



BRAIN NEWS THAT YOU CAN USE #102 NOVEMBER 2, 2023

SLEEP STRUGGLES LINK TO ELEVATED RISK OF HYPERTENSION <https://neurosciencenews.com/insomnia-hypertension-sleep-24902/>

Summary: Researchers have found a notable link between insomnia symptoms and hypertension in women. Drawing from a 16-year study involving over 66,000 participants, the study showed women with sleep difficulties were more prone to high blood pressure.

The findings emphasize the crucial importance of quality sleep for overall health, especially for women. The study's insights stress the need for early detection and intervention.

Key Facts:

1. The study monitored 66,122 women for 16 years, tracking sleep habits and hypertension.
2. Women sleeping less than 7-8 hours or facing insomnia symptoms had a higher risk of hypertension.
3. Despite the strong correlation, causality between sleep disturbances and hypertension is not confirmed.

Source: Brigham and Women's Hospital

PLAYFUL BRAINS: EARLY YEARS PLAY SHAPES CHILDREN'S FUTURES <https://neurosciencenews.com/play-brain-neurodevelopment-24903/>

Summary: Researchers examine the neural intricacies behind young children's inclination for play. Drawing from neuroscience and child development research, the researchers portray how play forges crucial neural pathways vital for growth.

The findings challenge the historic distinction between play and learning, emphasizing play's foundational role in early childhood development. Additionally, the research explores the pandemic's impact on young minds and stresses the importance of play in post-COVID recovery.

Key Facts:

1. Play in the early years forges essential neural pathways, impacting future growth and learning.
2. Children are biologically wired for play, and diverging from this can hinder their development.
3. The research integrates the COVID-19 pandemic's impact, suggesting play as a means of mental health recovery for children.

Source: Taylor and Francis Group

Dr Jacqueline Harding, director of Tomorrow's Child and an early childhood expert at Middlesex University, argues that the young child's brain is inherently designed to be playful, and this is crucial for its development.

CHRONIC STRESS AND DEPRESSION LINKED TO ALZHEIMER'S RISK <https://neurosciencenews.com/alzheimers-stress-depression-24905/>

Summary: A recent study highlights a potential connection between chronic stress, depression, and the onset of Alzheimer's disease.

Researchers found that individuals aged 18 to 65 previously diagnosed with either condition showed a heightened risk for Alzheimer's and mild cognitive impairment. In particular, patients diagnosed with both chronic stress and depression had up to four times the risk.

Although causality remains uncertain, these findings emphasize the need to understand and identify potential dementia risk factors.

Key Facts:

1. Individuals with chronic stress or depression have an increased likelihood of Alzheimer's diagnosis.
2. Those diagnosed with both chronic stress and depression saw up to a fourfold increased risk.
3. Chronic stress is defined as experiencing stress without recuperation for at least six months.

Source: Karolinska Institute

SINGLE PROTEIN REWIRES THE BRAIN TO ADAPT TO MOTHERHOOD

<https://neurosciencenews.com/motherhood-brain-genetics-24912/>

Summary: The presence of the MECP2 protein in parvalbumin (PV) neurons is crucial for newly-mothering mice to rapidly learn and respond to their pups' distress cries, hinting at how the brain rewires during pivotal adult learning phases.

When MECP2 is absent, maternal mice show neglectful behavior toward their young, illuminating how the protein's dysfunction could contribute to communication and interpretation deficits in neurodevelopmental disorders like Rett syndrome in humans.

Furthermore, the work illuminates the versatility of the brain's circuits, which, though they solidify as we age, retain the capacity for significant rewiring during specific life events.

This pivotal study opens new avenues, potentially pointing towards the brain circuits implicated in common neurological conditions and providing a framework to explore treatments.

