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NEWSLETTER

The following research articles can be found in their complete format at [Science Daily.com](http://ScienceDaily.com). This research represents academic and clinical efforts which we believe would be of benefit for you to know and implement into your lives, as well as supporting many of the principles of Metaphorical Iconicity.

Empathy Varies by Age and Gender: Women in Their 50s Are Tops

Jan. 30, 2013 — According to a new study of more than 75,000 adults, **women in that age group are more empathic than men of the same age and than younger or older people.** "Overall, late middle-aged adults were higher in both of the aspects of empathy that we measured," says Sara Konrath, co-author of an article on age and empathy forthcoming in the *Journals of Gerontology: Psychological and Social Sciences*.

"They reported that they were more likely to react emotionally to the experiences of others, and they were also more likely to try to understand how things looked from the perspective of others." For the study, researchers Ed O'Brien, Konrath and Linda Hagen at the University of Michigan and Daniel Grühn at North Carolina State University analyzed data on empathy from three separate large samples of American adults, two of which were taken from the nationally representative General Social Survey.

They found consistent evidence of an inverted U-shaped pattern of empathy across the adult life span, with younger and older adults reporting less empathy and middle-aged adults reporting more. According to O'Brien, this pattern may result because increasing levels of cognitive abilities and experience improve emotional functioning during the first part of the adult life span, while cognitive declines diminish emotional functioning in the second half.

But more research is needed in order to understand whether this pattern is really the result of an individual's age, or whether it is a generational effect reflecting the socialization of adults who are now in late middle age.

"Americans born in the 1950s and '60s -- the middle-aged people in our samples -- were raised during historic social movements, from civil rights to various antiwar countercultures," the authors explain. "It may be that today's middle-aged adults report higher empathy than other cohorts **because they grew up during periods of important societal changes that emphasized the feelings and perspectives of other groups.**"

Earlier research by O'Brien, Konrath and colleagues **found declines in empathy and higher levels of narcissism among young people today as compared to earlier generations of young adults.**

O'Brien and Konrath plan to conduct additional research on empathy, to explore whether people can be trained to show more empathy using new electronic media, for example. "Given the fundamental role of empathy in everyday social life and its relationship to many important social activities such as volunteering and donating to charities, it's important to learn as much as we can about what factors increase and decrease empathic responding," says Konrath.

Bonobos Predisposed to Show Sensitivity to Others

Jan. 30, 2013 — **Comforting a friend or relative in distress may be a more hard-wired behavior than previously thought,** according to a new study of **bonobos, which are great apes known for their empathy and close relation to humans and chimpanzees.** This finding provides key evolutionary insight into how critical social skills may develop in humans. The results are published in the online journal *PLOS ONE*.

Researchers from the Yerkes National Primate Research Center, Emory University, observed juvenile bonobos at the Lola ya Bonobo sanctuary in the Democratic Republic of Congo engaging in consolation behavior more than their adult counterparts. Juvenile bonobos (ages 3 to 7) are equivalent to preschool or elementary school-aged children.

Zanna Clay, PhD, a postdoctoral fellow in Emory's Department of Psychology, and Frans de Waal, PhD, director of the Living Links Center at Yerkes and C.H. Candler Professor of Psychology at Emory, led the study. "Our findings suggest that **for bonobos, sensitivity to the emotions of others emerges early and does not require advanced thought processes that develop only in adults,**" Clay says.

Starting at around age two, human children usually display consolation behavior, a sign of sensitivity to the emotions of others and the ability to take the perspective of another. Consolation has been observed in humans, bonobos, chimpanzees and other animals, including dogs, elephants and some types of birds, but has not been seen in monkeys.

At the Lola ya Bonobo sanctuary, most bonobos come as juvenile or infant orphans because their parents are killed for meat or captured as pets. A minority of bonobos in the sanctuary is second generation and raised by their biological mothers. The researchers found bonobos raised by their own mothers were more likely to comfort others compared to orphaned bonobos. This may indicate early life stress interferes with development of consolation behavior, while a stable parental relationship encourages it, Clay says.

Clay observed more than 350 conflicts between bonobos at the sanctuary during several months. Some conflicts involved violence, such as hitting, pushing or grabbing, while others only involved threats or chasing. Consolation occurred when a third bonobo -- usually one that was close to the scene of conflict -- comforted one of the parties in the conflict.

Consolation behavior includes hugs, grooming and sometimes sexual behavior. Consolation appears to lower stress in the recipient, based on a reduction in the recipient's rates of self-scratching and self-grooming, the authors write.

"We found strong effects of friendship and kinship, with bonobos being more likely to comfort those they are emotionally close to," Clay says. "This is consistent with the idea that empathy and emotional sensitivity contribute to consolation behavior."

In future research, Clay plans to take a closer look at the emergence of consolation behavior in bonobos at early ages. A process that may facilitate development of consolation behavior is when older bonobos use younger ones as teddy bears; their passive participation may get the younger bonobos used to the idea, she says.

Chimp See, Chimp Learn: First Evidence for Chimps Improving Tool Use Techniques by Watching Others

Jan. 30, 2013 — **Chimps can learn more efficient ways to use a tool by watching what others do**, according to research published Jan. 30 in the open access journal *PLOS ONE* by Shinya Yamamoto and colleagues from Kyoto University and Kent University, UK. Their study presents the first experimental evidence that **chimps, like humans, can watch and learn a group member's invention of a better technique**.

Chimps in the study were provided juice-boxes with a small hole and straws to drink with. One group of chimps used the straws like dipsticks, dipping and removing them to suck on the end, while the other group learned to suck through the straw directly. Learning both techniques required the same cognitive and motor skills, but chimps that drank through the straw got considerably more juice in a shorter amount of time. When the first group of chimps watched either a human or a chimp demonstrate the more efficient 'straw-sucking' technique, all of them switched to using this instead.

The study concludes, "**When chimpanzees are dissatisfied with their own technique, they may socially learn an improved technique by closely observing a proficient demonstrator.**" According to the authors, their results provide insights into the cognitive basis for the evolution of culture in chimpanzees, and suggest ways that culture could evolve in non-human animals.

The present study was financially supported by grants-in-aid from the Ministry of Education, Culture, Sports, Science and Technology in Japan (MEXT: 20002001, 24000001, and MEXT special grant "Human Evolution" to T. Matsuzawa) and from Japan Society for the promotion of Science (JSPS: 18-3451, 21-9340, 22800034 and 40585767 to S. Yamamoto).

Adding New Members to Group Increases Distrust Among Older Members, Impacts Coordination

Jan. 30, 2013 — **Adding a new member to a working group can create distrust between members and hinder group functions**, but a new study suggests that **the distrust created is between older group members rather than about the newcomers- especially when previous group performance with just the older group members is poor.** The results are part of a study published January 30 in the open access journal *PLOS ONE* by Matthew McCarter and Roman Sheremeta from Chapman University (U.S).

Previous studies report that changing members in an existing group hurts group performance, but the underlying reasons have been unclear. To identify these, the researchers in this study asked participants to play a 4-person coordination game. After a group had played, two members of the group were replaced and the newly formed group asked to repeat the game.

The authors found that replacing old group members with new individuals decreased trust across the group, which caused a drop in the group's performance. This effect was mitigated if the group knew the newcomers' performance history, but only if the new members also knew the older members' history.

Virtual Superheroes More Helpful in Real World, Too

Jan. 30, 2013 — **Having virtual super-powers in a game may incite people to better behavior in the real world**, according to research published January 30 in the open access journal *PLOS ONE* by Robin Rosenberg and colleagues from Stanford University's Virtual Human Interaction Lab.

Participants in this study were placed in a virtual environment and either given the power of flight or rode as passengers in a helicopter. They were then assigned one of two tasks: help find a missing diabetic child or tour a virtual city. The researchers explain that regardless of which task they performed, "Participants who were given the power to fly like Superman in virtual reality were more helpful afterward, out of virtual reality, compared to participants who were passengers in a helicopter in virtual reality."

The researchers suggest that **embodying a superpower in virtual reality may prime players to 'think like superheroes' and thus facilitate subsequent helpful behavior in the real world.** Alternately, the authors also suggest that participants who could fly in the game may have felt like more active participants than those who passively sat in the helicopter while performing tasks, and this more active involvement may have induced their subsequent behavior.

Sorting out Stroking Sensations: Biologists Find Individual Neurons in Skin That React to Massage

Jan. 30, 2013 — **The skin is a human being's largest sensory organ, helping to distinguish between a pleasant contact, like a caress, and a negative sensation, like a pinch or a burn.** Previous studies have shown that **these sensations are carried to the brain by different types of sensory neurons that have nerve endings in the skin. Only a few of those neuron types have been identified, however, and most of those detect painful stimuli.** Now biologists at the California Institute of Technology (Caltech) have **identified in mice a specific class of skin sensory neurons that reacts to an apparently pleasurable stimulus.**

More specifically, the team, led by David J. Anderson, Seymour Benzer Professor of Biology at Caltech, was able to **pinpoint individual neurons that were activated by massage-like stroking of the skin.** The team's results are outlined in the January 31 issue of the journal *Nature*.

"We've known a lot about the neurons that detect things that make us hurt or feel pain, but we've known much less about the identity of the neurons that make us feel good when they are stimulated," says Anderson, who is also an investigator with the Howard Hughes Medical Institute. "Generally it's a lot easier to study things that are painful because animals have evolved to become much more sensitive to things that hurt or are fearful than to things that feel good. Showing a positive influence of something on an animal model is not that easy."

In fact, the researchers had to develop new methods and technologies to get their results. First, Sophia Vrontou, a postdoctoral fellow in Anderson's lab and the lead author of the study, developed a line of genetically modified mice that had tags, or molecular markers, on the neurons that the team wanted to study. Then she placed a molecule in this specific population of neurons that fluoresced, or lit up, when the neurons were activated.

"The next step was to figure out a way of recording those flashes of light in those neurons in an intact mouse while stroking and poking its body," says Anderson. "We took advantage of the fact that these sensory neurons are bipolar in the sense that they send one branch into the skin that detects stimuli, and another branch into the spinal cord to relay the message detected in the skin to the brain."

The team obtained the needed data by placing the mouse under a special microscope with very high magnification and recording the level of fluorescent light in the fibers of neurons in the spinal cord as the animal was stroked, poked, tickled, and pinched. Through a painstaking process of applying stimuli to one tiny area of the animal's body at a time, they were able to confirm that certain neurons lit up only when stroked. A different class of neurons, by contrast, was activated by poking or pinching the skin, but not by stroking.

"Massage-like stroking is a stimulus that, if were we to experience it, would feel good to us, but as scientists we can't just assume that because something feels good to us, it has to also feel good to an animal," says Anderson. "So we then had to design an experiment to show that artificially activating just these neurons -- without actually stroking the mouse -- felt good to the mouse."

The researchers did this by creating a box that contained left, right, and center rooms connected by little doors. The left and right rooms were different enough that a mouse could distinguish them through smell, sight, and touch. In the left room, the mouse received an injection of a drug that selectively activated the neurons shown to detect massage-like stroking. In the room on the right, the mouse received a control injection of saline. After a few sessions in each outer room, the animal was placed in the center, with the doors open to see which room it preferred. It clearly favored the room where the massage-sensitive neurons were activated. According to Anderson, this was the first time anyone has used this type of conditioned place-preference experiment to show that activating a specific population of neurons in the skin can actually make an animal experience a pleasurable or rewarding state -- in effect, to "feel good."

The team's findings are significant for several reasons, he says. First, the methods that they developed give scientists who have discovered a new kind of neuron a way to find out what activates that neuron in the skin.

"Since there are probably dozens of different kinds of neurons that innervate the skin, we hope this will advance the field by making it possible to figure out all of the different kinds of neurons that detect various types of stimuli," explains Anderson. The second reason the results are important, he says, "is that now that we know these neurons detect massage-like stimuli, the results raise new sets of questions about which molecules in those neurons help the animal detect stroking but not poking."

The other benefit of their new methods, Anderson says, is that they will allow researchers to, in principle, trace the circuitry from those neurons up into the brain to ask why and how activating these neurons makes the animal feel good, whereas activating other neurons that are literally right next to them in the skin makes the animal feel bad.

"We are now most interested in how these neurons communicate to the brain through circuits," says Anderson. "In other words, what part of the circuit in the brain is responsible for the good feeling that is apparently produced by activating these neurons? It may seem frivolous to be identifying massage neurons in a mouse, but it could be that some good might come out of this down the road."

Allan M. Wong, a senior research fellow in biology at Caltech, and Kristofer K. Rau and Richard Koerber from the University of Pittsburgh were also coauthors on the *Nature* paper, "Genetic identification of C fibers that detect massage-like stroking of hairy skin *in vivo*." Funding for this research was provided by the National Institutes of Health, the Human Frontiers Science Program, and the Helen Hay Whitney Foundation.

Scientists Discover How Epigenetic Information Could Be Inherited: Mechanism of Epigenetic Reprogramming Revealed

Jan. 24, 2013 — New research reveals a potential way for **how parents' experiences could be passed to their offspring's genes**. The research was published January, 25 in the journal *Science*. **Epigenetics is a system that turns our genes on and off. The process works by chemical tags, known as epigenetic marks, attaching to DNA and telling a cell to either use or ignore a particular gene.**

The most common epigenetic mark is a methyl group. When these groups fasten to DNA through a process called methylation they block the attachment of proteins which normally turn the genes on. As a result, the gene is turned off.

Scientists have witnessed epigenetic inheritance, the observation that offspring may inherit altered traits due to their parents' past experiences. For example, historical incidents of famine have resulted in health effects on the children and grandchildren of individuals who had restricted diets, possibly because of inheritance of altered epigenetic marks caused by a restricted diet.

