Stress Sensitivity as a Predictor of Long-Term Vulnerability Versus Stress Resilience

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Symposium

Psychiatric disorders are caused and maintained by acute and chronic stressors individuals are exposed to throughout life. Biological psychiatry has a long tradition in understanding the mechanistic underpinnings of stress adaptation and maladaptation at all translational levels. At the human brain systems level, functional and structural imaging methods have allowed us to identify stress-induced brain changes. In this symposium we will present converging evidence from different cohorts in healthy samples, in high-risk samples and in psychiatric patients with one or more comorbidity. Firstly, we will identify stress sensitivity by means of multimodal imaging in cohorts of healthy children, adolescents and young adults. Next, we will introduce neurocognitive factors of resilience/vulnerability that influence responses to emotional challenges, as well as evidence for the effectiveness of interventions aimed at increasing resilience in clinical and non-clinical groups. Then we will share structural imaging data and measurements of early life adversity to disentangle the interaction with psychiatric comorbidity on the structural integrity of brain regions involved in emotion regulation. Finally, we identify the relationship of amygdala reactivity and a transdiagnostic neurocognitive marker of depression in psychiatric patients with neurodevelopmental and stress-related mental disorders to identify common and dissociating (mal-) adaptation factors. In sum, we give an overview how the susceptibility to stressful life events play a role in the development of psychopathology in the shorter and longer term also taking aspects of psychiatric comorbidity into account

Objective

Having accomplished this symposium or workshop, participants will be able to:
- Learn about the latest progress of innovative research in the field of stress vulnerability and resilience in clinical and non-clinical samples
- Learn applications of multimodal brain imaging techniques (i.e., EEG/ERP, MRI, fMRI) into understanding human stress sensitivity, vulnerability and resilience in both healthy and psychiatric populations including children, adolescents and adults.
- Gain awareness and knowledge of multimodal brain imaging techniques and advanced analytic methods, and interpretation of neuroimaging data

Target Audience

This session is suitable to a broad audience, especially for psychologists, cognitive neuroscientists, and clinical neursocientists with an interest in the field of stress-related research.

Presentations

Cultivating Affective Resilience: Proof-of-principle evidence of translational benefits from a novel cognitive-emotional training intervention

Available evidence highlights the importance of resilience factors in psychological well-being, but translation of their beneficial effects from laboratory to real-life remains scarce. In my talk, I will first present evidence regarding the role of emotion regulation (ER), cognitive flexibility, and general/coping self-efficacy in providing protection against symptoms of distress (anxiety and depression). Then, I will provide proof-of-concept evidence from a novel ER training intervention aimed at increasing resilience against emotional distress. This intervention, targeting the development of ER skills, involved training military veterans and university students over 5-8 weeks in flexibly applying two effective ER strategies (Focused Attention and Cognitive Reappraisal) to scenarios presenting emotional conflicts (constructed with both external and internal cues and focusing on past, present, and future emotional challenges). Training was preceded and followed by neuropsychological, personality and clinical assessments, and resting-state functional MRI data were also collected from a subsample of the participants. Results show enhanced executive function and psychological well-being following training, reflected in increased working memory, post-traumatic growth, and general self-efficacy. Brain imaging results showed evidence of diminished bottom-up influences from emotional and perceptual brain regions, along with evidence of normalized functional connectivity in the large-scale functional networks following training. The latter was reflected in increased connectivity among cognitive and emotion control regions and across regions of self-referential and control networks. Overall, our results provide proof-of-concept evidence that resilience and well-being can be learned through ER training, and that training-related improvements manifested in both behavioral change and neuroplasticity can translate into real-life benefits.

Presenter

Florin Dolcos, Beckman Institute for Advanced Urbana, IL, United States

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Childhood Adversity (CA) Induces Gray Matter Changes Independent of Psychiatric Comorbidity