Key Facts:

1. **Crucial for Motherhood:** In mice, the MECP2 protein, particularly in PV neurons, is critical for enabling new mothers to learn and adequately respond to their offspring's needs.
2. **Link to Rett Syndrome:** In humans, MECP2 dysfunction is responsible for Rett syndrome, and this research underscores a potential pathway to understanding and treating the neurodevelopmental disorder and other similar conditions.
3. **Adaptability of Brain Circuits:** While the brain's circuits tend to stabilize with age, certain life experiences, like motherhood, can reactivate mechanisms to repurpose and rewire them, which could have broader implications for understanding brain disorders emerging later in life.

Source: CSHL

Developing brains become shaped by the sights, sounds, and experiences of early life. The brain's circuits grow more stable as we age. However, some experiences later in life open up opportunities for these circuits to be rapidly rewired.

New research from Cold Spring Harbor Laboratory Associate Professor Stephen Shea helps explain how the brain adapts during a critical period of adulthood: the time when new mothers learn to care for their young.

Shea's work in mice shows how this learning process is disrupted when a small set of neurons lack a protein called MECP2. In humans, MECP2 dysfunction causes the rare neurodevelopmental disorder Rett syndrome.

Shea's findings could point researchers toward the brain circuits involved in Rett syndrome and potential treatment strategies. His research could also have implications for more common neurological conditions. Shea explains:

"It's not lost on us that Rett syndrome patients have difficulty interpreting and producing language. Difficulties with communicating are widespread in autism spectrum disorders. One of the reasons we study Rett syndrome is that this may be a valuable model for other forms of autism."

The Shea lab's studies of MECP2 began about 10 years ago when he first learned that female mice with mutations in the *Mecp2* gene are poor parents. When it comes to parenting, most mother mice are quick learners. But without adequate MECP2 protein, Shea says, "they neglect their children and don't listen to their cries."

Shea and his team tested how eliminating MECP2 from specific cells in the mouse brain affected maternal behavior. They found that for pup retrieval to be delayed, the protein only had to go missing from a small subset of cells in a sound-processing part of the brain. The crucial cells are known as parvalbumin (PV) neurons. To efficiently learn to retrieve their pups, mice need MECP2 in those specific brain cells when they first hear the young animals' cries of distress.

Shea points out that PV neurons also play an essential role in brain circuits earlier in life. These cells normally dampen the signals of other neurons. But they release this inhibition during development, creating conditions that are favorable for change. Shea says:

"We find that some of the same mechanisms engaged in development are actually at play in adults. They can be reactivated and repurposed for rewiring the brain in a new lifetime point."

In other words, it's not just about development or adulthood. This research may provide clues about brain disorders that arise later on, like dementia and Alzheimer's disease.

THE VEGETARIAN CODE: YOUR GENES MIGHT DICTATE YOUR DIET
<https://neurosciencenews.com/genetics-vegetarian-diet-24916/>

Summary: A new study illuminates a potential genetic foundation underpinning an individual's adherence to a strict vegetarian diet.

Analyzing genetic data from over 5,000 strict vegetarians and 329,455 controls, researchers identified genes significantly associated with vegetarianism, primarily influencing lipid metabolism and brain function.

The groundbreaking study, positioning genetics as a plausible factor influencing dietary preferences beyond moral and religious considerations, paves the way for nuanced understandings of diet and genetics.

The insights gleaned beckon further research to elucidate the physiological divergences between vegetarians and non-vegetarians, potentially informing tailored dietary recommendations and the development of enhanced meat substitutes.

Key Facts:

1. **Genetic Predisposition:** The study unveils a potential genetic predisposition influencing adherence to a vegetarian diet, identifying three genes significantly and 31 genes potentially associated with vegetarianism, many impacting lipid metabolism and brain function.
2. **Vegetarian Divergence:** Despite growing popularity and established health benefits of a vegetarian diet, a large proportion of self-identified vegetarians often consume some form of meat, suggesting potential biological or environmental factors impinging on strict adherence to the diet.
3. **Future Implications:** While the study offers a pioneering glimpse into the genetics of dietary habits, further research is imperative to comprehend the physiological nuances between vegetarians and non-vegetarians, which could shape future dietary guidelines and enhance meat substitute production.