However, **it is thought that between each generation the epigenetic marks are erased in cells called primordial gene cells (PGC), the precursors to sperm and eggs. This 'reprogramming' allows all genes to be read afresh for each new person --** leaving scientists to question how epigenetic inheritance could occur.

The new Cambridge study initially discovered how the DNA methylation marks are erased in PGCs, a question that has been under intense investigation over the past 10 years. **The methylation marks are converted to hydroxymethylation which is then progressively diluted out as the cells divide. This process turns out to be remarkably efficient and seems to reset the genes for each new generation.** Understanding the mechanism of epigenetic

resetting could be exploited to deal with adult diseases linked with an accumulation of aberrant epigenetic marks, such as cancers, or in 'rejuvenating' aged cells.

However, the researchers, who were funded by the Wellcome Trust, **also found that some rare methylation can 'escape' the reprogramming process and can thus be passed on to offspring -- revealing how epigenetic inheritance could occur.** This is important because **aberrant methylation could accumulate at genes during a lifetime in response to environmental factors, such as chemical exposure or nutrition, and can cause abnormal use of genes, leading to disease.** If these marks are then inherited by offspring, their genes could also be affected.

Dr Jamie Hackett from the University of Cambridge, who led the research, said: "Our research demonstrates **how genes could retain some memory of their past experiences, revealing that one of the big barriers to the theory of epigenetic inheritance -- that epigenetic information is erased between generations -- should be reassessed.**"

"It seems that while the precursors to sperm and eggs are very effective in erasing most methylation marks, they are fallible and at a low frequency may allow some epigenetic information to be transmitted to subsequent generations. The inheritance of differential epigenetic information could potentially contribute to altered traits or disease susceptibility in offspring and future descendants."

"However, it is not yet clear what consequences, if any, epigenetic inheritance might have in humans. Further studies should give us a clearer understanding of the extent to which heritable traits can be derived from epigenetic inheritance, and not just from genes. That could have profound consequences for future generations."

Professor Azim Surani from the University of Cambridge, principal investigator of the research, said: "The new study has the potential to be exploited in two distinct ways. First, the work could provide information on how to erase aberrant epigenetic marks that may underlie some diseases in adults. Second, the study provides opportunities to address whether germ cells can acquire new epigenetic marks through environmental or dietary influences on parents that may evade erasure and be transmitted to subsequent generations, with potentially undesirable consequences."

Revolutionary Theory of Dark Matter

Jan. 24, 2013 — The universe abounds with dark matter. Nobody knows what it consists of. University of Oslo physicists have now come up with a mathematical explanation that could solve the mystery once and for all.

Astrophysicists have known for the last 80 years that most of the universe consists of an unknown, dark matter. The solution to the mystery may now be just around the corner.

"We are looking for a new member of our particle zoo in order to explain dark matter. We know that it is a very exotic beast. And we have found a plausible explanation," reports *Are Raklev*, an associate professor in particle physics in the University of Oslo's Department of Physics to the research magazine *Apollon*. He is the university's leading theorist in astroparticle physics and has launched a model that explains what dark matter may consist of and how one can discover the invisible particles experimentally.

Even though dark matter is invisible, astrophysicists know it exists. Without this dark matter it is impossible to explain how the visible things in the universe hang together.

An 80-year fight

The world famous, Swiss physicist Fritz Zwicky was speculating on what dark matter might be as early as the 1930s.

Astrophysicists have calculated that 80 per cent of all the mass in the universe is dark, invisible matter. Thanks to gravity this dark matter clumps together as ordinary matter.

Dark matter can explain why stars move like they do. Dark matter may also explain the rotation speed of galaxies.

"Even though we can calculate how much dark matter there is in the universe, we still know little about what dark matter is. The particles in dark matter must either have a lot of mass, or there must be very many of them. Neutrinos meet all the requirements of dark matter. But there is one big difficulty. They have far too little mass."

Are Raklev is now trying to prove that dark matter consists of gravitinos. This is a particle that has been unfairly treated for years.

And just what are gravitinos? Hold tight: gravitinos are the supersymmetric partner of gravitons.

Or, to be even more precise: "The gravitino is the hypothetical, supersymmetric partner of the hypothetical particle graviton, so it is also impossible to predict a more hypothetical particle than this," laughs Raklev, who writes on his web pages that he is looking for dark material both under his sofa and other places.

In order to dig deeper into why Raklev believes dark matter consists of gravitinos, and have any chance at all of understanding the theory behind gravitinos, *Apollon* has to take a couple of steps back:

Step 1: Supersymmetry

Physicists want to find out whether or not nature is supersymmetric. Supersymmetry means that there is a symmetry between matter and forces. For each type of electron and quark there is a corresponding heavy, supersymmetric partner. The supersymmetric particles were created in the

instant after the Big Bang. If some of them have survived to today, they may be what dark matter is made of.

The supersymmetric partner of the gravitino is, as Apollon said, the graviton.

"A graviton is the particle we believe mediates gravitational force, just like a photon, the light particle, mediates electromagnetic force. While gravitons do not weigh anything at all, gravitinos may weigh a great deal. If nature is supersymmetric and gravitons exist, then gravitinos also exist. And vice versa. This is pure mathematics."

But there is a small but. Physicists cannot demonstrate the relationship between gravitons and gravitinos before they have managed to unify all the forces of nature.

Step 2: The forces of nature

One of the biggest things physicists long to do is to unify all the forces of nature in a single theory. In the middle of the last century physicists discovered that electricity and magnetism were part of the same force of nature. This force has since been called electromagnetism. Two of the other forces of nature are the strong nuclear force and the weak nuclear force. The weak nuclear force can be seen in, among things, radioactivity. The strong nuclear force is ten billion times as strong and binds together neutrons and protons.

In the 1970s, electromagnetism was unified with the strong and weak nuclear forces in what physicists call the standard model.

The fourth force of nature is gravity. Even though it is unbelievably painful to fall down stairs, gravity is the weakest of the four forces of nature.

The problem is that physicists have not yet been able to unify gravity with the three other forces of nature. The day physicists gain a unified understanding of all four forces of nature, they will gain a unique understanding of the world. This will make it possible to describe all imaginable interactions between all possible particles in nature. Physicists call this the ToE Theory (Theory of Everything).

"In order to unify gravitational force with the other three forces of nature we have to understand gravity as quantum theory. This means we need a theory in which the particle graviton is included in the atomic nucleus."

Researchers are now looking for signs of both supersymmetry and the ToE Theory. Discovering the graviton would be an enormous step in this direction.

Reveals dark matter

As the reader may have understood, it is very difficult to research dark matter. This is because dark matter has no electromagnetic relationships to terrestrial particles at all. One example of

dark matter is the aforementioned neutrino. Unfortunately, neutrinos make up only an imperceptibly tiny part of dark matter.

Even though it has not been possible to observe dark matter, several billion neutrinos race through your body every second. However, their speed is somewhat limited. The particles move just as slowly as the speed the solar system moves around the galaxy. In other words, a mere 400 kilometres a second.

"When there are no electromagnetic relationships with visible particles, the particles can pass right through us without any measuring instruments detecting them. This is where supersymmetry comes in. If supersymmetry is right, physicists can explain why there is dark matter in the universe. That is what is fun about my job," laughs Raklev.

He is now asserting that dark matter mostly consists of gravitinos.

"Supersymmetry simplifies everything. If the ToE Theory exists, in other words if it is possible to unify the four forces of nature, gravitinos must exist."

The gravitinos were formed right after the Big Bang.

"A short time after the Big Bang we had a soup of particles that collided. Gluons, which are the force bearing particles in the strong nuclear force, collided with other gluons and emitted gravitinos. Many gravitinos were formed after the Big Bang, while the universe was still plasma. So we have an explanation of why gravitinos exist."

Changed life span

Physicists have up to now viewed gravitinos as a problem. They have believed that the theory of supersymmetry does not work because there are too many gravitinos.

"Physicists have therefore strived to eliminate gravitinos from their models. We, on the other hand, have found a new explanation that unifies the supersymmetry model with dark matter that consists of gravitinos. If dark matter is not stable, but just very long lived, it is possible to explain how dark matter consists of gravitinos."

In the old models dark matter was always everlasting. This meant that gravitinos were a bothersome part of the supersymmetry model. In Raklev's new model, their life span is no longer endless. Nonetheless, the average life span of gravitinos is very long and actually longer than the life span of the universe.

However, there is a big difference between an unending life span and a life span of more than 15 billion years. With limited a life span, gravitinos must be converted into other particles. It is precisely this conversion effect that can be measured. And the conversion explains the model.

"We believe that almost all dark matter is gravitinos. The explanation lies in very hard mathematics. We are developing special models that calculate the consequences of these theories and we predict how the particles can be observed in experiments."

The measurements are underway

Researchers are now trying to test this experimentally and explain why these new particles have not yet been seen in the CERN experiments in Geneva in Switzerland.

"On the other hand, it should theoretically possible to observe them from a space probe."

The simplest way of observing gravitinos could be studying what happens if two particles collide out in the universe and are converted into other particles such as photons or antimatter.

Even though the collisions occur very rarely, there is still so much dark matter in the universe that a significant number of photons should be able to be produced.

The big problem is that gravitinos do not collide.

"At least it happens so rarely that we could never hope to observe it."

Nonetheless there is hope

"Luckily for us, gravitinos are not one hundred per cent stable. They are converted into something else at some point. We can predict what the signal looks like after gravitinos have been converted. The conversion will send out a small electromagnetic wave. This is also called a gamma ray."

NASA's Fermi-LAT space probe is currently measuring gamma rays. A number of research groups are now analysing the data.

"So far we have only seen noise. But one of the research groups claim they have observed a small, suspicious surplus of gamma rays from the centre of our galaxy. Their observations may fit our models," says the man behind the very difficult mathematical model for dark matter, associate professor in theoretical particle physics, Are Raklev.

'Connection Error' in Brains of Anorexics

Jan. 24, 2013 — Researchers have **found altered connectivity in the brain network for body perception in people with anorexia: The weaker the connection, the greater the misjudgement of body shape. When people see pictures of bodies, a whole range of brain regions are active. This network is altered in women with anorexia nervosa.** In a functional magnetic resonance imaging study, **two regions that are important for the processing of body images were functionally more weakly connected in anorexic women than in healthy women.**

The stronger this "connection error" was, the more overweight the respondents considered themselves. "These alterations in the brain could explain why women with anorexia perceive themselves as fatter, even though they are objectively underweight" says Prof. Dr. Boris Suchan of the Institute of Cognitive Neuroscience at the Ruhr-Universität. Together with Prof. Dr. Dietrich Grönemeyer (University of Witten-Herdecke), Prof. Dr. Silja Vocks (University of Osnabrück) and other colleagues, the Bochum researchers report in the journal *Behavioural Brain Research*.

Anorexics misperceive their body shape

The researchers tested ten anorexic and fifteen healthy women of similar age. To start with, all the women judged on the computer which of several different silhouettes corresponded best to their own body shape. Ten control subjects who did not participate in the MRI scan answered the same question by matching a photo of the test subject to the right silhouette. Both healthy and anorexic women estimated their body shape differently than outsiders: healthy subjects rated themselves as thinner than the control subjects. Anorexic women on the other hand perceived themselves to be fatter than the control subjects did.

Brain areas for body perception examined with MRI

In MRI scanners, the researchers then recorded the brain activity of the 25 participants while they observed photos of bodies. Above all, they analysed the activity in the "fusiform body area" (FBA) and the "extrastriate body area" (EBA), because previous studies showed that these brain regions are critical for the perception of bodies. To this end, the neuroscientists from Bochum calculated the so-called effective connectivity between the FBA and EBA in both hemispheres. This is a measure of how much the activity in several brain areas is temporally correlated. A high degree of correlation is indicative of a strong connection.

Brains of anorexics structurally and functionally altered

The connection between the FBA and EBA was weaker in women with anorexia nervosa than in healthy women. In addition, the researchers found a negative correlation between the EBA-FBA connection in the left hemisphere and the misjudgement of body weight: the weaker the effective connectivity between the EBA and FBA was, the fatter the subjects with anorexia falsely estimated themselves to be. "In a previous study we found that there are structural changes in the brains of patients with anorexia," says Boris Suchan. They have a lower density of nerve cells in the EBA. "The new data shows that the network for body processing is also functionally altered." The EBA, which has a lower cell density in anorexics, is also the area that stood out in the connection analysis: it receives reduced input from the FBA. "These changes could provide a mechanism for the development of anorexia," says Suchan.

Children's Play Spaces Becoming Increasingly Artificial

Jan. 24, 2013 — What makes a good children's play space? Penny Wilson from Play Association Tower Hamlets explores this important question in the inaugural issue of Routledge's *International Journal of Play*. **She discovers a world of difference between the 'play memories' of older residents of the East End of London -- who recall wandering freely, playing in the spaces between homes, shops and parks -- and the experiences of today's children, forced into rigid, over-designed and artificial play spaces.**

In today's East End, the creation of the Olympic Park, like most urban development, has reduced space for children to play. In the same way that each hour of our day in modern life is driven by a need to be productive and our achievements measurable, these open spaces are taken away from children so that their physical world is also separated for precise purposes only. In contrast, their parents and grandparents would have roamed around the area, playing together for hours on end, thriving in unidentified and in-between spaces. 'Parents did not seem to know or very much mind where their children were at any particular time,' she writes. But 'what has changed today is the standards by which we judge good parenting.'

Wilson describes how the design of her Association's Mile End Park aims to give the children of Tower Hamlets a little bit of that open space back, 'blurring the urban and rural playing of children' by the use of woodlands, paths, mirrors, branches and manufactured artefacts 'to rewrite the permissiveness of the park as a playable space'. She believes that 'we will make no difference to the impoverished state of play within our societies until we revisit our ways of perceiving the world.' Perhaps this is the most important Olympic Legacy of all for the children of Tower Hamlets, and the rest of the United Kingdom.