This lecture is based on the notion that childhood adversity (CA) related changes in brain structure are thought to mediate vulnerability for development and maintenance of psychiatric diseases. Hardly any studies have been conducted that have investigated the relationship between CA, psychiatric comorbidity and changes in brain structure by including healthy subjects and psychiatric patients. In this lecture we will present an approach starting with region of interest that have been mostly associated with CA and variation in stress-related psychopathology. We used high resolution structural 3 Tesla T1-weighted images and subsequent automatized segmentation, we investigated absence or presence of CA. on cortical thickness of the anterior cingulate, amygdala and hippocampus volume in a naturalistic cohort of psychiatric outpatients with stress-related disorders, neurodevelopmental disorders and their comorbidity and compared them with non-psychiatric control subjects. In our study, 165 patients (69 = female) and 83 controls (47= female) with a mean age of 37,7 (+- 14,1) years were included. CA was more present in the patients than controls and was most frequent in the stress-related disorders group. CA but not psychiatric comorbidity induced a cortical thinning in the anterior cingulate cortex but no changes in amygdala or hippocampus. We did not find any interaction effects. We conclude that the anterior cingulate is an important hub region in stress -related brain changes as expressed by the relationship with CA. However, the impact of psychopathology related brain changes is less clear and may depend on more subtle gene by environment interactions. Subsequent studies need to investigate whether the impact of CA on psychopathology related brain changes is mainly driven by gene by environment interactions.

Presenter

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Stress-induced Neurocognitive Reorganization Linking to Vulnerability: From circuitry to network and behaviour

Exposure to long-term stress can lead to brain dysfunction, cognitive deficits and mental disorders. Yet, our understanding of the underlying neurocognitive mechanisms why some individuals are more vulnerable than others is still in its infancy. Conventional approaches with acute stress paradigm provide limited information about the profound effects of long-term stress on human brain, cognition and behaviour. I will present a series of four task-dependent and resting-state fMRI studies with, in combination with naturistic long-term stress paradigms such as prolonged exposure to low socioeconomic backgrounds, negative parenting, and competitive exam stress, to investigate how stress-induced neurocognitive reorganization predicts individual differences in stress vulnerability school-aged children, adolescents and adults. By leveraging neuropsychological and endocrinal assessments, computational modeling, and advanced analytic approaches (i.e., K-means, network connectivity, dynamic causal modeling of functional circuits, we found that: (1) exposure to low socioeconomic backgrounds reduced children's integrative cortisol secretion considering basal cortisol at bedtime, nocturnal cortisol activity during sleep and accelerating cortisol activity after awakening in the morning, which further led to increased centromedial amygdala connectivity with ventromedial and dorsolateral prefrontal regions; (2) negative parenting at 13-year-old during early adolescence could predict adolescents' depressive symptoms 3 years alter during later adolescence through increased intrinsic amygdala connectivity with the ventrolateral prefrontal cortex; (3) trait anxiety as a vulnerable phenotype of stress-related mental disorders works in concert with long-term stress to affect latent decision-making dynamics during working memory through increased functional recruitment of fronto-parietal network and its imbalanced coupling with the default mode network in young healthy adults (4) pharmacological manipulation provide preliminary evidence to suggest that stress-sensitive cortisol secretion plays a critical role in stress-induced brain functional reorganization at regional activation, functional and effective connectivity levels. Altogether, our findings point toward that stress-induced neurocognitive reorganization predicts individual differences in stress vulnerability.

Presenter

Shaozheng Qin, Beijing Normal University, Beijing, China

Amygdala Reactivity and Negative Memory Bias; Two stress-related vulnerability markers and their relationship in a naturalistic psychiatric patient sample

Enhanced memory for negative self-relevant information (i.e. self-referent negative memory bias) is a key cognitive symptom of stress-related disorders, especially depression. Recent evidence suggests that it could be a transdiagnostic marker for depressotypic behaviour. Along the same lines, amygdala reactivity is a proposed neural correlate of stress reactivity, but its relationship with self-referent negative memory bias and its two components, endorsement and recall, is unknown. We therefore aimed to assess these relationships in a naturalistic psychiatric patient sample to understand whether they reflect depressotypic vulnerability in a similar way. we investigated patients (N = 125) with (multimorbid) stress-related and neurodevelopmental psychiatric disorders performed an fMRI emotion processing task to measure amygdala reactivity and the self-referent encoding task to measure endorsement, recall, and self-referent negative memory bias. Associations were assessed using linear regression models. We found a negative relationship between amygdala reactivity and self-referent negative memory bias in a subsample of patients (n = 58) who actually had a bias. We found no association between amygdala reactivity and negative endorsement, but increased left amygdala reactivity was related to more negative recall. Our study confirms that endorsement and recall represent separate processes with different underlying mechanisms; endorsement, which is less amygdala-dependent, may reflect negative cognitive schemas, whilst the positive association between amygdala reactivity and recall reflects the well-known amygdala modulation hypothesis of hippocampus-mediated memory retrieval. Notably, this was found not only in depression, but in psychiatric disorders in general, and will be further discussed in the context of a disease-independent vulnerability.

Presenter

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