Source: Northwestern University

MAPPING THE AMYGDALA LEADS TO NEW HOPE FOR COCAINE ADDICTION

<https://neurosciencenews.com/amygdala-mapping-addiction-24921/>

Summary: Researchers crafted a detailed atlas of the amygdala, revealing new insights into emotional responses and potential treatments for cocaine addiction.

A cell-by-cell study of the amygdala, a brain structure vital in controlling emotional reactions, has exposed previously unobserved links between addiction behaviors and genes related to energy metabolism, suggesting energy management in neurons could influence addiction-like actions.

Through utilizing single-cell sequencing, the team discerned the genes active in individual amygdala cells from rats, offering a fresh perspective on the molecular biology behind cocaine addiction.

The findings, demonstrating the potential role of preexisting genetics in addiction and the efficacy of a drug targeting an enzyme involved in energy metabolism and neuron signaling in modifying behaviors, are pivotal in advancing personalized medicine for addictions.

Key Facts:

1. **Cell-by-Cell Atlas:** The research utilized single-cell sequencing to generate a comprehensive molecular atlas of the rat amygdala, unveiling novel links between genes and addiction behaviors.
2. **Energy Metabolism:** The discovered connection between energy metabolism in amygdala neurons and addiction-like behaviors opens new avenues in understanding the molecular biology of cocaine addiction.
3. **Drug Trial:** The team tested a drug on rats that successfully reversed addiction behaviors by targeting an enzyme essential for energy metabolism and neuron communication, spotlighting a potential new treatment avenue.

Source: UCSD

Researchers at University of California San Diego School of Medicine and the Salk Institute for Biological Studies have created a unique, cell-by-cell atlas of the amygdala, a small structure deep within the brain that plays a crucial role in controlling emotional responses to drugs.

THALAMUS PLAYS A PIVOTAL ROLE IN ADULT BRAIN PLASTICITY

<https://neurosciencenews.com/thalamus-adult-neuroplasticity-24926/>

Summary: Researchers spotlight the thalamus, typically regarded merely as a relay station, as a pivotal entity in adult brain plasticity.

Contrasting prior beliefs focusing largely on the cortex, the thalamus demonstrates a significant role in adapting sensory and motor information, as illuminated through mouse models in vision studies.

While visual input does journey from the retina to the visual cortex via the thalamus, this study accentuates that the thalamus isn't merely a passive conduit but an active participant in adaptive processes.

Insights garnered could pave the way for innovative therapeutic approaches in treating conditions like lazy eye, shifting focus from the cortex to also encompass the thalamus.

Key Facts:

1. **Critical Component:** The removal of the GABA-alpha 1 subunit in the thalamus during mice's critical vision development period significantly altered traditional visual cortex response, underscoring the thalamus's role in neural plasticity.

2. **Adaptability Insights:** Experiments demonstrated that plasticity occurred in the adult thalamus and was pivotal for alterations in the cortex, revealing its influential presence beyond mere sensory relay.
3. **Potential Therapeutic Applications:** The findings suggest that issues traditionally attributed to the cortex, such as lazy eye, may also involve the thalamus, providing a new potential therapeutic focus.

Source: KNAW

It is generally believed that the adaptability of the adult brain mainly takes place in the cortex. However, a new study from the *Netherlands Institute for Neuroscience* shows that the thalamus, a relay station for incoming motor and sensory information, plays an unexpectedly important role in this process.

“This could be an interesting starting point for various therapies,” says Christiaan Levelt.

Learning new things requires a tremendous capacity of our brains. The adaptation of our brain as a result of new experiences is called plasticity. There are periods during our development when neural networks show a lot of plasticity, known as critical periods. But also the adult brain is capable of adapting. Where this plasticity takes place in adult brain is not well understood.

RUNNING PARALLELS ANTIDEPRESSANTS IN REDUCING DEPRESSION

<https://neurosciencenews.com/running-ssri-depression-24928/>

Summary: Researchers offered 141 patients with anxiety and/or depression a choice between 16 weeks of SSRIs (antidepressants) or group running therapy, revealing both options approximately equally benefited mental health. However, physical health improvements—including weight, waist circumference, and cardiovascular function—were notably observed in the running group, despite a higher dropout rate.

