Unit 2 Homework 2020

During puberty massive amounts of hormones drive the physical changes to the body that we observe. But as discussed in lecture those hormones also cause extensive changes in the organization of the brain. Certain connections are strengthened, others are lessened and still others are newly created. This affects intellectual abilities such as the capacity for abstract thought, social cognition and the ability to grasp advanced moral principles. I often refer to this as the brain going from 'information acquisition mode' to 'information application mode.' Young adults become more adept at using what they know and applying their knowledge and skills to solving problems. It is also during this delicate transition period that a number of mental illnesses emerge such as mood and anxiety disorders as well as schizophrenia.

Attached are a number of short articles that summarize recent research investigating different aspects of puberty. Read them over and then answer the following questions.

1. The first three articles are related to the onset of puberty. What significant change has occurred over the last 150 years in regards to the onset of puberty?

2. What factors are believed to be involved that have contributed to this change?

3. What are some of the potential problems that coincide with the early onset of puberty?

4. The remainder of the articles discuss various different aspects of what's actually happening inside the brain and nervous system over the course of puberty. What happens to sensory pathways in the brain, such as those responsible for visual processing?

5. What happens to pathways in the brain having to do with advanced social skills (understanding the perspective of another), self-control and decision making?

6. Are there gender differences in how the brain develops over the course of puberty and beyond?

7. Taken together, what can these findings tell us with regard to mental illness?

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Molecular link between body weight, early puberty identified

Enzyme that can activate or suppress puberty gene behaves differently in fat, thin rats

Date: October 11, 2018

Source: Oregon Health & Science University

Summary: Becoming overweight at a young age can trigger a molecular chain reaction that leads some girls to experience puberty early, according to new research. Scientists have discovered an enzyme in the brain that behaves differently in fat and thin rats, and leads overweight female rats to have early-onset puberty.

FULL STORY

Becoming overweight at a young age can trigger a molecular chain reaction that leads some girls to experience puberty early, according to new research published in *Nature Communications*.

Scientists have discovered a molecular mechanism that leads overweight female rats to have early-onset puberty.

"Knowing how nutrition and specific molecules play a role in starting puberty early could one day help physicians prevent the condition in humans," said one of the study's corresponding authors, Alejandro Lomniczi, Ph.D., a research assistant professor at OHSU's Oregon National Primate Research Center.

Girls have been experiencing puberty earlier in life for the last 150 years or so, with 12.5 years being the average age girls start puberty today. Early-onset puberty can lead girls to experience health problems later, including increased incidence of ovarian, uterine and breast cancers, as well as being at a higher risk for cardiovascular and metabolic diseases.

But the human genome -- the complete set of nucleic acid sequences in human DNA -- hasn't changed substantially in the past 150 years. So Lomniczi and colleagues are now exploring if the difference might be due to epigenetics, or changes caused by gene expression rather than changes in the genetic code itself. Gene expression is when genes make functional products such as proteins.

Lomniczi's previous research identified two gene families that keep puberty in check when rodents and nonhuman primates are young. This new study builds on that earlier work by specifically examining how gene expression and body weight are involved in puberty in rats.

For this study, the team raised three kinds of female rats: overweight, lean and average-sized. While focusing on the hypothalamus, the bottom part of the brain that controls reproductive development, they found that a puberty-activating gene called Kiss1 was expressed differently in each rat type.

Lomniczi and colleagues identified the enzyme SIRT1 in the hypothalamus as being a key player in transmitting body weight information to the brain. In overweight rats, there is less SIRT1 in the hypothalamus, allowing the Kiss1 gene to be expressed earlier, leading the rats to undergo puberty early. In lean rats, SIRT1 is higher for a prolonged period of time, taking longer for Kiss1 gene activation, which delayed puberty in those rats.

Lomniczi continues to explore the causes of early-onset puberty through animal model studies. He's also examining how the circadian clock and endocrine disruptors might play a role.

