**Mood disorders on genetic spectrum**

Researchers shed new light on the genetic relationship between three mood disorders associated with depression—major depression and bipolar disorder types 1 and 2, in a new study in the journal Biological Psychiatry, published by Elsevier.

 “The clearest findings are a genetic distinction between type 1 bipolar and type 2 bipolar, and the greater similarity of type 2 bipolar to major depressive disorder,” said first author Jonathan Coleman, PhD, a statistical geneticist and postdoctoral fellow in the lab of senior author Gerome Breen, PhD at the Institute of Psychiatry, Neuroscience, and Psychology at Kings College London, UK.

Both types of bipolar disorder used to be referred to as ‘manic-depressive disorder’. Mania is a behavioral state associated with behavioral activation, euphoric or irritable mood, reduced need for sleep, impulsive behavior, impaired judgement, racing disorganized thoughts, impulsive behaviors, and frequently strongly held false beliefs (delusions) or hallucinations. Bipolar disorder type 1 is associated with mania and depression, while bipolar 2 is predominately associated with depression marked by mild symptoms reminiscent of mania, called hypomania.

The insights came from several extremely large datasets analyzed together. For their meta-analysis, Coleman, Breen and their co-authors combined genome-wide association studies from three large datasets of people with major depression and bipolar disorder to evaluate shared and distinct molecular genetic associations. Most of the data came from the large international Psychiatric Genomics Consortium. Additional data came from the UK Biobank, a major health resource established by the Wellcome Trust, and the online genetic service platform, 23andMe.

There are significant racial and ethnic differences in the findings from genome-wide association studies (GWAS). The findings of this study pertain only to people of European ancestry and findings might be different in other groups.

The authors also report that the genetic risk for these disorders was predictive of other traits as well. For example, the genetic risk for bipolar disorder was correlated with more educational attainment, while the heritable risk for major depressive disorder was associated with less education.

In the mouse brain, the authors also mapped the genetic risk for these disorders on to particular brain cell types using a sophisticated analytic strategy building on the pattern of genes expressed. They implicated serotonin neurons in the risk for both depression and bipolar disorder, while bipolar disorder distinctively involved GABA and glutamate neurons (nerve cell types also implicated in schizophrenia).

 “We have long known that mood disorders are highly heterogeneous and the boundaries between types of mood disorders are often difficult to define clinically,” said John Krystal, MD, editor of Biological Psychiatry. “This new study suggests that there are aspects of genetic risk, and presumably brain function, that link forms of mood disorders, but there are also distinctions that may shed light on subtypes of depression that may have important implications for treatment.”

Ultimately, the researchers want to develop clinical tools to help predict if a first episode of depression is likely to persist as a disorder or progress into bipolar disorder. “Genetic data won’t ever replace clinical insight, but it might be a useful addition to clinical models,” said Coleman.

**Trained musicians perform better — at paying attention**

Musical training produces lasting improvements to a cognitive mechanism that helps individuals be more attentive and less likely to be distracted by irrelevant stimuli while performing demanding tasks. According to a new study appearing in the journal Heliyon, published by Elsevier, trained musicians demonstrate greater executive control of attention (a main component of the attentional system) than non-musicians. Notably, the more years of training musicians have, the more efficient they are at controlling their attention.

“Our study investigated the effects of systematic musical training on the main components of the attentional system. Our findings demonstrate greater inhibitory attentional control abilities in musicians than non-musicians. Professional musicians are able to more quickly and accurately respond to and focus on what is important to perform a task, and more effectively filter out incongruent and irrelevant stimuli than non-musicians. In addition, the advantages are enhanced with increased years of training,” explained lead investigator, Paulo Barraza, PhD, Center for Advanced Research in Education, University of Chile, Santiago, Chile.

The attentional system consists of three subsystems that are mediated by anatomically distinct neural networks: alerting, orienting, and executive control networks. The alerting function is associated with maintaining states of readiness for action. The orienting function is linked to the selection of sensory information and change of attentional focus. The executive control function is involved both in the suppression of irrelevant, distracting stimuli and in top-down attentional control. The study’s findings also demonstrated a correlation between the alerting and orienting networks in musicians than in non-musicians, possibly reflecting a functional relationship between these attentional networks derived from the deliberate practice of music.