The antidepressant group showed a tendency towards a slight deterioration in these metabolic markers. This study underscores the significance and potential of exercise in mental health treatment, albeit with adherence challenges.

Key Facts:

1. **Equal Mental Benefits, Varied Physical Outcomes:** Both running and SSRIs similarly alleviated depression and anxiety, but running also enhanced physical health, unlike SSRIs, which tended to slightly impair metabolic markers.
2. **Adherence Disparity:** Despite an initial preference for running, the adherence rate was notably lower (52%) compared to the antidepressant group (82%), indicating the practical challenges of maintaining an exercise regimen.
3. **Patient Preference in Treatment Selection:** The research offered patients a genuine choice between exercise and medication, reflecting a realistic approach to mental health care and revealing an initial preference towards exercise among participants.

Source: ECNP

EARLY PARENTAL BONDS SHAPE FUTURE EMPATHY

<https://neurosciencenews.com/empathy-parenting-neurodevelopment-24930/>

Summary: A new study links early parental bonding with children’s future prosocial behavior, exhibiting kindness and empathy. Utilizing data from over 10,000 people born from 2000-2002, the study illustrates the long-term interplay of early relationships, mental health, and prosociality.

Those experiencing warm parental relationships at age three displayed not only increased prosocial tendencies but also fewer mental health issues during childhood and adolescence. A contrasting correlation was observed in children with strained early parental relationships, often showcasing less development of prosocial habits over time.

Key Facts:

1. **Causal Link Established:** Warm parent-child relationships at age three correlate with higher prosociality and fewer mental health issues into adolescence.
2. **Contrast in Early Relationships:** Children exposed to early emotional strain or abuse in parental relationships tend to develop fewer prosocial habits.
3. **Prosociality and Mental Health:** A visible link exists between prosociality and mental health, though fostering prosociality doesn't necessarily improve mental health over time.

Source: University of Cambridge

A loving bond between parents and their children early in life significantly increases the child's tendency to be 'prosocial' and act with kindness and empathy towards others, research indicates.

The University of Cambridge study used data from more than 10,000 people born between 2000 and 2002 to understand the long-term interplay between our early relationships with our parents, prosociality, and mental health. It is one of the first studies to look at how these characteristics interact over a long period spanning childhood and adolescence.

The researchers found that people who experienced warm and loving relationships with their parents at age three not only tended to have fewer mental health problems during early childhood and adolescence, but also displayed heightened 'prosocial' tendencies. This refers to socially-desirable behaviours intended to benefit others, such as kindness, empathy, helpfulness, generosity and volunteering.

Although the correlation between parent-child relationships and later prosociality needs to be verified through further research, the study points to a sizeable association. On average, it found that for every standard unit above 'normal' levels that a child's closeness with their parents was higher at age three, their prosociality increased by 0.24 of a standard unit by adolescence.

Conversely, children whose early parental relationships were emotionally strained or abusive were less likely to develop prosocial habits over time.

The researchers suggest this strengthens the case for developing targeted policies and support for young families within which establishing close parent-child relationships may not always be straightforward; for example, if parents are struggling with financial and work pressures and do not have much time.

The study also explored how far mental health and prosocial behaviour are fixed 'traits' in young people, and how far they fluctuate according to circumstances like changes at school or in personal relationships. It measured both mental health and prosociality at ages five, seven, 11, 14 and 17 in order to develop a comprehensive picture of the dynamics shaping these characteristics and how they interact.

The research was undertaken by Ioannis Katsantonis and Dr Ros McLellan, both from the Faculty of Education, University of Cambridge.

Katsantonis, the lead author and a doctoral researcher specialising in psychology and education, said: "Our analysis showed that after a certain age, we tend to be mentally well, or mentally unwell, and have a reasonably fixed level of resilience. Prosociality varies more and for longer, depending on our environment.