Story Source:

Materials provided by **Oregon Health & Science University**. *Note: Content may be edited for style and length.*

Journal Reference:

1. M. J. Vazquez, C. A. Toro, J. M. Castellano, F. Ruiz-Pino, J. Roa, D. Beiroa, V. Heras, I. Velasco, C. Dieguez, L. Pinilla, F. Gaytan, R. Nogueiras, M. A. Bosch, O. K. Rønnekleiv, A. Lomniczi, S. R. Ojeda, M. Tena-Sempere. **SIRT1 mediates obesity- and nutrient-dependent perturbation of pubertal timing by epigenetically controlling Kiss1 expression**. *Nature Communications*, 2018; 9 (1) DOI: 10.1038/s41467-018-06459-9

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Oregon Health & Science University. "Molecular link between body weight, early puberty identified: Enzyme that can activate or suppress puberty gene behaves differently in fat, thin rats." ScienceDaily. ScienceDaily, 11 October 2018. <www.sciencedaily.com/releases/2018/10/181011090526.htm>.

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Obesity speeds up the start of puberty in boys

Date: March 25, 2019

Source: The Endocrine Society

Summary: Girls are not the only ones who go through puberty early if they have obesity. Boys with obesity enter puberty at an earlier age than average, according to a new study.

FULL STORY

Girls are not the only ones who go through puberty early if they have obesity. Boys with obesity enter puberty at an earlier age than average, according to a study that will be presented Sunday at ENDO 2019, the Endocrine Society's annual meeting in New Orleans, La.

In 527 Chilean boys ages 4 to 7 years, both total body obesity and central obesity, or excess belly fat, were associated with greater odds of starting puberty before age 9, researchers from the University of Chile in Santiago, Chile reported.

"With the increase in childhood obesity worldwide, there has been an advance in the age at which puberty begins in girls," said the lead investigator, Maria Veronica Mericq, M.D., a professor at the university. "However, in boys the evidence has been controversial."

Some U.S. studies have found that obesity delayed puberty, whereas another study showed that only overweight but not obesity induced earlier puberty in boys. In contrast, study results from Europe showed earlier puberty in boys with overweight and obesity. Early puberty -- called precocious puberty -- is linked to possible problems including stunted growth and emotional-social problems, according to the Hormone Health Network.

The boys were part of Chile's Growth and Obesity Cohort Study. Puberty was considered precocious using a standard measure for boys: testicle growth (larger than 3 cubic centimeters, or about 0.19 cubic inches) before age 9. To determine central obesity, study personnel measured each boy's waistline. For total obesity, they used weight and height to calculate the body mass index (BMI) standard deviation score (SDS). A BMI greater than 1 SDS is equal to BMI above the 85th percentile for age, the scale the United States uses to indicate overweight in children. Obesity is a BMI greater than 2 SDS or above the 95th percentile.

Mericq's team found that the prevalence of total obesity increased with age, from 22 percent of boys ages 6 to 7 years to 28.6 percent at 11.4 years, the average age at onset of puberty for this group. Central obesity also increased in that timeframe, from 11.8 percent to 17.4 percent.

Precocious puberty reportedly occurred in 45 boys, or 9 percent. Total obesity and central obesity from ages 4 to 7 raised the odds of early puberty compared with having a healthy weight. For instance, among boys age 5 or 6, those with obesity had nearly 2.7 times the odds of starting puberty early, and those with central obesity had almost 6.4 higher odds of puberty before age 9, Mericq reported. She explained that central obesity more closely relates to fat mass, because a higher BMI may reflect increased muscle, especially in athletes.

"Early puberty might increase the risk of behavior problems and in boys could be related to a higher incidence of testicular cancer in adulthood," Mericq said. "Our results suggest that controlling the obesity epidemic in children could be useful in decreasing these risks."