The Right Massage Can Relax the Body and Improve Health

Jan. 29, 2013 — Massage therapy can lower blood pressure, help prevent colds, enhance skin tone and more, according to an expert at the University of Alabama at Birmingham (UAB). Licensed Massage Therapist Arnold Kelly, who provides massage therapy at the Outpatient Physical Therapy Clinic at the UAB Spain Rehabilitation Center, said massage provides two types of benefits: immediate and cumulative.

"Immediately following massage, you can experience reduced tightness in the muscles, improved blood flow and breathing, plus reduced anxiety and stress," Arnold explained. "Over the long-term, the benefits of massage accumulate; massage can increase a person's range of motion, strengthen the immune system and provide an improved sense of well-being," Arnold added.

Stress seems to creep into the lives of almost everybody at some point, and Arnold said a massage can do a lot to help. "Swedish and deep-tissue massages are two of the 'big four' types of massage," Arnold explained. "Swedish is for those who are interested in just relieving stress. If there are deeper aches and pains, deep tissue can help take care of it."

Neuromuscular and trigger point therapy are the other two major types of massage that have proven to be universally beneficial, according to Arnold. "Clients often inquire about which form of massage therapy is right for them," Arnold said. "What you should look for and ask about are things like: how long the type of massage therapy has been around; how long the massage therapist has practiced it; what it is based on; and whether it focuses more on the physical or mental aspect." How often massage therapy should be utilized varies from person to person.

"Someone who has little to no physical issues and is simply looking to relax and unwind can benefit from massage as little as once a month," Arnold said. "Someone who has a problem that can benefit from regular massage can be seen as often as once a day. My regular clients average about once a week."

Arnold recommends those considering massage first visit a physician to see if this form of therapy will help then choose a licensed therapist.

Smaller Snacking Is Smart Snacking: New Study Shows 'Just a Bite' Will Satisfy

Jan. 29, 2013 — How much chocolate would you need to eat to be satisfied? Less than half as much as you think, according to this recently published Cornell University snacking study. Using chocolate chips, apple pie, and potato chips, researchers Ellen van Kleef, Mitsuru Shimizu, and Brian Wansink designed a study to determine **if people who were given smaller portions of snack foods would feel hungrier or satisfied fifteen minutes after eating.**

Two groups with different portion sizes were tested. The larger portion size group was given 100g of chocolate, 200g of apple pie, and 80g of potato chips, all slightly larger than the recommended portion sizes. This equaled 1370 calories in snack foods. The other group was given 10g, 40g, and 10g of these same foods respectively, for a total of 195 calories. The two groups were given as much time to eat as needed, and were asked to fill out surveys to rate the liking, familiarity, and boredom with the food. They were also asked to rate their hunger and craving before the food was presented and fifteen minutes after the taste tests ended.

The results remarkably showed that smaller portion sizes are capable of providing similar feelings of satisfaction as larger ones. Those given larger portions consumed 77% more food, amounting to 103 calories more, but they did not feel any appetite enhancing or stronger feelings of satiety than the group with the smaller portions. Overall these findings reflect the importance of portion size. While larger portions result in increased food intake, smaller portions may make you feel equally satisfied. The smaller portions can lead to a decline in hunger and desire that

would help people limit their food intake. So, next time you are craving a snack food, remember that you can feel similarly satisfied with one handful as you would with two!

Early-Onset Puberty in Females Explained

Jan. 29, 2013 — New research from Oregon Health & Science University has provided significant insight into the reasons why early-onset puberty occurs in females. The research, which was conducted at OHSU's Oregon National Primate Research Center, is published in the current early online edition of the journal *Nature Neuroscience*.

The paper explains how OHSU scientists are investigating the role of epigenetics in the control of puberty. Epigenetics refers to changes in gene activity linked to external factors that do not involve changes to the genetic code itself. The OHSU scientists believe improved understanding of these complex protein/gene interactions will lead to greater understanding of both early-onset (precocious) puberty and delayed puberty, and highlight new therapy avenues.

To conduct this research, scientists studied female rats, which like their human counterparts, go through puberty as part of their early aging process. These studies revealed that a group of proteins, called PcG proteins, regulate the activity of a gene called the Kiss1 gene, which is required for puberty to occur. When these PcG proteins diminish, Kiss1 is activated and puberty begins.

PcG proteins are produced by another set of genes that act as a biological switch during the embryonic stage of life. The role of these proteins is to turn off specific downstream genes at key developmental stages.

OHSU scientists found that both the activity of these "master" genes and their ability to turn off puberty are impacted by two forms of epigenetic control: a chemical modification of DNA known as DNA methylation, and changes in the composition of histones, a specialized set of proteins that modify gene activity by interacting with DNA.

Using this new information, researchers were then able to delay puberty in female rats. They accomplished this by increasing PcG protein levels in the hypothalamus of the brain using a targeted gene therapy approach so that Kiss1 activation failed to occur at the normal time in life. The hypothalamus is a region of the brain that controls reproductive development.

"While it was always understood that an organism's genes determine the timing of puberty, the role of epigenetics in this process has never been recorded until now," said Alejandro Lomniczi, Ph.D., a scientist in the Division of Neuroscience at the OHSU Oregon National Primate Research Center.

"Because epigenetic changes are driven by environmental, metabolic and cell-to-cell influences, these findings raise the possibility that a significant percentage of precocious and delayed puberty cases occurring in humans may be the result of environmental factors and other

alterations in epigenetic control," said Sergio Ojeda, D.V.M., who is also a scientist in the Division of Neuroscience at the OHSU ONPRC.

"There is also much more to be learned about the way that epigenetic factors may link environmental factors such as nutrition, human-made chemicals, social interactions and other day-today influences to the timing and completion of normal puberty."

Hydrogen Sulfide: The Next Anti-Aging Agent?

Jan. 29, 2013 — Hydrogen sulfide* (H₂S) may play a wide-ranging role in staving off aging, according to a paper published online ahead of print in the journal *Molecular and Cellular Biology*. In this review article, a team from China explores the compound's plethora of potential anti-aging pathways.

"H₂S has been gaining increasing attention as an important endogenous signaling molecule because of its significant effects on the cardiovascular and nervous systems," the team writes. The evidence is mounting, they note, that hydrogen sulfide slows aging by inhibiting free-radical reactions, by activating SIRT1, an enzyme believed to be a regulator of lifespan, and probably through its interactions with a gene, *klotho*, which appears to have its own market basket of anti-aging activity.

Hydrogen sulfide is produced within the human body, and has a variety of important physiological effects. For example, it relaxes the vascular endothelium and smooth muscle cells, which is important to maintaining clean arteries as one ages, says first author Zhi-Sheng Jiang, of the University of South China, Hunan. It functions as an antioxidant. And it inhibits expression of pro-inflammatory factors, all of which "imply an important role in aging and age-associated diseases," according to the paper. For example, mice lacking CSE, the gene for an enzyme involved in producing H₂S, manifest extensive, premature arteriosclerosis, an inevitable consequence of aging, says Jiang.

The gene, *klotho*, which appears to be upregulated by hydrogen sulfide, is thought to extend lifespan via a number of different pathways, some of which promote production of endogenous antioxidants, according to the report. Produced in the kidneys, it has direct angiotensin-converting enzyme (ACE) inhibiting activity; that is, it's an ACE inhibitor, just like certain drugs that mitigate high blood pressure. Not surprisingly, plasma H₂S declines with age, and is lower in spontaneously hypertensive rats than in those with normal blood pressure. More generally, a lack of H₂S is implicated in cardiovascular disease.

A decline in H₂S is also thought to undermine neurological health. Endogenous H₂S has been found wanting in an animal model of Parkinson's disease, and is found to be depressed in the brains of patients with Alzheimer's disease. There are even suggestions, mostly in animal models, but also in human studies, that H₂S may be protective against cancer, according to the report.

"Data available so far strongly suggest that H₂S may become the next potent agent for preventing and ameliorating the symptoms of aging and age-associated diseases," concludes Jiang. In the future, he says, people may take H₂S via food, or as an anti-aging supplement.

* Hydrogen sulfide (British English: *hydrogen sulphide*) is the chemical compound with the formula H₂S. It is a colorless, very poisonous, flammable gas that gives off the odor of rotten eggs.

Doctor-Patient Relationship: Physicians' Brain Scans Indicate Doctors Can Feel Their Patients' Pain -- And Their Relief

Jan. 29, 2013 — A patient's relationship with his or her doctor has long been considered an important component of healing. Now, in a novel investigation in which physicians underwent brain scans while they believed they were actually treating patients, researchers have provided the first scientific evidence indicating that doctors truly can feel their patients' pain -- and can also experience their relief following treatment.

Led by researchers at Massachusetts General Hospital (MGH) and the Program in Placebo Studies and Therapeutic Encounter (PiPS) at Beth Israel Deaconess Medical Center/Harvard Medical School, the new findings, which appear online January 29 in *Molecular Psychiatry*, help to illuminate one of the more intangible aspects of health care -- the doctor/patient relationship.

"Our findings showed that the same brain regions that have previously been shown to be activated when patients receive placebo therapies are similarly activated in the brains of doctors when they administer what they think are effective treatments," explains first author Karin Jensen, PhD, an investigator in the Department of Psychiatry and Martinos Center for Biological Imaging at MGH and member of the PiPS. Notably, she adds, the findings also showed that the physicians who reported greater ability to take things from the patients' perspective, that is, to empathize with patients' feelings, experienced higher satisfaction during patients' treatments, as reflected in the brain scans.

"By demonstrating that caring for patients involves a complex set of brain events, including deep understanding of the patient's facial and body expressions, possibly in combination with the physician's own expectations of relief and feelings of reward, we have been able to elucidate the neurobiology underlying caregiving," adds senior author Ted Kaptchuk, director of the PiPS and Associate Professor of Medicine at Harvard Medical School. "Our findings provide early evidence of the importance of interacting brain networks between patients and caregivers and acknowledge the doctor/patient relationship as a valued component of health care, alongside medications and procedures."

Previous investigations have demonstrated that a brain region associated with pain relief (right ventrolateral prefrontal cortex, VLPFC) and a region associated with reward (rostral anterior cingulate cortex, rACC) are activated when patients experience the placebo effect, which occurs when patients show improvement from treatments that contain no active ingredients. The placebo effect accounts for significant portions of clinical outcomes in many illnesses -- including pain, depression and anxiety.

Although behavioral research has suggested that physicians' expectations influence patients' clinical outcomes and help determine patients' placebo responses, until now little effort has been directed to understanding the biology underlying the physician component of the clinical relationship. Jensen and her colleagues hypothesized that the same brain regions that are activated during patients' placebo responses -- the VLPFC and rACC -- would similarly be activated in the brains of physicians as they treated patients. They also hypothesized that a physician's perspective-taking skills would influence the outcomes.

To test these hypotheses, the scientists developed a unique equipment arrangement that would enable them to conduct functional magnetic resonance imaging (fMRI) of the physicians' brains while the doctors had face-to-face interactions with patients, including observing patients as they underwent pain treatments.

The experiment included 18 physicians (all of whom had received their medical degree within the last 10 years and represented nine separate medical specialties). Two 25-year-old females played the role of "patients" and followed a rehearsed script. The experiment called for the participating physicians to administer pain relief with what they thought was a pain-relieving electronic device, but which was actually a non-active "sham" device.

To ensure that the physicians believed that the sham device really worked, the investigators first administered a dose of "heat pain" to the physicians' forearms to gauge pain threshold and then "treated" them with the fake machine. During the treatments, the investigators reduced the heat stimulation, to demonstrate to the participants that the therapy worked. The physicians underwent fMRI scans while they experienced the painful heat stimulation so that investigators could see exactly which brain regions were activated during first-person perception of pain.

In the second portion of the experiment, each physician was introduced to a patient and asked to perform a standardized clinical examination, which was conducted in a typical exam room for approximately 20 minutes. (The clinical exam was performed in order to establish a realistic rapport between the physician and patient before fMRI scanning took place, and was comparable to a standard U.S. doctor's appointment.) At this point the physician also answered a questionnaire, the Interpersonal Reactivity Index, used to measure the participant's self-reported perspective-taking skills.

During the third step, says Jensen, the physician and patient were led into the scanner room. "The physician went inside the scanner and was equipped with a remote control that could activate the 'analgesic device' when prompted," she explains. Mirrors inside the scanner enabled physicians to maintain eye contact with the patient, who was seated on a chair next to the scanner's bed and hooked up to both the thermal pain stimulator and the pain-relieving device.

Then, in a randomized order, physicians were instructed to either treat a patient's pain or to press a control button that provided no relief. When physicians were told not to activate pain relief, the "patient" exhibited a painful facial expression while the physicians watched. When the physicians were instructed to treat the patients' pain, they could see that the subjects' faces were neutral and relaxed, the result of pain relief. During these doctor-patient interactions, fMRI scans measured the doctors' brain activations.

Following the scanning session, the physicians were removed from the scanner and told exactly how the experiment had been performed, says Jensen. "If the physician did not agree with the deceptive component of the study, they were given the opportunity to withdraw their data. No one did this."

As predicted, the authors found that while treating patients, the physicians activated the right VLPFC region of the brain, a region previously implicated in the placebo response. Furthermore, Jensen adds, the physicians' ability to take the patients' viewpoints correlated to brain activations and subjective ratings; physicians who reported high perspective-taking skills were more likely to show activation in the rACC brain region, which is associated with reward.

"We already know that the physician-patient relationship provides solace and can even relieve many symptoms," adds Kaptchuk. "Now, for the first time, we've shown that caring for patients encompasses a unique neurobiology in physicians. Our ultimate goal is to transform the 'art of medicine' into the 'science of care,' and this research is an important first step in this process as we continue investigations to find out how patient-clinician interactions can lead to measurable clinical outcomes in patients."