The investigators recorded the behavioral responses of 18 professional pianists and a matched group of 18 non-musician professional adults who engaged in an attentional networks test. The musician group consisted of full-time conservatory students or conservatory graduates from Conservatories of the Universidad de Chile, Universidad Mayor de Chile, and Universidad Austral de Chile, with an average of more than 12 years of practice. “Non-musicians” were university students or graduates who had not had formal music lessons and could not play or read music.

The participants viewed and provided immediate feedback on rapidly presented image variations to test the efficiency of their reactive behavior. Mean scores of the alerting, orienting, and executive networks for the group of musicians were 43.84 milliseconds (ms), 43.70 ms, and 53.83 ms; for the group of non-musicians mean scores were 41.98 ms, 51.56 ms, and 87.19 ms, respectively. The higher scores show less efficient inhibitory attentional control.

Prior research has shown that systematic musical training results in changes to the brain that correlate with the enhancement of some specific musical abilities. However, musical training not only enhances the musical auditory perception, but also seems to have an impact on the processing of extra-musical cognitive abilities (e.g., working memory). According to the investigators, this is the first study to test the effect of musical training on attentional networks, which adds to previous research about the potential effect of musical practice on the development of extra-musical cognitive skills.

 “Our findings of the relationship between musical training and improvement of attentional skills could be useful in clinical or educational fields, for instance, in strengthening the ability of ADHD individuals to manage distractions or the development of school programs encouraging the development of cognitive abilities through the deliberate practice of music. Future longitudinal research should directly address these interpretations,” noted co-investigator David Medina, BMEd, Department of Music, Metropolitan University of Educational Sciences, Santiago, Chile.

**Sports involvement linked to fewer depressive symptoms in children**

Participation in team sports is associated with fewer depressive symptoms in children, whereas non-sport activities have no association with symptoms, according to a study in Biological Psychiatry: Cognitive Neuroscience and Neuroimaging, published by Elsevier. The association was found only for boys. The findings suggest that exercise could have anti-depressant effects in adolescents.

 “These interesting results provide important clues as to how exercise benefits mood in children and reveals the important role that gender plays in these effects,” said Cameron Carter, MD, Editor of Biological Psychiatry: Cognitive Neuroscience and Neuroimaging.

Using brain imaging, the researchers showed that involvement in sports was associated with increased volume of a brain region important for memory and response to stress—the hippocampus—in both boys and girls. However, hippocampal volume was associated with depressive symptoms in boys only, suggesting that in boys, hippocampal changes may play a role in the relationship between sports involvement and depressive symptoms.

The positive impact of exercise on depression, and the link with hippocampal volume, has been shown previously in adults. But the new study, which included over 4,000 children ages 9–to–11 years, is the first to connect involvement in sports with mental health and brain development in children.

 “We found that these relationships were specific to participating in sports, and not to participating in other type of activities, such as clubs, arts and music, though these activities may have their own benefits that were not examined in the current study,” said first author Lisa Gorham and senior author Deanna Barch, PhD, both of Washington University in St. Louis, MO, USA. “We also found that these relationships were particularly strong for participating in team sports or sports that involved ‘structure’, such as a school team, a non-school league or regular lessons, as compared to more informal engagement in sports. This raises the intriguing possibility that there is some added benefit of the team or structured component of sports, such as the social interaction or the regularity that these activities provide.”

The data do not show which one causes the other—whether participating in sports leads to the effects on brain development and depression, or if children with those characteristics are less likely to engage in sports. “However, either of these causal relations is important and would suggest new directions for work on improving or preventing depression in children,” said Ms. Gorham and Dr. Barch.

The findings provide an important look at how exercise might impact brain development in adolescence and suggest a way for reducing or preventing depression. Confirming the impact of sports on brain development and mood would provide strong support for encouraging children to participate in structured sports that provide both exercise and social interaction.