Story Source:

Materials provided by **The Endocrine Society**. *Note: Content may be edited for style and length.*

ScienceDaily

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Stress Fast Tracks Puberty, Researchers Say

Date:
October 19, 2006
Source:
BMJ Specialty Journals
Summary:
Stress, such as that brought on by parental separation and absentee fathers, fast tracks puberty, say researchers in the Journal of Epidemiology and Community Health.

FULL STORY

Stress, such as that brought on by parental separation and absentee fathers, fast tracks puberty, say researchers in the Journal of Epidemiology and Community Health.

But the failure of politicians, teachers and often parents to acknowledge these physical and emotional changes only adds to teenagers' stress and leads to poor physical and mental health among this age group, they say.

The authors from Liverpool John Moores University Centre for Public Health, say that the onset of puberty has been steadily falling for the past 150 years, and has dropped three years within the past century alone, as a result of public health measures and improved nutrition.

But it is also due to stress, with parental separation/divorce and absentee fathers "one of the most effective stressors," they write. Rates of divorce and single parenthood have rapidly increased in many countries, they say.

But despite the younger age at which children reach puberty, there have been no attempts to develop young people faster, "leaving an increasing gap between physical puberty [changes to their bodies] and social puberty [when they are able to make decisions for themselves]," they write.

"The results can be ill informed health damaging behaviour," they say, including unprotected sex, substance abuse, self harm, violence and bullying, with disadvantaged communities likely to hit the hardest.

While society in general might prefer to ignore earlier puberty, the commercial sector certainly has not, drawing heavily on sexual imagery in their marketing to young teens, say the authors.

"Such marketing is more likely to reinforce the confusion caused by separated physical and social puberty rather than providing the information necessary to deal with it," they write.

"In the short term, responding to earlier puberty means moving away from societal attitudes that equate protecting children with regarding them as firmly ensconced in childhood long after their physical journey into adulthood has begun," contend the authors.

"Such pretence, however well intentioned, simply denies them the vital information they require to complete this transition without damaging their health," they conclude.

Story Source:

Materials provided by **BMJ Specialty Journals**. *Note: Content may be edited for style and length.*

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BMJ Specialty Journals. "Stress Fast Tracks Puberty, Researchers Say." ScienceDaily. ScienceDaily, 19 October 2006. <www.sciencedaily.com/releases/2006/10/061019094213.htm>.
BMJ Specialty Journals. (2006, October 19). Stress Fast Tracks Puberty, Researchers Say. *ScienceDaily*. Retrieved February 23, 2020 from www.sciencedaily.com/releases/2006/10/061019094213.htm
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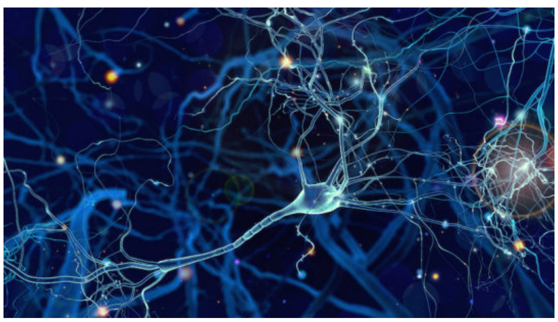
Brain networks come 'online' during adolescence to prepare teenagers for adult life

Date: January 29, 2020

Source: University of Cambridge

Summary: New brain networks come 'online' during adolescence, allowing teenagers to develop more complex adult social skills, but potentially putting them at increased risk of mental illness, according to new research.

FULL STORY



Neurons illustration (stock image).

Credit: © whitehoune / Adobe Stock

New brain networks come 'online' during adolescence, allowing teenagers to develop more complex adult social skills, but potentially putting them at increased risk of mental illness, according to new research published in the *Proceedings of the National Academy of Sciences* (*PNAS*).

Adolescence is a time of major change in life, with increasing social and cognitive skills and independence, but also increased risk of mental illness. While it is clear that these changes in the mind must reflect developmental changes in the brain, it has been unclear how exactly the function of the human brain matures as people grow up from children to young adults.