Could the Timing of When You Eat, Be Just as Important as What You Eat?

Jan. 29, 2013 — Most weight-loss plans center around a balance between caloric intake and energy expenditure. However, new research has shed light on a new factor that is necessary to shed pounds: timing. Researchers from Brigham and Women's Hospital (BWH), in collaboration with the University of Murcia and Tufts University, have found that **it's not simply what you eat, but also when you eat, that may help with weight-loss regulation.** The study will be published on January 29, 2013 in the *International Journal of Obesity*.

"This is the first large-scale prospective study to demonstrate that the timing of meals predicts weight-loss effectiveness," said Frank Scheer, PhD, MSc, director of the Medical Chronobiology Program and associate neuroscientist at BWH, assistant professor of medicine at Harvard Medical School, and senior author on this study. **"Our results indicate that late eaters displayed a slower weight-loss rate and lost significantly less weight than early eaters, suggesting that the timing of large meals could be an important factor in a weight loss program."**

To evaluate the role of food timing in weight-loss effectiveness, the researchers studied 420 overweight study participants who followed a 20-week weight-loss treatment program in Spain. The participants were divided into two groups: early-eaters and late-eaters, according to the self-selected timing of the main meal, which in this Mediterranean population was lunch. During this meal, 40 percent of the total daily calories are consumed. Early-eaters ate lunch anytime before 3 p.m. and late-eaters, after 3 p.m. They found that late-eaters lost significantly less weight than early-eaters, and displayed a much slower rate of weight-loss. Late-eaters also had a lower estimated insulin sensitivity, a risk factor for diabetes.

Researchers found that timing of the other (smaller) meals did not play a role in the success of weight loss. However, the late eaters -- who lost less weight -- also consumed fewer calories during breakfast and were more likely to skip breakfast altogether. Late-eaters also had a lower estimated insulin sensitivity, a risk factor for diabetes.

The researchers also examined other traditional factors that play a role in weight loss such as total calorie intake and expenditure, appetite hormones leptin and ghrelin, and sleep duration. Among these factors, researchers found no differences between both groups, suggesting that the timing of the meal was an important and independent factor in weight loss success.

"This study emphasizes that the timing of food intake itself may play a significant role in weight regulation" explains Marta Garaulet, PhD, professor of Physiology at the University of Murcia Spain, and lead author of the study. "Novel therapeutic strategies should incorporate not only the caloric intake and macronutrient distribution, as it is classically done, but also the timing of food."

Scientists Discover How Epigenetic Information Could Be Inherited: Mechanism of Epigenetic Reprogramming Revealed

Jan. 24, 2013 — New research reveals a potential way for **how parents' experiences could be passed to their offspring's genes**. The research was published January, 25 in the journal *Science*. Epigenetics is a system that turns our genes on and off. The process works by chemical tags, known as epigenetic marks, attaching to DNA and telling a cell to either use or ignore a particular gene.

The most common epigenetic mark is a methyl group. When these groups fasten to DNA through a process called methylation they block the attachment of proteins which normally turn the genes on. As a result, the gene is turned off.

Scientists have witnessed epigenetic inheritance, the observation that **offspring may inherit altered traits due to their parents' past experiences**. For example, historical incidents of famine have resulted in health effects on the children and grandchildren of individuals who had

restricted diets, possibly because of inheritance of altered epigenetic marks caused by a restricted diet.

However, **it is thought that between each generation the epigenetic marks are erased in cells called primordial gene cells (PGC), the precursors to sperm and eggs.** This 'reprogramming' allows all genes to be read afresh for each new person -- leaving scientists to question how epigenetic inheritance could occur.

The new Cambridge study initially discovered how the DNA methylation marks are erased in PGCs, a question that has been under intense investigation over the past 10 years. The methylation marks are converted to hydroxymethylation which is then progressively diluted out as the cells divide. This process turns out to be remarkably efficient and **seems to reset the genes for each new generation. Understanding the mechanism of epigenetic resetting could be exploited to deal with adult diseases linked with an accumulation of aberrant epigenetic marks, such as cancers, or in 'rejuvenating' aged cells.**

However, the researchers, who were funded by the Wellcome Trust, **also found that some rare methylation can 'escape' the reprogramming process and can thus be passed on to offspring -- revealing how epigenetic inheritance could occur.** This is important because aberrant methylation could accumulate at genes during a lifetime in response to environmental factors, such as chemical exposure or nutrition, and can cause abnormal use of genes, leading to disease. If these marks are then inherited by offspring, their genes could also be affected.

Dr Jamie Hackett from the University of Cambridge, who led the research, said: "Our research demonstrates how genes could retain some memory of their past experiences, revealing that one of the big barriers to the theory of epigenetic inheritance -- that epigenetic information is erased between generations -- should be reassessed."

"It seems that while the precursors to sperm and eggs are very effective in erasing most methylation marks, they are fallible and at a low frequency may allow some epigenetic information to be transmitted to subsequent generations. The inheritance of differential epigenetic information could potentially contribute to altered traits or disease susceptibility in offspring and future descendants."

"However, it is not yet clear what consequences, if any, epigenetic inheritance might have in humans. Further studies should give us a clearer understanding of the extent to which heritable traits can be derived from epigenetic inheritance, and not just from genes. That could have profound consequences for future generations."

Professor Azim Surani from the University of Cambridge, principal investigator of the research, said: "The new study has the potential to be exploited in two distinct ways. First, the work could provide information on how to erase aberrant epigenetic marks that may underlie some diseases in adults. Second, the study provides opportunities to address whether germ cells can acquire new epigenetic marks through environmental or dietary influences on parents that may evade erasure and be transmitted to subsequent generations, with potentially undesirable consequences."

Neural Mechanism Underlying Drug Cravings

Jan. 28, 2013 — **Addiction may result from abnormal brain circuitry in the frontal cortex, the part of the brain that controls decision-making.** Researchers from the RIKEN Center for Molecular Imaging Science in Japan collaborating with colleagues from the Montreal Neurological Institute of McGill University in Canada report that the **lateral and orbital regions of the frontal cortex interact during the response to a drug-related cue and that aberrant interaction between the two frontal regions may underlie addiction.** Their results are published January 28 in the journal *Proceedings of the National Academy of Sciences*.

Cues such as the sight of drugs can induce cravings and lead to drug-seeking behaviors and drug use. But cravings are also influenced by other factors, such as drug availability and self-control. To investigate the neural mechanisms involved in cue-induced cravings the researchers studied the brain activity of a group of 10 smokers, following exposure to cigarette cues under two different conditions of cigarette availability. In one experiment cigarettes were available immediately and in the other they were not. The researchers combined a technique called transcranial magnetic stimulation (TMS) with functional magnetic resonance imaging (fMRI).

The results demonstrate that in smokers the orbitofrontal cortex (OFC) tracks the level of craving while the dorsolateral prefrontal cortex (DLPFC) is responsible for integrating drug cues and drug availability. Moreover, the DLPFC has the ability to suppress activity in the OFC when the cigarette is unavailable. When the DLPFC was inactivated using TMS, both craving and craving-related signals in the OFC became independent of drug availability.

The authors of the study conclude that the DLPFC incorporates drug cues and knowledge on drug availability to modulate the value signals it transmits to the OFC, where this information is transformed into drug-seeking action.

"We demonstrate that in smokers, cravings build up in the OFC upon processing of cigarette cues and availability by the DLPFC. What is surprising is that this is a neural circuit involved in decision making and self-control, that normally guides individuals to optimal behaviors in daily life." Explains Dr. Hayashi, from RIKEN, who designed and conducted the fMRI and TMS experiments.

"This research uncovers the brain circuitry responsible for self-control during reward-seeking choices. It is also consistent with the view that drug addiction is a pathology of decision making." According to Dr. Alain Dagher, a neurologist at the Montreal Neurological Institute.

These findings will help understand the neural basis of addiction and may contribute to a therapeutic approach for addiction.

Power Helps You Live the Good Life by Bringing You Closer to Your True Self

Jan. 28, 2013 — **How does being in a position of power at work, with friends, or in a romantic relationship influence well-being? While we might like to believe the stereotype that power leads to unhappiness or loneliness, new research indicates that this stereotype is largely untrue: Being in a position of power may actually make people happier.**

Drawing on personality and power research, Yona Kifer of Tel Aviv University in Israel and colleagues hypothesized that **holding a position of authority might enhance subjective well-being through an increased feeling of authenticity**. The researchers predicted that because the **powerful are able to "navigate their lives in congruence with their internal desires and inclinations," they feel as if they are acting more authentically -- more "themselves" -- and thus are more content**. Their findings are published in *Psychological Science*, a journal of the Association for Psychological Science.

In their first experiment, the researchers surveyed over 350 participants to determine if internal feelings of power are associated with subjective well-being in different contexts: at work, with friends, or in romantic relationships. **The results indicated that people who feel powerful in any context tend to be more content.**

The most powerful people surveyed felt 16% more satisfied with their lives than the least powerful people. This effect was most pronounced in the workplace: Powerful employees were 26% more satisfied with their jobs than their powerless colleagues. The power-based discrepancy in happiness was smaller for friendships and romantic relationships. The researchers posit that this may be because **friendships are associated with a sense of community rather than hierarchy, and therefore having power in this kind of relationship is less important.**

In the second and third experiments, Kifer and colleagues examined the causal relationship between power, feelings of authenticity, and general well-being, by manipulating each of the factors independently. The results revealed that **being in a position of power causes people to feel more authentic and "true to themselves" -- that is, it allows their actions to more closely reflect their beliefs and desires. Feelings of authenticity, in turn, enhance subjective feelings of well-being and happiness.**

"By leading people to be true to their desires and inclinations -- to be authentic -- power leads individuals to experience greater happiness," the researchers conclude. Kifer and colleagues propose that future research into power dynamics, happiness, and authenticity should focus on specific kinds of power, both positive (such as charisma) and negative (such as punishment).

Together, these findings suggest that even the perception of having power can lead people to live more authentic lives, thereby increasing their happiness and well-being. Co-authors on this research include Daniel Heller of Tel Aviv University, Wei Qi Elaine Perunovic of University of

New Brunswick, and Adam Galinsky of Columbia Business School. This research was supported by grants from the Henry Crown Institute of Business Research in Israel and by a Harrison McCain Young Scholar award.

Neuroscientists Pinpoint Location of Fear Memory in Amygdala

Jan. 27, 2013 — A rustle of undergrowth in the outback: it's a sound that might make an animal or person stop sharply and be still, in the anticipation of a predator. **That "freezing" is part of the fear response, a reaction to a stimulus in the environment and part of the brain's determination of whether to be afraid of it.**

A neuroscience group at Cold Spring Harbor Laboratory (CSHL) led by Assistant Professor Bo Li Ph.D., together with collaborator Professor Z. Josh Huang Ph.D., have just released the results of a new study that examines the **how fear responses are learned, controlled, and memorized. They show that a particular class of neurons in a subdivision of the amygdala plays an active role in these processes.**

Locating fear memory in the amygdala

Previous research had indicated that structures inside the amygdala, a pair of almond-shaped formations that sit deep within the brain and are known to be involved in emotion and reward-based behavior, may be part of the circuit that controls fear learning and memory. In particular, a region called the central amygdala, or CeA, was thought to be a passive relay for the signals relayed within this circuit.

Li's lab became interested when they observed that neurons in a region of the central amygdala called the lateral subdivision, or CeL, "lit up" in a particular strain of mice while studying this circuit.

"Neuroscientists believed that changes in the strength of the connections onto neurons in the central amygdala must occur for fear memory to be encoded," Li says, "but nobody had been able to actually show this."

This led the team to further probe into the role of these neurons in fear responses and furthermore to ask the question: If the central amygdala stores fear memory, how is that memory trace read out and translated into fear responses?

To examine the behavior of mice undergoing a fear test the team first trained them to respond in a Pavlovian manner to an auditory cue. The mice began to "freeze," a very common fear response, whenever they heard one of the sounds they had been trained to fear.

To study the particular neurons involved, and to understand them in relation to the fear-inducing auditory cue, the CSHL team used a variety of methods. One of these involved delivering a gene that encodes for a light-sensitive protein into the particular neurons Li's group wanted to look at.

By implanting a very thin fiber-optic cable directly into the area containing the photosensitive neurons, the team was able to shine colored laser light with pinpoint accuracy onto the cells, and in this manner activate them. This is a technique known as optogenetics. Any changes in the behavior of the mice in response to the laser were then monitored.

A subset of neurons in the central amygdala controls fear expression

The ability to probe genetically defined groups of neurons was vital because there are two sets of neurons important in fear-learning and memory processes. The difference between them, the team learned, was in their release of message-carrying neurotransmitters into the spaces called synapses between neurons. In one subset of neurons, neurotransmitter release was enhanced; in another it was diminished. If measurements had been taken across the total cell population in the central amygdala, neurotransmitter levels from these two distinct sets of neurons would have been averaged out, and thus would not have been detected.

Li's group found that fear conditioning induced experience-dependent changes in the release of neurotransmitters in excitatory synapses that connect with inhibitory neurons -- neurons that suppress the activity of other neurons -- in the central amygdala. These changes in the strength of neuronal connections are known as synaptic plasticity.

Particularly important in this process, the team discovered, were somatostatin-positive (SOM+) neurons. Somatostatin is a hormone that affects neurotransmitter release. Li and colleagues found that fear-memory formation was impaired when they prevent the activation of SOM+ neurons.

SOM+ neurons are necessary for recall of fear memories, the team also found. Indeed, the activity of these neurons alone proved sufficient to drive fear responses. Thus, instead of being a passive relay for the signals driving fear learning and responses in mice, the team's work demonstrates that the central amygdala is an active component, and is driven by input from the lateral amygdala, to which it is connected.

"We find that the fear memory in the central amygdala can modify the circuit in a way that translates into action -- or what we call the fear response," explains Li.