"A big influence appears to be our early relationship with our parents. As children, we internalise those aspects of our relationships with parents that are characterised by emotion, care and warmth. This affects our future disposition to be kind and helpful towards others."

The study used data from 10,700 participants in the Millennium Cohort Study, which has monitored the development of a large group of people born in the UK between 2000 and 2002. It includes survey-based information about their prosociality, 'internalising' mental health symptoms (such as depression and anxiety) and 'externalising' symptoms (such as aggression).

Further survey data provided information about how far the participants' relationships with their parents at age three were characterised by 'maltreatment' (physical and verbal abuse); emotional conflict; and 'closeness' (warmth, security and care). Other potentially confounding factors, like ethnic background and socio-economic status, were also taken into account.

The Cambridge team then used a complex form of statistical analysis called latent state-trait-occasion modeling to understand how far the participants' mental health symptoms and prosocial inclinations seemed to be expressing fixed personality 'traits' at each stage of their development.

This enabled them, for example, to determine how far a child who behaved anxiously when surveyed was responding to a particular experience or set of circumstances, and how far they were just a naturally anxious child.

The study found some evidence of a link between mental health problems and prosociality. Notably, children who displayed higher than average externalizing mental health symptoms at a younger age showed less prosociality than usual later.

For example, for each standard unit increase above normal that a child displayed externalizing mental health problems at age seven, their prosociality typically fell by 0.11 of a unit at age 11.

There was no clear evidence that the reverse applied, however. While children with greater than average prosociality generally had better mental health at any single given point in time, this did not mean their mental health improved as they got older.

On the basis of this finding, the study suggests that schools' efforts to foster prosocial behaviours may be more impactful if they are integrated into the curriculum in a sustained way, rather than being implemented in the form of one-off interventions, like anti-bullying weeks.

As well as being more prosocial, children who had closer relationships with their parents at age three also tended to have fewer symptoms of poor mental health in later childhood and adolescence.

Katsantonis said that the findings underlined the importance of cultivating strong early relationships between parents and children, which is already widely seen as critical to supporting children's healthy development in other areas.

"So much of this comes back to parents," Katsantonis said. "How much they can spend time with their children and respond to their needs and emotions early in life matters enormously."

"Some may need help learning how to do that, but we should not underestimate the importance of simply giving them time. Closeness only develops with time, and for parents who are living or working in stressful and constrained circumstances, there often isn't enough. Policies which address that, at any level, will have many benefits, including enhancing children's mental resilience and their capacity to act positively towards others later in life."

EMOTIONAL TRAINING STRENGTHENS MOTHER-BABY BONDS

<https://neurosciencenews.com/emotional-training-maternal-bonding-24931/>

Summary: Up to one-third of mothers struggle to bond with their babies, leading to emotional distress for both, but a new approach may offer hope.

Researchers trained expectant mothers, particularly those at high risk of postpartum depression, to better recognize and respond to infant emotions. Post-training, these women exhibited an improved ability to recognize happy baby expressions and displayed more happy facial expressions themselves.

The preliminary results hint at the potential to reduce the risk of postpartum depression and enhance mother-infant bonding through emotional cognitive training.

Key Facts:

1. **Emotional Recognition Training:** High-risk expectant mothers were trained to accurately recognize and respond to baby emotions, shifting their perception from slightly negative to positive regarding ambiguous baby expressions.
2. **Positive Post-Training Outcome:** After the training, mothers showed an improved ability to recognize happy baby expressions, displaying more happy facial expressions themselves, and reacted less to signs of infant distress.
3. **Potential Reduction in Postpartum Depression:** Improved recognition of happy expressions in babies and regulated emotional reactions towards baby distress among mothers could potentially reduce the risk of postpartum depression.

Source: ECNP

Up to a third of mothers don't bond well with their babies after birth, causing intense emotional distress to both mother and baby. Now researchers have found that they can train at-risk expectant mothers to recognise and regulate emotions better, potentially reducing their risk of postpartum depression.