A team based in the University of Cambridge and University College London has published a major new research study that helps us understand more clearly the development of the adolescent brain.

The study collected functional magnetic resonance imaging (fMRI) data on brain activity from 298 healthy young people, aged 14-25 years, each scanned on one to three occasions about 6 to 12 months apart. In each scanning session, the participants lay quietly in the scanner so that the researchers could analyse the pattern of connections between different brain regions while the brain was in a resting state.

The team discovered that the functional connectivity of the human brain -- in other words, how different regions of the brain 'talk' to each other -- changes in two main ways during adolescence.

The brain regions that are important for vision, movement, and other basic faculties were strongly connected at the age of 14 and became even more strongly connected by the age of 25. This was called a 'conservative' pattern of change, as areas of the brain that were rich in connections at the start of adolescence become even richer during the transition to adulthood.

However, the brain regions that are important for more advanced social skills, such as being able to imagine how someone else is thinking or feeling (so-called theory of mind), showed a very different pattern of change. In these regions, connections were redistributed over the course of adolescence: connections that were initially weak became stronger, and connections that were initially strong became weaker. This was called a 'disruptive' pattern of change, as areas that were poor in their connections became richer, and areas that were rich became poorer.

By comparing the fMRI results to other data on the brain, the researchers found that the network of regions that showed the disruptive pattern of change during adolescence had high levels of metabolic activity typically associated with active re-modelling of connections between nerve cells.

Dr Petra Vértes, joint senior author of the paper and a Fellow of the mental health research charity MQ, said: "From the results of these brain scans, it appears that the acquisition of new, more adult skills during adolescence depends on the active, disruptive formation of new connections between brain regions, bringing new brain networks 'online' for the first time to deliver advanced social and other skills as people grow older."

Professor Ed Bullmore, joint senior author of the paper and head of the Department of Psychiatry at Cambridge, said: "We know that depression, anxiety and other mental health disorders often occur for the first time in adolescence -- but we don't know why. These results show us that active re-modelling of brain networks is ongoing during the teenage years and deeper understanding of brain development could lead to deeper understanding of the causes of mental illness in young people."

Measuring functional connectivity in the brain presents particular challenges, as Dr František Váša, who led the study as a Gates Cambridge Trust PhD Scholar, and is now at King's College London, explained.

"Studying brain functional connectivity with fMRI is tricky as even the slightest head movement can corrupt the data -- this is especially problematic when studying adolescent development as younger people find it harder to keep still during the scan," he said. "Here, we used three different approaches for removing signatures of head movement from the data, and obtained consistent results, which made us confident that our conclusions are not related to head movement, but to developmental changes in the adolescent brain."

The study was supported by the Wellcome Trust.

Story Source:

Journal Reference:

1. František Váša, Rafael Romero-Garcia, Manfred G. Kitzbichler, Jakob Seidlitz, Kirstie J. Whitaker, Matilde M. Vaghi, Prantik Kundu, Ameera X. Patel, Peter Fonagy, Raymond J. Dolan, Peter B. Jones, Ian M. Goodyer, Petra E. Vértes, Edward T. Bullmore. **Conservative and disruptive modes of adolescent change in human brain functional connectivity**. *Proceedings of the National Academy of Sciences*, 2020; 201906144 DOI: 10.1073/pnas.1906144117

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Research identifies changes in neural circuits underlying self-control during adolescence

Study shows developing brain networks support cognition in youth

Date: January 3, 2020

Source: University of Pennsylvania School of Medicine

Summary: Researchers applied tools from network science to identify how anatomical connections in the brain develop to support neural activity underlying executive function.

FULL STORY

Self control concept (stock image).

Credit: © tashatuvango / Adobe Stock

The human brain is organized into circuits that develop from childhood through adulthood to support executive function -- critical behaviors like self-control, decision making, and complex thought. These circuits are anchored by white matter pathways which coordinate the brain activity necessary for cognition. However, little research exists to explain how white matter matures to support activity that allows for improved executive function during adolescence -- a period of rapid brain development.