In the future Li's group will try to obtain a better understanding of how these processes may be altered in post-traumatic stress disorder (PTSD) and other disorders involving abnormal fear learning. One important goal is to develop pharmacological interventions for such disorders.

Li says more research is needed, but is hopeful that with the discovery of specific cellular markers and techniques such as optogenetics, a breakthrough can be made.

'First Time' May Predict Lifelong Sexual Satisfaction

Jan. 28, 2013 — Research conducted by Matthew Shaffer, a doctoral psychology student at UT and C. Veronica Smith, an assistant psychology professor at the University of Mississippi, reveals that **the first sexual experience can set the tone for the rest of one's sexual life.** The study is published in the *Journal of Sex and Marital Therapy* and is the first to look at whether **the circumstances of losing one's virginity have lasting consequences.**

"The loss of virginity is often viewed as an important milestone in human development, signifying a transition to adulthood," said Shaffer. "However, it has not been studied in this capacity. We wanted to see the influence it may have related to emotional and physical development."

The researchers examined how first-time sexual satisfaction impacts long-term sexual function as well as how first-time physical and emotional responses affect long-term sexual experiences. **They found that positive first-time experiences were predictive of physical and emotional satisfaction. Specifically, those who felt loved and respected by their partner found later encounters more emotionally satisfying.**

The researchers asked 331 young men and women about how they lost their virginity. The anonymous participants ranked the experience according to emotions related to anxiety, contentment and regret. They also answered questions about their sex life using scales measuring sense of control, satisfaction and well-being. Finally, the participants filled out a diary for two weeks describing each sexual experience.

A series of analyses revealed **those who were most emotionally and physically satisfied the first time found their sex lives the most fulfilling. Those who reported higher levels of anxiety and negativity with the first time reported lower overall sexual functioning.**

"While this study doesn't prove that a better first time makes for a better sex life in general, a person's experience of losing their virginity may set the pattern for years to come," said Shaffer.

Shaffer suggests that a first-time sexual experience may create a general pattern of thought and behavior that guides sexual experiences and understanding of information concerning sexuality.

Penicillin, Not the Pill, May Have Launched the Sexual Revolution

Jan. 28, 2013 — **The rise in risky, non-traditional sexual relations that marked the swinging '60s actually began as much as a decade earlier, during the conformist '50s,** suggests an analysis recently published by the *Archives of Sexual Behavior*.

"It's a common assumption that the sexual revolution began with the permissive attitudes of the 1960s and the development of contraceptives like the birth control pill," notes Emory University economist Andrew Francis, who conducted the analysis. "The evidence, however, strongly indicates that **the widespread use of penicillin, leading to a rapid decline in syphilis during the 1950s, is what launched the modern sexual era.**"

As penicillin drove down the cost of having risky sex, the population started having more of it, Francis says, comparing the phenomena to the economic law of demand: When the cost of a good falls, people buy more of the good. "People don't generally think of sexual behavior in economic terms," he says, "but it's important to do so because sexual behavior, just like other behaviors, responds to incentives."

Syphilis reached its peak in the United States in 1939, when it killed 20,000 people. "It was the AIDS of the late 1930s and early 1940s," Francis says. "Fear of catching syphilis and dying of it loomed large." Penicillin was discovered in 1928, but it was not put into clinical use until 1941. As World War II escalated, and sexually transmitted diseases threatened the troops overseas, penicillin was found to be an effective treatment against syphilis. "The military wanted to rid the troops of STDs and all kinds of infections, so that they could keep fighting," Francis says. "That really sped up the development of penicillin as an antibiotic."

Right after the war, penicillin became a clinical staple for the general population as well. In the United States, syphilis went from a chronic, debilitating and potentially fatal disease to one that could be cured with a single dose of medicine. From 1947 to 1957, the syphilis death rate fell by 75 percent and the syphilis incidence rate fell by 95 percent. "That's a huge drop in syphilis. It's essentially a collapse," Francis says.

In order to test his theory that risky sex increased as the cost of syphilis dropped, Francis analyzed data from the 1930s through the 1970s from state and federal health agencies. Some of the data was only available on paper documents, but the Centers for Disease Control and Prevention (CDC) digitized it at the request of Francis.

For his study, Francis chose three measures of sexual behavior: The illegitimate birth ratio; the teen birth share; and the incidence of gonorrhea, a highly contagious sexually transmitted disease that tends to spread quickly. "As soon as syphilis bottoms out, in the mid- to late-1950s, you start to see dramatic increases in all three measures of risky sexual behavior," Francis says.

While many factors likely continued to fuel the sexual revolution during the 1960s and 1970s, Francis says the 1950s and the role of penicillin have been largely overlooked. "The 1950s are associated with prudish, more traditional sexual behaviors," he notes. "That may have been true for many adults, but not necessarily for young adults. It's important to recognize how reducing the fear of syphilis affected sexual behaviors."

A few physicians sounded moralistic warnings during the 1950s about the potential for penicillin to affect behavior. Spanish physician Eduardo Martinez Alonso referenced Romans 6:23, and the notion that God uses diseases to punish people, when he wrote: "The wages of sin are now negligible. One can almost sin with impunity, since the sting of sinning has been removed." Such

moralistic approaches, equating disease with sin, are counterproductive, Francis says, stressing that interventions need to focus on how individuals may respond to the cost of disease.

He found that the historical data of the syphilis epidemic parallels the contemporary AIDS epidemic. "Some studies have indicated that the development of highly active antiretroviral therapy for treating HIV may have caused some men who have sex with men to be less concerned about contracting and transmitting HIV, and more likely to engage in risky sexual behaviors," Francis says.

"Policy makers need to take into consideration behavioral responses to changes in the cost of disease, and implement strategies that are holistic and long-sighted," he concludes. "To focus exclusively on the defeat of one disease can set the stage for the onset of another if preemptive measures are not taken."

Poor Sleep in Old Age Prevents the Brain from Storing Memories

Jan. 27, 2013 — **The connection between poor sleep, memory loss and brain deterioration as we grow older has been elusive.** But for the first time, scientists at the University of California, Berkeley, have found **a link between these hallmark maladies of old age.** Their discovery opens the door to boosting the quality of sleep in elderly people to improve memory.

Postdoctoral fellow, Bryce Mander, demonstrates how the sleep study was conducted.

UC Berkeley neuroscientists have found that the slow brain waves generated during the deep, restorative sleep we typically experience in youth play a key role in transporting memories from the hippocampus -- which provides short-term storage for memories -- to the prefrontal cortex's longer term "hard drive."

However, in older adults, memories may be getting stuck in the hippocampus due to the poor quality of deep 'slow wave' sleep, and are then overwritten by new memories, the findings suggest.

"What we have discovered is a dysfunctional pathway that helps explain the relationship between brain deterioration, sleep disruption and memory loss as we get older -- and with that, a **potentially new treatment avenue,**" said UC Berkeley sleep researcher Matthew Walker, an associate professor of psychology and neuroscience at UC Berkeley and senior author of the study to be published Jan. 27, in the journal *Nature Neuroscience*. **The findings shed new light on some of the forgetfulness common to the elderly that includes difficulty remembering people's names.**

"When we are young, we have deep sleep that helps the brain store and retain new facts and information," Walker said. "But as we get older, the quality of our sleep deteriorates and prevents those memories from being saved by the brain at night."

Healthy adults typically spend one-quarter of the night in deep, non-rapid-eye-movement (REM) sleep. Slow waves are generated by the brain's middle frontal lobe. Deterioration of this frontal region of the brain in elderly people is linked to their failure to generate deep sleep, the study found.

The discovery that slow waves in the frontal brain help strengthen memories paves the way for therapeutic treatments for memory loss in the elderly, such as transcranial direct current stimulation or pharmaceutical remedies. For example, in an earlier study, neuroscientists in Germany successfully **used electrical stimulation of the brain in young adults to enhance deep sleep and doubled their overnight memory.**

UC Berkeley researchers will be conducting a similar sleep-enhancing study in older adults to see if it will improve their overnight memory. "**Can you jumpstart slow wave sleep and help people remember their lives and memories better? It's an exciting possibility,**" said Bryce Mander, a postdoctoral fellow in psychology at UC Berkeley and lead author of this latest study.

For the UC Berkeley study, Mander and fellow researchers tested the memory of 18 healthy young adults (mostly in their 20s) and 15 healthy older adults (mostly in their 70s) after a full night's sleep. Before going to bed, participants learned and were tested on 120 word sets that taxed their memories.

As they slept, an electroencephalographic (EEG) machine measured their brain wave activity. The next morning, they were tested again on the word pairs, but this time while undergoing functional and structural Magnetic Resonance Imaging (fMRI) scans.

In older adults, the results showed a clear link between the degree of brain deterioration in the middle frontal lobe and the severity of impaired "slow wave activity" during sleep. On average, the quality of their deep sleep was 75 percent lower than that of the younger participants, and their memory of the word pairs the next day was 55 percent worse.

Meanwhile, in younger adults, brain scans showed that deep sleep had efficiently helped to shift their memories from the short-term storage of the hippocampus to the long-term storage of the prefrontal cortex. Co-authors of the study are William Jagust, Vikram Rao, Jared Saletin and John Lindquist of UC Berkeley; Brandon Lu of the California Pacific Medical Center and Sonia Ancoli-Israel of UC San Diego. The research was funded by the National Institute of Aging of the National Institutes of Health.

Diet, Parental Behavior and Preschool Can Boost Children's IQ

Jan. 25, 2013 — **Supplementing children's diets with fish oil, enrolling them in quality preschool, and engaging them in interactive reading all turn out to be effective ways to raise a young child's intelligence,** according to a new report published in *Perspectives on Psychological Science*, a journal of the Association for Psychological Science.

Using a technique called meta-analysis, a team led by John Protzko, a doctoral student at the NYU Steinhardt School of Culture, Education, and Human Development, combined the findings from existing studies to evaluate the overall effectiveness of each type of intervention. In collaboration with NYU Steinhardt professors Joshua Aronson and Clancy Blair, leaders in the field of intelligence, Protzko analyzed the best available studies involving samples of children from birth and kindergarten from their newlyassembled "Database of Raising Intelligence."

"Our aim in creating this database is to learn what works and what doesn't work to raise people's intelligence," said Protzko. "For too long, findings have been disconnected and scattered throughout a wide variety of journals. The broad consensus about what works is founded on only two or three very high-profile studies."

All of the studies in this database rely on a normal population (participants without clinical diagnoses of intellectual disabilities), focus on interventions that are sustained over time, use widely accepted measures of intelligence, and, most importantly, are randomly controlled trials (participants selected at random to receive one of the interventions).

"The larger goal here is to understand the nature of intelligence, and if and how it can be nurtured at every stage of development," said Aronson, Protzko's advisor. "This is just a first step in a long process of understanding. It is by no means the last word. In fact, one of the main conclusions is how little high quality research exists in the field and how much more needs to be done."

Overall, the results of the meta-analyses indicated that certain dietary and environmental interventions can be effective in raising children's IQ. Supplementing pregnant women and newborns with long-chain polyunsaturated fatty acids, foods rich in Omega-3, were found to boost children's IQ by more than 3.5 points. These essential fatty acids may help raise intelligence by providing the building blocks for nerve cell development that the body cannot produce on its own.

There is insufficient research, however, to determine whether other types of supplements -- including iron, B-complex vitamins, riboflavin, thiamine, niacin, and zinc -- have beneficial effects on intelligence.

Enrolling an economically disadvantaged child into an early education intervention was found to raise his or her IQ by more than four points; interventions that specifically included a center-based education component raised a child's IQ by more than seven points.

The researchers hypothesize that early education interventions may help to raise children's IQ by increasing their exposure to complex environments that are cognitively stimulating and demanding. It's not clear, however, whether these results apply more broadly to kids from different socioeconomic backgrounds.

Surprisingly, Protzko, Aronson, and Blair found no evidence to support the idea that early education interventions that take place earlier in childhood are more effective than those that begin later.

Interventions focused on interactive reading -- teaching parents how to engage their children while reading with them -- were found to raise children's IQ by over 6 points. These interventions do not seem to have an effect for children over 4 years old, suggesting that the interventions may accelerate language development, which, in turn, boosts IQ.

Sending a child to preschool was found to raise his or her IQ by more than four points, and preschools that include a language development component were found to boost IQ by more than seven points. The link between preschool and intelligence could be a function of increased exposure to language or the result of the overall cognitive complexity of the preschool environment.

"Our current findings strengthen earlier conclusions that complex environments build intelligence, but do cast doubt on others, including evidence that earlier interventions are always most effective," Protzko explained. "Overall, identifying the link between essential fatty acids and intelligence gives rise to tantalizing new questions for future research and we look forward to exploring this finding."

No Link Found Between Facial Shape and Aggression

Jan. 25, 2013 — There is no significant evidence to support the association between facial shape and aggression in men, according to a study published by the journal *PLOS ONE*.

The professor Mireia Esparza, from the Anthropology Section of the Department of Animal Biology of the University of Barcelona, is part of the international research group who carried out this study. The research is coordinated by the experts Rolando González José, from the Patagonic National Centre (CENPAT-CONICET, Argentina) and Jorge Gómez Valdés, from the National Autonomous University of Mexico.

Sample of about 5,000 individuals from 94 worldwide human populations

The study provides new scientific data to reject the hypotheses that associate facial shape with antisocial and criminal behaviours, which attained its maximum splendour during the mid-19th century and lately have been revitalized. To carry out the study, researchers used a sample of 4,960 individuals from 94 worldwide populations. This large sample allowed to get a global estimation of facial shape and to develop an accurate analysis taking into account distinguishing traits. The experts based the research on the study of the fWHR -- facial width-to-height ratio -- as a possible predictor of aggressive behaviours in men populations.