Presenting the work at the ECNP Congress in Barcelona, researcher Dr Anne Bjertrup said:

“People generally have an automatic tendency to see the positive or negative in any situation. In previous studies we saw that certain expectant mothers tended to perceive mostly negative emotions in relation to babies. This took several forms. In some cases the expectant mother would look at babies and mistakenly think that they were distressed or unhappy, when in fact they weren't.

“In other cases where the baby was distressed, they were emotionally unable to deal with this. So we had to see if we could train them, to help them avoid this negative bias and their own reaction during motherhood”.

The work has just been published in the peer-reviewed journal *Neuroscience Applied*.

The proof-of-concept study included 45 expectant mothers from hospitals in Copenhagen. 23 of them were at high risk of postpartum depression and potentially not bonding with their child, having suffered from earlier depression. The remaining 22 had no depression history and were classified as having a low risk.

All were assessed at the beginning of the study to see how they responded to various “baby emotions”. The women at high-risk then underwent a series of computer-based training sessions aimed at helping them cope with difficult emotions, and after two weeks they were reassessed.

Anne Bjertrup (of the Psychiatric Centre Copenhagen- NEAD Centre, Copenhagen, Denmark) said, “With the at-risk women we were trying to communicate different things. For example, to make the worried expectant mothers focus on how a baby really expressed itself not just what she thought she saw, and then to respond appropriately.

“We tried to make sure that the women could accurately recognise the emotion a baby was showing, and we got them to visualise how to properly respond to these emotions”.

After the training, women in the high-risk group were significantly better at recognising happy babies; the women were themselves able to show more happy facial expressions, and reacted less to signs of infant distress.

Dr Bjertrup Continued:

“We found that participants’ perceptions of infant facial expressions shifted significantly after the training. For example, before the training, they viewed ambiguous baby facial expressions as slightly negative.

“After the training, this perception became positive, marking a 5% shift towards a positive perception on our rating scale. Importantly, those who showed the most improvement in recognizing happy baby expressions had fewer indications of depression six months post-childbirth.

“Those who improved the most in recognizing happy baby expressions had fewer signs of depression six months after giving birth.

“This means that if we can train expecting mothers to be more sensitive to happy expressions and give them back control over their emotional reaction toward baby distress, it might reduce the risk of postpartum depression. This not only benefits the mother but also contributes to a healthier emotional development for the baby”.

She added “This is a preliminary study, so we need to interpret these results cautiously. We are currently undertaking a bigger trial, which will include a control group. Nevertheless, these initial results are promising.

“We’re amongst the first groups anywhere to really explore how we can use emotional cognitive processes to prevent this significant mental illness and mother-infant bonding problem”.

In the EU alone, there are around 4 million births every year, meaning that well over a million mothers and babies will be having bonding problems. Not bonding can have serious impacts on, mother and child, and families.

Children may find it difficult to develop secure attachments in later life, although this also depends on what happens in early life. A mother may find it difficult to bond for various reasons, such as hormonal changes, stress, or past traumas.

This can lead to a sense of shame or inadequacy, with many mothers refusing to acknowledge their difficulties. Many respond by emotionally closing down, creating a vicious cycle of alienation.

Dr Bjertrup added “It’s important to recognize that bonding challenges, outside of PostPartum Depression or other mental illnesses, can stem from various factors. Not experiencing immediate bonding feelings as one might expect doesn’t inherently signal an issue. A mother might not have immediate bonding feelings yet can still respond sensitively and appropriately to her infant’s emotions and cues”.

Commenting, Dr Mijke Lambregtse – van den Berg, Infant Mental Health Specialist at Erasmus Medical Center, Rotterdam, said: “Postpartum depression is a serious condition, not only affecting the mother, but also her child.

“This promising study not only stresses the importance of early mother-child bonding, it also trains expectant mothers at risk in how to better recognise positive emotions in babies. Reinforcing a positive mother-baby interaction might ultimately prevent postpartum depression as well.”