Researchers from the Lifespan Brain Institute of the Perelman School of Medicine at the University of Pennsylvania and Children's Hospital of Philadelphia applied tools from network science to identify how anatomical connections in the brain develop to support neural activity underlying these key areas. The findings were published in the *Proceedings of the National Academy of Sciences*.

"By charting brain development across childhood and adolescence, we can better understand how the brain supports executive function and self-control in both healthy kids and those with different mental health experiences," said the study's senior author Theodore Satterthwaite, MD, an assistant professor of Psychiatry at Penn. "Since abnormalities in developing brain connectivity and deficits in executive function are often linked to the emergence of mental illness during youth, our findings may help identify biomarkers of brain development that predict cognitive and clinical outcomes later in life."

In this study, the researchers mapped structure-function coupling -- the degree to which a brain region's pattern of anatomical connections supports synchronized neural activity. This could be thought of like a highway, where the anatomical connections are the road and the functional connections are the traffic flowing along those roads. Researchers mapped and analyzed multi-modal neuroimaging data from 727 participants ages 8 to 23 years, and three major findings emerged.

First, the team found that regional variability in structure-function coupling was inversely related to the complexity of the function a given brain area is responsible for. Higher structure-function coupling was found in parts of the brain that are specialized for processing simple sensory information, like the visual system. In contrast, there was lower structure-function coupling in complex parts of the brain that are responsible for executive function and self-control, which require more abstract and flexible processing.

Results showed that structure-function coupling also aligned with known patterns of brain expansion over the course of primate evolution. Previous work comparing human, ape, and monkey brains has showed that sensory areas like the visual system are highly conserved across primate species and have not expanded much during recent evolution. In contrast, association areas of the brain, such as the prefrontal cortex, have expanded dramatically over the course of primate evolution. This expansion may have allowed for the emergence of uniquely complex human cognitive abilities. The team found that the brain areas which expanded rapidly during evolution had lower structure-function coupling, while simple sensory areas that have been conserved in recent evolution had higher structure-function coupling.

Researchers also found that structure-function coupling increased throughout childhood and adolescence in complex frontal brain regions. These are the same regions that tend to have lower baseline structure-function coupling, are expanded compared to monkeys, and are responsible for self-control. The prolonged development of structure-function coupling in these regions may allow for improved executive function and self-control that develops into adulthood. Indeed, the team found that higher structure-function coupling in the lateral prefrontal cortex -- a complex brain area which plays important roles in self-control -- was associated with better executive function.

"These results suggest that executive functions like impulse control -- which can be particularly challenging for children and adolescents -- rely in part on the prolonged development of structure-function coupling in complex brain areas like the prefrontal cortex," explained lead author Graham Baum, PhD, a postdoctoral fellow at Harvard University, who was a Penn neuroscience PhD student during the time of the research. "This has important implications for understanding how brain circuits become specialized during development to support flexible and appropriate goal-oriented behavior."

Additional Penn co-authors include Zaixu Cui, David R. Roalf, Bart Larsen, Matthew Cieslak, Philip A. Cook, Cedric H. Xia, Tyler M. Moore, Kosha Ruparel. Desmond Oathes, Russell T. Shinohara, Raquel E. Gur, Ruben C. Gur, and Danielle S. Bassett.

This work was supported by the National Institute of Mental Health (F31MH115709, R01MH113550, MH089983, MH089924, R01MH107703, R01MH112847, R01MH107235, P50MH096891, K01MH102609, R01NS085211, RF1MH116920). Additional support was provided by the Lifespan Brain Institute.