According to the professor Mireia Esparza, "fWHR was used for two main reasons: on one hand, it is a good indicator of face shape and, on the other hand, it was used in those previous studies which established a correlation between higher fWHR scores and aggression. By this way, we were able to compare results without any bias caused by the use of any other indicator." Esparza contributed to this international study by reconstructing the genealogies of the Hallstatt

population from biodemographic data to get genealogical information of the skulls studied and estimate the fitness of each individual analysed.

Craniofacial measurements and 2D and 3D cranial landmark coordinates

Research's results support previous studies which do not prove any relation between fWHR and aggression. "This study goes more deeply," remarks Mireia Esparza. "The methodology used is based on craniofacial measurements and 2D and 3D cranial landmark coordinates, so it provides us with more accurate results than other previous studies based on photographs analysis. Moreover, our research used a large sample of about 5,000 individuals from 94 worldwide populations, so we were able to carry out inter and intra-population comparisons."

"Finally -- she continues -- , two specific databases, one sample of male prisoners of the Mexico City Federal Penitentiary and one the skulls from the catholic church of Hallstatt, Austria, enabled a deeper analysis. The Hallstatt database was used to estimate the correlation among life history parameters, such as fitness or reproductive success, and skull shape traits; this sample has been essential to yield that there is not significant correlation between fWHR and male fitness in this population. The Mexican database demonstrated that fWHR is not significantly greater on those males involved in aggressive crimes in comparison with the general population."

Neither more violence, nor more reproductive success

According to the coordinators of the study, the experts Rolando González José and Jorge Gómez Valdés, "the social and political implications that this kind of non-contrasted adaptive hypotheses could have, may increase racial prejudices, discrimination and intolerance." Besides demonstrating that facial traits are a poor predictor of aggressive behaviours, the study also proves that fWHR is unrelated to sexual dimorphism. In other words, males who present higher fWHR values -- wide faces in comparison with their height -- do not have a greater reproductive success or show more violent behaviours. If males displaying higher fWHR scores achieved better fitness values, it would trigger a process of sexual selection focused on fWHR. "Our study proves that there is not statistical association between fWHR and male fitness, and that facial shape is not a good predictor of behaviour," concludes Esparza.

More Than One Brain Behind Einstein's Famous Equation: $E=mc^2$



Jan. 25, 2013 — **A new study reveals the contribution of a little known Austrian physicist, Friedrich Hasenöhrl, to uncovering a precursor to Einstein famous equation.**

Two American physicists outline the role played by Austrian physicist Friedrich Hasenöhrl in establishing the proportionality between the energy (E) of a quantity of matter with its mass (m) in a cavity filled with radiation. In a paper about to be published in the *European Physical Journal H*, Stephen Boughn from Haverford College in Pennsylvania and Tony Rothman from Princeton University in New Jersey **argue how Hasenöhrl's work, for which he now receives little credit, may have contributed to the famous equation $E=mc^2$.**

According to science philosopher Thomas Kuhn, the nature of scientific progress occurs through paradigm shifts, which depend on the cultural and historical circumstances of groups of scientists. Concurring with this idea, the authors believe **the notion that mass and energy should be related did not originate solely with Hasenöhrl. Nor did it suddenly emerge in 1905, when Einstein published his paper, as popular mythology would have it.**

Given the lack of recognition for Hasenöhrl's contribution, the authors examined the Austrian physicist's original work on blackbody radiation in a cavity with perfectly reflective walls. This study seeks to identify the blackbody's mass changes when the cavity is moving relative to the observer.

They then explored the reason why the Austrian physicist arrived at an energy/mass correlation with the wrong factor, namely at the equation: $E = (3/8) mc^2$. Hasenöhrl's error,

they believe, stems from failing to account for the mass lost by the blackbody while radiating.

Before Hasenöhrl focused on cavity radiation, other physicists, including French mathematician Henri Poincaré and German physicist Max Abraham, showed the existence of an inertial mass associated with electromagnetic energy. In 1905, Einstein gave the correct relationship between inertial mass and electromagnetic energy, $E=mc^2$. Nevertheless, it was not until 1911 that German physicist Max von Laue generalised it to include all forms of energy.

Many Apples a Day Keep the Blues at Bay

Jan. 23, 2013 — **Eating more fruit and vegetables may make young people calmer, happier and more energetic in their daily life**, new research from the University of Otago suggests. Department of Psychology researcher Dr Tamlin Conner, and Dr Caroline Horwath and Bonnie White from Otago's Department of Human Nutrition, investigated the relationship between day-to-day emotions and food consumption. The study is published in the *British Journal of Health Psychology* on January 24.

A total of 281 young adults (with a mean age of 20 years) completed an internet-based daily food diary for 21 consecutive days. Prior to this, participants completed a questionnaire giving details of their age, gender, ethnicity, weight and height. Those with a history of an eating disorder were excluded.

On each of the 21 days participants logged into their diary each evening and rated how they felt using nine positive and nine negative adjectives. They were also asked five questions about what they had eaten that day. Specifically, participants were asked to report the number of servings eaten of fruit (excluding fruit juice and dried fruit), vegetables (excluding juices), and several categories of unhealthy foods like biscuits/cookies, potato crisps, and cakes/muffins.

The results showed a strong day-to-day relationship between more positive mood and higher fruit and vegetable consumption, but not other foods. "On days when people ate more fruits and vegetables, they reported feeling calmer, happier and more energetic than they normally did," says Dr Conner. To understand which comes first -- feeling positive or eating healthier foods -- Dr Conner and her team ran additional analyses and found that **eating fruits and vegetables predicted improvements in positive mood the next day, suggesting that healthy foods may improve mood. These findings held regardless of the BMI of individuals.**

"After further analysis we demonstrated that young people would need to consume approximately seven to eight total servings of fruits and vegetables per day to notice a meaningful positive change. One serving of fruit or vegetables is approximately the size that could fit in your palm, or half a cup. My co-author Bonnie White suggests that this can be done by making half your plate at each meal vegetables and snacking on whole fruit like apples," says Dr Conner.

She adds that while this research shows a promising connection between healthy foods and healthy moods, further research is necessary and the authors recommend the development of randomised control trials evaluating the influence of high fruit and vegetable intake on mood and wellbeing.

Frequent Multitaskers Are Bad at It: Can't Talk and Drive Well

Jan. 23, 2013 — **Most people believe they can multitask effectively, but a University of Utah study indicates that people who multitask the most -- including talking on a cell phone while driving -- are least capable of doing so.**

"What is alarming is that people who talk on cell phones while driving tend to be the people least able to multitask well," says psychology Professor David Sanbonmatsu, a senior author of the study. "Our data suggest the people talking on cell phones while driving are people who probably shouldn't. We showed that **people who multitask the most are those who appear to be the least capable of multitasking effectively.**" The new study was scheduled for publication Jan. 23 in *PLOS ONE*, an online journal of the Public Library of Science.

The other senior author, University of Utah psychology Professor David Strayer, adds, "The people who are most likely to multitask harbor the illusion they are better than average at it, when in fact they are no better than average and often worse."

Citing humorist Garrison Keillor's catchphrase about kids in Keillor's fictitious hometown, Strayer says people who use cell phones while driving "all think they live in Lake Wobegon, where everybody is above average. But it's a statistical impossibility."

The study ran 310 undergraduate psychology students through a battery of tests and questionnaires to measure actual multitasking ability, perceived multitasking ability, cell phone use while driving, use of a wide array of electronic media, and personality traits such as impulsivity and sensation-seeking.

The key findings:

- "The persons who are most capable of multitasking effectively are not the persons who are most likely to engage in multiple tasks simultaneously." **Instead, people who score high on a test of actual multitasking ability tend not to multitask because they are better able to focus attention on the task at hand.**
- The more people multitask by talking on cell phones while driving or by using multiple media at once, the more they lack the actual ability to multitask, and **their perceived multitasking ability "was found to be significantly inflated." In fact, 70 percent of participants thought they were above average at multitasking, which is statistically impossible.**
- **People with high levels of impulsivity and sensation-seeking reported more multitasking.** However, there was an exception: **People who talk on cell phones while driving tend not to be impulsive, indicating that cell phone use is a deliberate choice.**

- The research suggests that people who engage in multitasking often do so not because they have the ability, **but "because they are less able to block out distractions and focus on a singular task."**

The researchers conclude, "The negative relation between cellular communication while driving and multitasking ability appears to further bolster arguments for legislation limiting the use of cell phones while operating a motor vehicle."

Sanbonmatsu and Strayer conducted the study with University of Utah co-authors Jason Watson, an associate professor of psychology, and Nathan Medeiros-Ward, a doctoral student in psychology. The study was funded by the American Automobile Association Foundation for Traffic Safety.

How the Study Was Performed

The researchers say that while people frequently multitask to try to achieve several goals at once, "relatively little is known about when and why people perform more than one attention-demanding task at a time. Related to this, little is known about who is most likely to multitask."

The study participants were 310 University of Utah psychology undergraduates -- 176 female and 134 male with a median age of 21 -- who volunteered for their department's subject pool in exchange for extra course credit.

To measure actual multitasking ability, participants performed a test named Operation Span, or OSPAN. The test involves two tasks: memorization and math computation. Participants must remember two to seven letters, each separated by a math equation that they must identify as true or false. A simple example of a question: "is $2+4=6$?, g, is $3-2=2$?, a, is $4 \times 3=12$." Answer: true, g, false, a, true. Participants also ranked their perceptions of their own multitasking ability by giving themselves a score ranging from zero to 100, with 50 percent meaning average.

Study subjects reported how often they used a cell phone while driving, and what percentage of the time they are on the phone while driving. They also completed a survey of how often and for how many hours they use which media, including printed material, television and video, computer video, music, nonmusic audio, video games, phone, instant and text messaging, e-mail, the Web and other computer software such as word processing. The results were used to compute an index of media multitasking.

They also completed well-established questionnaires that measure impulsivity and sensation-seeking.

Who Multitasks and Why?

The researchers looked for significant correlations among results of the various tests and questionnaires.

"The people who multitask the most tend to be impulsive, sensation-seeking, overconfident of their multitasking abilities, and they tend to be less capable of multitasking," says Strayer, summarizing the findings.

The 25 percent of the people who performed best on the OSPAN test of multitasking ability "are the people who are least likely to multitask and are most likely to do one thing at a time," Sanbonmatsu says. In contrast, 70 percent of participants said they were above-average at multitasking, and they were more likely to multitask.

"One of the main reasons people multitask is because they think they are good at it," Sanbonmatsu says. "But our study suggests people rarely are as good at multitasking as they think they are." Multitasking ability on the OSPAN was significantly and negatively correlated with actual media multitasking and cell phone use while driving, meaning the people who multitask the most have the least ability to do so.

"If you have people who are multitasking a lot, you might come to the conclusion they are good at multitasking," Strayer says. "In fact, the more likely they are to do it, the more likely they are to be bad at it." Sanbonmatsu adds: "Our data show people multitask because they have difficulty focusing on one task at a time. They get drawn into secondary tasks. ... They get bored and want that stimulation of talking while they are driving."

Study participants reported spending 13 percent of their driving time talking on a cell phone, which Strayer says roughly squares with federal estimates that one in 10 drivers are on the phone at any given time. Media multitasking -- except cell phone use while driving -- correlated significantly with impulsivity, particularly the inability to concentrate and acting without thinking. Impulsive people tend to be more reward-oriented and more apt to take risks, so they may be less sensitive to the costs of multitasking, the researchers say.

Multitasking, including cell phone use while driving, correlated significantly with sensation-seeking, indicating some people multitask because it is more stimulating, interesting and challenging, and less boring -- even if it may hurt their overall performance.

Socially Isolated Rats Are More Vulnerable to Addiction, Report Researchers

Jan. 23, 2013 — **Rats that are socially isolated during a critical period of adolescence are more vulnerable to addiction to amphetamine and alcohol**, found researchers at The University of Texas at Austin. Amphetamine addiction is also harder to extinguish in the socially isolated rats. **These effects, which are described this week in the journal *Neuron*, persist even after the rats are reintroduced into the community of other rats.**

"Basically the animals become more manipulatable," said Hitoshi Morikawa, associate professor of neurobiology in the College of Natural Sciences. **"They're more sensitive to**

reward, and once conditioned the conditioning takes longer to extinguish. We've been able to observe this at both the behavioral and neuronal level."

Morikawa said the negative effects of social isolation during adolescence have been well documented when it comes to traits such as anxiety, aggression, cognitive rigidity and spatial learning. What wasn't clear until now is how social isolation affects the specific kind of behavior and brain activity that has to do with addiction.

"Isolated animals have a more aggressive profile," said Leslie Whitaker, a former doctoral student in Morikawa's lab and now a researcher at the National Institute on Drug Abuse. "They are more anxious. Put them in an open field and they freeze more. We also know that those areas of the brain that are more involved in conscious memory are impaired. But the kind of memory involved in addiction isn't conscious memory. It's an unconscious preference for the place in which you got the reward. You keep coming back to it without even knowing why. That kind of memory is enhanced by the isolation."

The rats in the study were isolated from their peers for about a month from 21 days of age. That period is comparable with early-to-middle adolescence in humans. They were then tested to see how they responded to different levels of exposure to amphetamine and alcohol.

The results were striking, said Mickaël Degoulet, a postdoctoral researcher in Morikawa's lab. The isolated rats were much quicker to form a preference for the small, distinctive box in which they received amphetamine or alcohol than were the never-isolated control group. Nearly all the isolated rats showed a preference after just one exposure to either drug. The control rats only became conditioned after repeated exposures.

Morikawa said that this kind of preference for the environmental context in which the reward was received provides researchers with a more useful way of understanding addiction than seeing it as a desire for more of the addictive substance.

