurology education in psychiatry residency, cognitive-affective neuroscience and neuropsychiatry remain a challenge to integrate into clinical practice and psychiatric training experiences.

While there has been increasing recognition for the need to better incorporate neuroscience and psychiatrically relevant neurology into the education and training of psychiatry residents (Benjamin, 2013), successfully implementing such efforts and

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achieving tangible results has remained elusive. A recent study, for example, noted that while 94% of surveyed academic chairs, practicing psychiatrists, and residents agreed on the need to further promote neuroscience education, only 13% of trainees considered themselves to have a strong neuroscience knowledge base (Fung et al., 2015). In this article, we present the integrated perspectives of a current psychiatry resident in training (JT), a neuropsychiatry fellow with a background in neuroimaging research (JLP), an early career academic faculty psychiatrist with a background in neuromodulation (APS), a researcher in psychiatric neuroscience (MSK), and a dual trained early career neurologist-psychiatrist and cognitive-affective neuroscientist (DLP) to explore how trainees can bridge in real-time brain-symptom relationships in psychiatry. This article outlines how psychiatry residents can integrate systems-level neuroscience into their training to conceptualize psychiatric symptom-complexes and advance translational therapeutic efforts. An illustrative case example is presented to model this approach.

2. Current challenge

Many psychiatry residents may not be aware of their potential interest in a clinical psychiatric neuroscience approach to patient care due to a lack of clinical exposure. While any patient presentation can, and should, inspire a comprehensive, neuroscientifically and neurologically informed approach, trainees need clinical exposure to cases with salient neuropsychiatric elements to develop relevant conceptual and technical skills. High yield neuropsychiatric cases may include patients with prominent emotional, perceptual and/or behavioral symptoms in the context of neurodegenerative disease, epilepsy, cerebrovascular disease, traumatic brain injury, movement disorders and autoimmune disorders with neuropsychiatric features such as anti-NMDA encephalitis. However, depending on the training environment, some residents may be rarely exposed to such patients, as they are instead treated in sub-specialty clinics or other departments.

A related challenge for residents in developing a strong neuroscience and neuropsychiatric foundation may be the nature of the didactics available within many training programs. A recent study of 226 adult and child/adolescent psychiatry program directors noted that 39% felt that a lack of neuropsychiatry faculty, and 36% a lack of neuroscience faculty, were perceived barriers to appropriately offering increased training in neuropsychiatry and the neurosciences respectively (Benjamin et al., 2014). Other barriers also included the lack of relevant curriculums and faculty availability.

While a long-term solution to both these issues could be to establish neuropsychiatry divisions within academic psychiatry departments, in which psychiatry residents readily care for patients with psychiatric symptoms secondary to neurological illnesses, an equally important solution as discussed below is for academic psychiatry departments to place greater emphasis on a brain-symptom based approach in the formulation and treatment of patients experiencing idiopathic (primary) psychiatric symptoms.

3. Evolving large-scale solutions

Recognizing the challenges likely experienced by most residents in United States training programs and globally, several solutions have been proposed and developed at the national level. The National Institute of Mental Health (NIMH) has taken a dual approach to specifically support trainees who will define psychiatry as a field of "clinical neurosciences" and encourages neuroscience literacy through development of online modules and teaching based on the Research Domain Criteria (RDoC) project (Chung and Insel, 2014). RDoC is essentially a systems-level, dimensional research approach that conceptualizes psychiatric illness in part as disorders of neural circuitry (Insel et al., 2010). It emphasizes the association between broadly defined emotional and cognitive domains (e.g., negative and positive emotional valence systems) and neurobiological measures, ranging from genetics to physiology, in a manner agnostic to traditional diagnostic categories. The National Neuroscience Curriculum Initiative (NNCI) (http://www.nncionline.org/) has also been recently established to create, pilot, and disseminate a comprehensive set of shared resources for psychiatry residents and already features online educational modules, resources, and videos. Also, the Accreditation Council for Graduate Medical Education (ACGME) in the United States recently implemented a novel framework for evaluating resident performance and one of the these evaluation metrics is that all residents must show competency in clinical neuroscience. However, the specifics behind how individual residency programs implement and meet this clinical neuroscience requirement are less well defined. Beyond the evolving resources and changes discussed in this section, the time is now for residents, educators and like-minded academic psychiatrists to develop a culture of embracing cognitive-affective neuroscience and neuropsychiatry to expedite the "bench-to-bedside" translation of brain-symptom relationships to help guide clinical thinking and future innovative therapeutic interventions.

4. Proposed solution

We suggest that one potentially immediate and impactful method of increasing psychiatry residents' awareness, interest, expertise and clinical appreciation of clinical psychiatric neuroscience and neuropsychiatry is to encourage real-time circuit-specific discussions of brain-symptom relationships across the care of psychiatric patients. Akin to daily discussions occurring in neurology wards and outpatient clinics related to localizing the structural lesion, we specifically propose that psychiatry residents should be taught and encouraged to engage in discussions around *identifying suspected abnormally functioning brain circuits* (and particular nodes within a broadly distributed network that may be linked to a patient's particular symptoms). Given that the bio-psycho-social model is an integral part of psychiatric formulation (Engel, 1977) and residency educational experience, encouraging residents to use clinically-oriented neuroscience and neuropsychiatric principles to discuss the likely affected brain circuits as part of their overall case formulation offers an inexpensive and readily available translational neuroscience paradigm.

While identifying a discrete lesion remains important in making a neurological diagnosis, specific focal lesion localization in psychiatry has proven more difficult. Rather than there being a specific lesion or neuroanatomical site of damage that we can localize through examination or neuroimaging, psychiatric diseases may be better framed as disorders of distributed, interconnected brain networks. To use a metaphor, these diseases can be considered like the abnormal traffic flow patterns in a congested city where old and narrow roads, inefficient traffic lights, and bottlenecks at bridges create in combination a horrible traffic jam of the city's network of streets. While no one traffic light, single narrow road, or individual bridge may in itself be typically sufficient to cause a traffic jam, their effects combine to bring the city's traffic to a halt. Furthermore, at times there is one specific bridge or intersection that receives traffic from many distinct parts of the city and its disruption by itself can cause significant delays. Likewise, psychiatric symptoms can be conceptualized as brain network problems where often times no single isolated region, or lesion, of the brain is responsible for a psychiatric illness but rather