Story Source:

Materials provided by **University of Pennsylvania School of Medicine**. *Note: Content may be edited for style and length.*

Journal Reference:

1. Graham L. Baum, Zaixu Cui, David R. Roalf, Rastko Ciric, Richard F. Betzel, Bart Larsen, Matthew Cieslak, Philip A. Cook, Cedric H. Xia, Tyler M. Moore, Kosha Ruparel, Desmond J. Oathes, Aaron F. Alexander-Bloch, Russell T. Shinohara, Armin Raznahan, Raquel E. Gur, Ruben C. Gur, Danielle S. Bassett, Theodore D. Satterthwaite. **Development of structure–function coupling in human brain networks during youth**. *Proceedings of the National Academy of Sciences*, 2019; 201912034 DOI: 10.1073/pnas.1912034117

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Sex-specific changes in cerebral blood flow begin at puberty

Date:
May 26, 2014
Source:
Perelman School of Medicine at the University of Pennsylvania
Summary:
Cerebral blood flow (CBF) levels decreased similarly in males and females before puberty, but researchers saw them diverge sharply in puberty, with levels increasing in females while decreasing further in males, which could give hints as to developing differences in behavior in men and women and sex-specific pre-dispositions to certain psychiatric disorders.

FULL STORY

Puberty is the defining process of adolescent development, beginning a cascade of changes throughout the body, including the brain. Penn Medicine researchers have discovered that cerebral blood flow (CBF) levels decreased similarly in males and females before puberty, but saw them diverge sharply in puberty, with levels increasing in females while decreasing further in males, which could give hints as to developing differences in behavior in men and women and sex-specific pre-dispositions to certain psychiatric disorders.

Their findings are available in *Proceedings of the National Academy of Science (PNAS)*.

"These findings help us understand normal neurodevelopment and could be a step towards creating normal 'growth charts' for brain development in kids. These results also show what every parent knows: boys and girls grow differently. This applies to the brain as well," says Theodore D. Satterthwaite, MD, MA, assistant professor in the Department of Psychiatry in the Perelman School of Medicine at the University of Pennsylvania. "Hopefully, one day such growth charts might allow us to identify abnormal brain development much earlier before it leads to major mental illness."

Studies on structural brain development have shown that puberty is an important source of sex differences. Previous work has shown that CBF declines throughout childhood, but the effects of puberty on properties of brain physiology such as CBF, also known as cerebral perfusion, are not well known. "We know that adult women have higher blood flow than men, but it was not clear when that difference began, so we hypothesized that the gap between women and men would begin in adolescence and coincide with puberty," Satterthwaite says.

The Penn team imaged the brains of 922 youth ages 8 through 22 using arterial spin labeled (ASL) MRI. The youth were all members of the Philadelphia Neurodevelopmental Cohort, a National Institute of Mental Health-funded collaboration between the University of Pennsylvania Brain Behavior Laboratory and the Center for Applied Genomics at the Children's Hospital of Philadelphia.

They found support for their hypothesis.

Age related differences were observed in the amount and location of blood flow in males versus females, with blood flow declining at a similar rate before puberty and diverging markedly in mid-puberty. At around age 16, while male CBF values continue to decline with advanced age, females CBF values actually increased. This resulted in females having notably higher CBF than males by the end of adolescence. The difference between males and females was most notable in parts of the brain that are critical for social behaviors and emotion regulation such as the orbitofrontal cortex. The researchers speculate that such differences could be related to females' well-established superior performance on social cognition tasks. Potentially, these effects could also be related to the higher risk in women for depression and anxiety disorders, and higher risk of flat affect and schizophrenia in men.