"When you drink or take addictive drugs, that triggers the release of dopamine," he said. "People commonly think of dopamine as a happy transmitter or a pleasure transmitter, which may or may not be true, but it is becoming increasingly clear that it is also a learning transmitter. It strengthens those synapses that are active when dopamine is released. It tells our brain that what we're doing at that moment is rewarding and thus worth repeating."

In an important sense, says Morikawa, you don't become addicted to the experience of pleasure or relief but to the constellation of environmental, behavioral and physiological cues that are reinforced when the substance triggers the release of dopamine in the brain.

Morikawa and Whitaker have also been able to document these changes at the neuronal level. Social isolation primes dopamine neurons in the rats' brain to quickly learn to generate spikes in response to inputs from other brain areas. So dopamine neurons will learn to respond to the context more quickly.

If the control, group-housed rats are given enough repeated exposure to amphetamine, they eventually achieve the same degree of addiction as the socially isolated rats. Even from this point of comparable addiction, however, there are differences. It takes longer for the socially isolated rats to kick the addiction to amphetamine when they're exposed to the same extinction protocols. (They spend time in the same environments, but amphetamine is no longer available.)

"So the social isolation leads to addiction more quickly, and it's harder to extinguish," said Whitaker.

Whitaker said that the implications of these findings for addiction in humans are obvious. There is a rich literature that documents the negative effects of social isolation in humans, as well as a great deal of evidence that addiction in rats and humans is functionally similar at the neurological level.

"It's not a one-to-one correlation, but there are socially impoverished human environments," she said. "There are children who are neglected, who have less social input. It's reasonable to make guesses about what the impact of that is going to be."

Morikawa points out that their findings may also have implications for how social isolation during adolescence affects conditionability when it comes to other kinds of rewards.

"We think that maybe what's happening is that the brain reacts to the impoverished environment, to a lack of opportunities to be reinforced by rewarding stimuli, by increasing its sensitivity to reward-based conditioning," said Morikawa. "The deprived brain may be overinterpreting any reward it encounters. And if that's the case, it's likely that you are more conditionable not only to drugs but to any sort of reward, including food reward. One interesting possibility is that it might also make adolescents more prone to food 'addiction,' and then to obesity."

Children's Complex Thinking Skills Begin Before Going to School

Jan. 23, 2013 — New research at the University of Chicago and the University of North Carolina at Chapel Hill shows that **children begin to show signs of higher-level thinking skills as young as age 4 ½. Researchers have previously attributed higher-order thinking development to knowledge acquisition and better schooling, but the new longitudinal study shows that other skills, not always connected with knowledge, play a role in the ability of children to reason analytically.**

The findings, reported in January in the journal *Psychological Science*, show for the first time that **children's executive function has a role in the development of complicated analytical thinking. Executive function includes such complex skills as planning, monitoring, task switching, and controlling attention. High, early executive function skills at school entry are related to higher than average reasoning skills in adolescence.**

Growing research suggests that **executive function may be trainable through pathways, including preschool curriculum, exercise and impulse control training.** Parents and teachers may be able to help encourage development of executive function by having youngsters help plan activities, learn to stop, think, and then take action, or engage in pretend play, said lead author of the study, Lindsey Richland, assistant professor in comparative human development at the University of Chicago.

Although important to a child's education, "little is known about the cognitive mechanisms underlying children's development of the capacity to engage in complex forms of reasoning," Richland said.

The new research is reported in the paper "Early Executive Function Predicts Reasoning Development" and follows the development of complex reasoning in children from before the time they go to school until they are 15. Richland's co-author is Margaret Burchinal, senior scientist at the Frank Porter Graham Child Development Institute at the University of North Carolina at Chapel Hill.

The two studied the acquisition of analogical thinking, one form of complex reasoning. "The ability to see relationships and similarities between disparate phenomena is fundamental to analytical and inductive reasoning, and is closely related to measurements of general fluid intelligence," said Richland. Developing complex reasoning ability is particularly fundamental to the innovation and adaptive thinking skills necessary for a modern workforce, she pointed out.

Richland and Burchinal studied a database of 1,364 children who were part of the Early Child Care and Youth Development study from birth through age 15. The group was fairly evenly divided between boys and girls and included families from a diverse cross-section of ethnic and income backgrounds.

The current study examined tests children took when they were 4 ½, when they were in first grade, third grade, and when they were 15. Because the study was longitudinal, the same children were tested at each interval. Among the tests they took were ones to measure analytical reasoning, executive function, vocabulary knowledge, short-term memory and sustained attention.

Children were tested at 4 ½ on their ability to monitor and control their automatic responses to stimuli. In first grade they worked on a test that judged their ability to move objects in a "Tower of Hanoi" game, in which they had to move disks between pegs in a specific order.

In third grade and at 15 year olds, they were tested on their ability to understand analogies, asked in third grade for instance to complete the question "dog is to puppy as cat is to ___?" At 15 year olds, they were asked to complete written tests of analogies.

The study found a strong relationship between high scores among children who, as preschoolers, had strong vocabularies and were good at monitoring and controlling their responses to later ability on tests of understanding analogies.

"Overall, these results show that knowledge is necessary for using thinking skills, as shown by the importance of early vocabulary, but also inhibitory control and executive function skills are important contributors to children's analytical reasoning development," Richland said.

The National Academy of Education/Spencer Foundation, the Office of Naval Research and the National Science Foundation supported the research.

Personal Epigenetic 'Signatures' Found Consistent in Prostate Cancer Patients' Metastases

Jan. 23, 2013 — In a genome-wide analysis of 13 metastatic prostate cancers, scientists at the Johns Hopkins Kimmel Cancer Center found consistent epigenetic "signatures" across all metastatic tumors in each patient. **The discovery of the stable, epigenetic "marks" that sit on the nuclear DNA of cancer cells and alter gene expression, defies a prevailing belief** that the marks vary so much within each individual's widespread cancers that they have little or no value as targets for therapy or as biomarkers for treatment response and predicting disease severity.

A report of the discovery, published in the Jan. 23 issue of *Science Translational Medicine*, describes a genomic analysis of 13 men who died of metastatic prostate cancer and whose tissue samples were collected after a rapid autopsy.

Samples from three to six metastatic sites in each of the patients and one to three samples of their normal tissue were analyzed to determine the amount of molecular marks made up of methyl groups that attach to sites along the genome in a process known as DNA methylation. The process is part of an expanding target of scientific study called epigenetics, known to help drive cell processes by regulating when and how genes are activated. Mistakes in epigenetic processes also are known to trigger or fuel cancers.

"Knowing both the genetic and epigenetic changes that happen in lethal prostate cancers can eventually help us identify the most aggressive cancers earlier and develop new therapies that target those changes," says Srinivasan Yegnasubramanian, M.D., Ph.D., assistant professor of oncology at The Johns Hopkins University School of Medicine. "But there has been an open question of whether epigenetic changes are consistently maintained across all metastatic sites of an individual's cancer."

The research team found that while methylation patterns vary from one patient to another, many methylation patterns occur "very consistently" within different metastatic sites in an individual patient. They identified more than 1,000 regions of the genome where various types of DNA methylation were consistently maintained within their 13 subjects' genomes.

"As they evolve and grow, cancer cells acquire and maintain changes that enable them to continue thriving," says Yegnasubramanian. "We know that cancer cells maintain and pass along

genetic changes in the nucleus of cells across metastatic sites, and our research now shows that epigenetic changes also are maintained to nearly the same degree."

The scientists say that the consistent methylation changes they found appear to represent so-called driver changes critical to the cancer's development and could be targets for treatment. By contrast, other methylation changes found only sporadically in the metastatic sites are more likely what are called passenger changes that occur by chance and are less promising as treatment targets or biomarkers than driver changes.

"Our study shows that for prostate cancer, at least, each person develops his own path to cancer and metastasis, and we can find a signature of that path in the epigenetic marks within their tumors," says Yegnasubramanian, who envisions that certain epigenetic changes can be grouped into clusters to be used as biomarkers signaling a lethal cancer. Yegnasubramanian and his team also plan to study how each of the driver changes work and how they influence cancer metastasis.

The research was funded by the Department of Defense Prostate Cancer Research Program (PC073533/W81XH-08-1-0049), the National Institutes of Health (CA58236, CA070196, CA113374, CA135008, GM083084), the Prostate Cancer Foundation Creativity and Challenge Awards, the Patrick C. Walsh Prostate Cancer Research Fund/Dr. and Mrs. Peter S. Bing Scholarship, the V Foundation for Cancer Research Martin D. Abeloff V Scholar Award, the German Research Foundation Research Fellowship, the Finnish Academy of Sciences Finnish Distinguished Professor Award, the Commonwealth Foundation, Mr. David H. Koch, and the Irving A. Hanson Memorial Foundation.

Scientists participating in this research included Martin Aryee, Julia Engelmann, Philipp Nuhn, Meltem Gurel, Michael Haffner, David Esopi, Rafael Irizarry, Robert Getzenberg, William Nelson, Jun Luo, Jianfeng Xu, and William Isaacs from Johns Hopkins; Wennuan Liu from Wake Forest University; and G. Steven Bova from the University of Tampere in Finland.

Yegnasubramanian, Haffner, Esopi, Nelson, and Isaacs and The Johns Hopkins University have provisional or fully executed patents relating to DNA methylation biomarkers in prostate cancer. Yegnasubramanian and Nelson, along with The Johns Hopkins University, hold a patent for a polypeptide for detection of methylated DNA. This reagent has been made available to the research community via a nonexclusive license with Clontech, Inc., which provides royalties to The Johns Hopkins University, Yegnasubramanian, and Nelson from sales of kits containing this reagent. The authors are pursuing intellectual property protection for the new prostate cancer biomarkers described in this research.

Caloric Restriction Has a Protective Effect On Chromosomes

Jan. 23, 2013 — One of the indicators of a cell's health is the state of its DNA and containers -- the chromosomes -- so when these fuse together or suffer anomalies, they can become the source of illnesses like cancer and/or aging processes.

According to a study carried out by a team led by María Blasco, the director of the Spanish National Cancer Research Centre (CNIO) and head of the Telomeres and Telomerase Group, **a sustained lowering of food intake over time results in an increase of telomere length** -- the ends of chromosomes -- in adult mice, which has a protective effect on the DNA and genetic material. **These beneficial effects on the youth of the chromosomes translate to a lower incidence of cancer and other age-related illnesses.** The journal *PLOS ONE* is to publish the details of this study in its online edition this week.

A lower incidence of cancer and better health

To carry out the study, researchers used young mice -- just three months old -- and reduced their caloric intake by 40% before observing them until the end of their life cycle. "We see that mice that undergo caloric restriction show a lower telomere shortening rate than those fed with a normal diet," says Blasco. "These mice therefore have longer telomeres as adults, as well as lower rates of chromosome anomalies," she adds.

To study the effects of this phenomenon on the health of the mammals, researchers observed the incidence of age-related illnesses like cancer. The mice that had been fed a lower calorie intake showed a reduction in the incidence of cancer. Furthermore, these mice also showed a lower incidence of other age-related illnesses such as osteoporosis, greater glucose uptake or improvements in motor coordination.

When the researchers carried out these same experiments with a variety of mice that produce more telomerase -- a protein that lengthens telomeres and protects chromosomes -- they observed that these mice not only enjoyed better health but also lived up to 20% longer.

"We believe that such a significant increase in longevity is due to the protective effect against cancer produced by caloric restriction -- incidents fall by 40% if we compare them with the mice that produce more telomerase and have a normal diet -- and, added to the presence of longer telomeres, this makes the mice live longer and better," says Blasco.

Despite the effects of caloric restriction depending on the genetic characteristics of each organism, this study opens the way to studying the effect other factors and lifestyle habits, such as smoking or exercise, might have on aging.

Furthermore, it is calculated that there are currently more than 10,000 people in the world on some form of controlled caloric restriction, so the observation of these individuals will be decisive in discovering the effects of this type of diet on humans.

New Brain Circuit Sheds Light On Development of Voluntary Movements

Jan. 23, 2013 — All parents know the infant milestones: turning over, learning to crawl, standing, and taking that first unassisted step. **Achieving each accomplishment presumably requires the formation of new connections among subsets of the billions of nerve cells in the infant's brain. But how, when and where those connections form has been a mystery.**

Now researchers at Duke Medicine have begun to find answers. In a study reported Jan. 23, 2013, in the scientific journal *Neuron*, the research team **describes the entire network of brain cells that are connected to specific motor neurons controlling whisker muscles in newborn mice.**

A better understanding of such motor control circuits could help inform how human brains develop, potentially leading to new ways of restoring movement in people who suffer paralysis from brain injuries, or to the development of better prosthetics for limb replacement.

"Whiskers to mice are like fingers to humans, in that both are moving touch sensors," said lead investigator Fan Wang, PhD, associate professor of cell biology and member of the Duke Institute for Brain Sciences. "Understanding how the mouse's brain controls whisker movements may tell us about neural control of finger movements in people."

Mice are active at night, so they rely heavily on whiskers to detect and discriminate objects in the dark, brushing their whiskers against objects in a rhythmic back-and-forth sweeping pattern referred to as "whisking." But this whisking behavior does not appear until about two weeks after birth, when young mice start to explore the world outside their nest.

To learn how motor control of whiskers takes place, Wang and postdoctoral fellow Jun Takatoh used a new technique that takes advantage of the rabies virus' ability to spread through connected nerve cells. A disabled form of the virus used to vaccinate pets was created with the ability to express a fluorescent protein. The researchers were able to trace its path through a network of brain cells directly connected to the motor neurons controlling whisker movement.

"The precision of this mapping method allowed us to ask a key question, namely are parts of the whisker motor control circuitry not yet connected in newborn mice, and are such missing links added later to enable whisking?" Wang said.

By taking a series of pictures in the fluorescently labeled brains during the first two weeks after birth, the research team chronicled the developing circuits before and after mice start whisking.