Story Source:

Materials provided by **Perelman School of Medicine at the University of Pennsylvania**. *Note: Content may be edited for style and length.*

Journal Reference:

1. T. D. Satterthwaite, R. T. Shinohara, D. H. Wolf, R. D. Hopson, M. A. Elliott, S. N. Vandekar, K. Ruparel, M. E. Calkins, D. R. Roalf, E. D. Gennatas, C. Jackson, G. Erus, K. Prabhakaran, C. Davatzikos, J. A. Detre, H. Hakonarson, R. C. Gur, R. E. Gur. **Impact of puberty on the evolution of cerebral perfusion during adolescence**. *Proceedings of the National Academy of Sciences*, 2014; DOI: 10.1073/pnas.1400178111

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Puberty changes the brains of boys and girls differently

Date: September 9, 2019

Source: European College of Neuropsychopharmacology

Summary: Scientists have found that brain networks develop differently in males and females at puberty, with boys showing an increase in connectivity in certain brain areas, and girls showing a decrease in connectivity as puberty progresses. These analyses were focused on brain regions previously identified as conferring risk for mood problems in adolescents, suggesting an association, although this needs to be tested.

FULL STORY

Scientists have found that brain networks develop differently in males and females at puberty, with boys showing an increase in connectivity in certain brain areas, and girls showing a decrease in connectivity as puberty progresses. These analyses were focused on brain regions previously identified as conferring risk for mood problems in adolescents, suggesting an association, although this needs to be tested. This work is presented at the ECNP Congress in Copenhagen, and is based on a recent peer-reviewed publication.

According to lead researcher, Dr Monique Ernst (National Institute of Mental Health / NIH, Bethesda, Maryland, USA), "In our study, we showed that certain brain regions develop differently in boys and girls at puberty. Functional connectivity increases in boys and decreases in girls over puberty. Our next set of studies will aim to clarify the significance of these communication changes in the maturing brain, and to identify if the changes are protective or if they increase vulnerability."

"We looked at these brain areas because they had previously been identified as conferring risk for mood problems in adolescents. We know that mood upsets, particularly anxiety and depression, occur disproportionately in girls, and that women are twice likely as men to suffer from depression following the trend emerging during puberty. We found that the puberty period is associated with significant brain changes in these mood-related brain areas; however, we need to be cautious in interpreting these changes; we need to verify that the association we see between these brain changes and the coincident mood changes are linked. This work is underway."

The researchers analysed brain scans of 147 girls and 157 boys, aged between 13 and 15, from centres in Dublin, London, Dresden, Mannheim, and Paris.They were at varying puberty stages, from having not started their puberty to being fully mature. The researchers took images of the brain activity while the adolescent volunteers were lying still in an MRI scanner. These images were corrected for age and then were analyzed in a way that measures how strongly brain regions communicate with one another (known as "functional connectivity"). The values of the functional connectivity of these regions were correlated with the level of maturity at puberty.

Monique Ernst continued, "This is a first, because in the past, brain scans of adolescents have mostly been measured against a relatively wide chronological age, whereas, here, we were able to measure brain changes directly against their puberty status. We found that for an equivalent change in puberty status, the functional connectivity in these specific brain areas increased in boys by an average of around 6.5%, but decreased in girls by an average of around 7.2% (both these results were statistically significant). Specifically, these brain areas are within the medial prefrontal cortex and the parietal cortex.

Collectively these findings indicate that there are opposite changes of brain activity in boys and in girls as they go through puberty, and this male/female developmental pattern can be a key factor in in the role of pubertal development in the emergence of mood disorders. The next critical next step is to examine the role of these brain connectivities in the development of depression as these adolescents get older, using a longitudinal design."

Commenting, Dr Jaanus Harro (Division of Neuropsychopharmacology, Department of Psychology, University of Tartu and Psychiatry Clinic, North Estonia Medical Centre, Tallinn), said:

"This is particularly interesting in terms of demonstrating connectivity differences between boys and girls. While depression is more prevalent in females it still does occur in males too frequently, while the formal diagnostic criteria are identical. However, the neural pathways to depression in males and females might be partly different, as increasing number of gene-environment interaction studies has shown different interactions in boys and girls, on occasion quite opposite to one other. This imaging study offers a potential brain correlate to these distinct interactions, and it is quite plausible that they might arise during adolescence."

Dr Harro was not involved in this work; this is an independent comment.

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Journal Reference:

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