"When we traced the circuit it was stunning in the sense that we didn't realize there are so many pools of neurons located throughout the brainstem that are connected to whisker motor neurons," said Wang. "It's remarkable that a single motor neuron receives so many inputs, and somehow is able to integrate them."

At the same time whisking movements emerge, motor neurons receive a new set of inputs from a region of the brainstem called the LPGi. A single LPGi neuron is connected to motor neurons on both sides of the face, putting them in perfect position to synchronize the movements of left and right whiskers.

To learn more about the new circuit formed between LPGi and motor neurons, Wang and Takatoh drew on the expertise of Duke colleague Richard Mooney, PhD, professor of neurobiology, and his student Anders Nelson. Together, the researchers were able to record the labeled neurons and found the LPGi neurons communicate with motor neurons using glutamate, the main neurotransmitter that stimulates the brain. They further discovered that LPGi neurons receive direct inputs from the motor cortex.

"This makes sense because exploratory whisking is a voluntary movement under control of the motor cortex," Wang said. "Excitatory input is needed for initiating such movements, and LPGi may be critical for relaying signals from the motor cortex to whisker motor neurons."

The researchers will next explore the connectivity by using genetic, viral and optical tools to see what happens when certain components of the circuits are activated or silenced during various motor tasks.

In addition to Wang, Takatoh, Mooney and Nelson at Duke, study authors include Xiang Zhou of the University of Chicago; Michael D. Ehlers of Pfizer Inc. R&D; M. McLean Bolton of the Max Planck Institute; and Benjamin R. Arenkiel of Baylor College of Medicine.

The research was supported by grants from the National Institutes of Health (DA028302, DE19440, NS079929) and by the Duke Institute for Brain Sciences.

New Greenland Ice Core Reveals Warmer Temperatures 120,000 Years Ago

Jan. 23, 2013 — A new study provides surprising details on changes in Earth's climate during the last warm period (120,000-128,000 years ago). **Even though temperatures in Northern Greenland were 5-8 degrees Celsius higher than today, the thickness of the ice sheet was only a few hundred meters lower. And this despite the fact that sea level was 4-8 metres higher than today.**

This indicates that the melting of the Greenland ice sheet may have contributed less than half of the total sea level rise at the time. This interglacial period (the so called "Eemian")

may be a good analogue for where the Greenland ice sheet is heading today in the face of increasing greenhouse gases and warming temperatures.

These results from the North Greenland Eemian Ice Drilling (NEEM) project, led by the University of Copenhagen and with participation by the University of Bern, have now been published in "Nature."

"A thick Greenland ice sheet connected to much warmer conditions in Greenland is astounding but no reason to relax and watch what the future of human-made warming has in store for us," says Prof. Hubertus Fischer, ice core scientist at the University of Bern. "Fact is that the warming was accompanied by a sea level rise of 4-8 metres. Such a sea-level rise would be a disaster for the more than 7 billion people living on this planet today, even if it takes a couple thousand years to be reached."

The apparent good news from this study is that the Greenland ice sheet may not be as sensitive to temperature increases as previously thought. However, the bad news is that if Greenland did not discharge larger parts of its ice into the ocean during the Eemian, then Antarctica and here especially the more climate sensitive West Antarctic Ice Sheet must be responsible for a significant part of the 4-8-metre sea level rise and may be even more sensitive to climate warming than previously thought.

The new findings also revealed temporal changes in the higher temperatures in Northern Greenland over the last interglacial period. At the beginning of the Eemian (128,000 years before today), the ice sheet in the vicinity of NEEM was 200 metres higher than today. At the same time, the temperature at the altitude of the current drill site was up to 8°C warmer.

Towards the end of the Eemian, the sheet thickness was reduced by 130 metres compared to today but the ice was still 2400 metres thick, while the temperature was still about 5°C warmer. The research team estimates that the volume of the Greenland ice sheet shrank during the Eemian by no more than 25% over 6000 years. The rate of elevation change in the early part of the Eemian was high (about 6 cm/yr) and the loss of mass from the Greenland ice sheet was likely on the same order as changes observed during the last ten years.

The concentrations of the atmospheric greenhouse gases methane and nitrous oxide in the Eemian, measured by the Bern team, were similar at that time to what is observed during the preindustrial period about 150 years ago, i.e. before the increase by human emissions started.

The strong warming in Northern Greenland during the Eemian led to frequent summer melt layers clearly recognized by a low air content and greenhouse gas concentrations, which due to the melt processes were much higher than their atmospheric value. Such melt events are very rare by comparison during the past 5000 years and require a warming during the Eemian of at least 4°C.

People Seek High-Calorie Foods in Tough Times

Jan. 22, 2013 — Bad news about the economy could cause you to pack on the pounds, according to a new study published in *Psychological Science*, a journal of the Association for Psychological Science.

The study shows that when there is a perception of tough times, people tend to seek higher-calorie foods that will keep them satisfied longer. When subconsciously primed with such messages, a "live for today" impulse is triggered causing people to consume nearly 40 percent more food than when compared to a control group primed with neutral words.

"The findings of this study come at a time when our country is slowly recovering from the onslaught of negative presidential campaign ads chalked with topics such as the weak economy, gun violence, war, deep political divides, just to name a few problem areas," said Juliano Laran, an assistant professor of marketing at the University of Miami School of Business Administration, who conducted the research with doctoral student Anthony Salerno. "Now that we know this sort of messaging causes people to seek out more calories out of a survival instinct, it would be wise for those looking to kick off a healthier new year to tune out news for a while."

Further, when the same group primed with "tough times" messages was then told the food they were sampling was low-calorie, they consumed roughly 25 percent less of the food. According to the researchers this is because if people perceive that food resources are scarce, they place a higher value on food with more calories.

Several studies were conducted as part of the research. In the first one, the researchers invited study subjects to join in a taste test for a new kind of M&M. Half the participants were given a bowl of the new candy and were told that the secret ingredient was a new, high-calorie chocolate. The other half of the participants also received a bowl of M&Ms but were told the new chocolate was low-calorie. All of the participants were told that they could sample the product in order to complete a taste test evaluation form.

In reality, there was no difference in the M&Ms that the two groups were given to taste. The researchers were actually measuring how much participants consumed after they were exposed to posters containing either neutral sentences or sentences related to struggle and adversity. Those who were subconsciously primed to think about struggle and adversity ate closer to 70 percent more of the "higher-calorie" candy vs. the "lower-calorie" option, while those primed with neutral words did not significantly differ in the amount of M&M's consumed.

"It is clear from the studies that taste was not what caused the reactions, it was a longing for calories," continued Laran. "These findings could have positive implications for individuals in the health care field, government campaigns on nutrition, and companies promoting wellness. And, certainly beware of savvy food marketers bearing bad news."

The APS journal *Psychological Science* is the highest ranked empirical journal in psychology. For a copy of the article "Life-History Strategy, Food Choice, and Caloric Consumption

Brain Structure of Infants Predicts Language Skills at One Year

Jan. 22, 2013 — Using a brain-imaging technique that examines the entire infant brain, researchers have found **that the anatomy of certain brain areas – the hippocampus and cerebellum – can predict children's language abilities at 1 year of age.** The University of Washington study is the first to associate these brain structures with future language skills. The results are published in the January issue of the journal *Brain and Language*.

"The brain of the baby holds an infinite number of secrets just waiting to be uncovered, and these discoveries will show us why infants learn languages like sponges, far surpassing our skills as adults," said co-author Patricia Kuhl, co-director of the UW's Institute for Learning & Brain Sciences. **Children's language skills soar after they reach their first birthdays, but little is known about how infants' early brain development seeds that path. Identifying which brain areas are related to early language learning could provide a first glimpse of development going awry, allowing for treatments to begin earlier.**

"Infancy may be the most important phase of postnatal brain development in humans," said Dilara Deniz Can, lead author and a UW postdoctoral researcher. "Our results showing brain structures linked to later language ability in typically developing infants is a first step toward examining links to brain and behavior in young children with linguistic, psychological and social delays."

In the study, the researchers used magnetic resonance imaging to measure the brain structure of a mix of 19 boys and girls at 7 months of age. The researchers used a measurement called voxel-based morphometry to determine the concentration of gray matter, consisting of nerve cells, and of white matter, which make up the network of connections throughout the brain.

The study is the first to relate the outcomes of this whole-brain imaging technique to predict future ability in infants. The whole-brain approach freed the researchers from having to select a few brain regions for study ahead of time, ones scientists might have expected to be involved based on adult data.

Five months later, when the children were about 1 year old they returned to the lab for a language test. This test included measures of the children's babbling, recognition of familiar names and words, and their ability to produce different types of sounds. "At this age, children typically don't say many words," Deniz Can said. "So we rely on babbling and the ability to comprehend language as a sign of early language mastery."

Infants with a greater concentration of gray and white matter in the cerebellum and the hippocampus showed greater language ability at age 1. This is the first study to identify a

relationship between language and the cerebellum and hippocampus in infants. Neither brain area is well-known for its role in language: the cerebellum is typically linked to motor learning, while the hippocampus is commonly recognized as a memory processor.

"Looking at the whole brain produced a surprising result and scientists live for surprises. It wasn't the language areas of the infant brain that predicted their future linguistic skills, but instead brain areas linked to motor abilities and memory processing," Kuhl said. "Infants have to listen and memorize the sound patterns used by the people in their culture, and then coax their own mouths and tongues to make these sounds in order join the social conversation and get a response from their parents."

The findings could reflect infants' abilities to master the motor planning for speech and to develop the memory requirements for keeping the sound patterns in mind.

"The brain uses many general skills to learn language," Kuhl said. "Knowing which brain regions are linked to this early learning could help identify children with developmental disabilities and provide them with early interventions that will steer them back toward a typical developmental path." Todd Richards, a UW professor of radiology, was another co-author. The study was funded by the National Institutes of Health and the Santa Fe Institute Consortium.

New Study Examines On/Off Relationships and 'Sex With an Ex' Among Teenagers and Young Adults

Jan. 22, 2013 — A new study finds that **nearly half of older teenagers and young adults break up and get back together with previous dating partners and over half of this group have sex as part of the reconciliation process.** This study was recently published in the *Journal of Adolescent Research*.

Researchers Sarah Halpern-Meekin, Wendy Manning, Peggy Giordano and Monica Longmore studied data on 792 daters and cohabiters ages 17 to 24, also **known as "emerging adults."** The researchers studied two relationship patterns specifically -- reconciliation with an ex, or breaking up and getting back together, and "sex with an ex," when couples break up, yet remain sexually involved.

Study authors found that approximately 44% of emerging adults who had been in a romantic relationship in the past two years had experienced at least one reconciliation with an ex romantic partner and 53% of those who reported reconciliations also reported having sex with their ex. Additionally, racial minorities in particular were even more likely to experience reconciliation or sexual relationships with previous romantic partners.

The study authors discussed the implications of reconciliations with previous romantic partners: **"Emerging adults who reconcile may be prone to a behavior pattern that involves cycling through relationship formation... Furthermore, having sex with an ex may be problematic because former partners can have difficulty moving on from an old relationship or building new romantic attachments."**

Emotional Intelligence Mapped in Brain: Study of Vietnam Veterans With Combat-Related Brain Injuries

Jan. 22, 2013 — A new study of 152 Vietnam veterans with combat-related brain injuries offers the first detailed map of **the brain regions that contribute to emotional intelligence -- the ability to process emotional information and navigate the social world.** The study found **significant overlap between general intelligence and emotional intelligence,** both in terms of behavior and in the brain. **Higher scores on general intelligence tests corresponded significantly with higher performance on measures of emotional intelligence, and many of the same brain regions were found to be important to both.** The study appears in the journal *Social Cognitive & Affective Neuroscience*.

"This was a remarkable group of patients to study, mainly because it allowed us to determine the degree to which damage to specific brain areas was related to impairment in specific aspects of general and emotional intelligence," said study leader Aron K. Barbey, a professor of neuroscience, of psychology and of speech and hearing science at the Beckman Institute for Advanced Science and Technology at the University of Illinois.

A previous study led by Barbey mapped the neural basis of general intelligence by analyzing how specific brain injuries (in a larger sample of Vietnam veterans) impaired performance on tests of fundamental cognitive processes.

In both studies, researchers pooled data from CT scans of participants' brains to produce a collective, three-dimensional map of the cerebral cortex. They divided this composite brain into 3-D units called voxels. They compared the cognitive abilities of patients with damage to a particular voxel or cluster of voxels with those of patients without injuries in those brain regions. This allowed the researchers to identify brain areas essential to specific cognitive abilities, and those that contribute significantly to general intelligence, emotional intelligence, or both.

They found that specific regions in the frontal cortex (behind the forehead) and parietal cortex (top of the brain near the back of the skull) were important to both general and emotional intelligence. The frontal cortex is known to be involved in regulating behavior. It also processes feelings of reward and plays a role in attention, planning and memory. The parietal cortex helps integrate sensory information, and contributes to bodily coordination and language processing.

"Historically, general intelligence has been thought to be distinct from social and emotional intelligence," Barbey said. The most widely used measures of human intelligence focus on tasks such as verbal reasoning or the ability to remember and efficiently manipulate information, he said.

"Intelligence, to a large extent, does depend on basic cognitive abilities, like attention and perception and memory and language," Barbey said. "But it also depends on interacting with other people. We're fundamentally social beings and our understanding not only involves basic cognitive abilities but also involves productively applying those abilities to social situations so that we can navigate the social world and understand others."

The new findings will help scientists and clinicians understand and respond to brain injuries in their patients, Barbey said, but the results also are of broader interest because they illustrate the interdependence of general and emotional intelligence in the healthy mind.

The study team also included Roberto Colom, of the Universidad Autónoma de Madrid, and Jordan Grafman, now at the Rehabilitation Institute of Chicago. This study was conducted in part at the Walter Reed Army Medical Center in Washington, D.C., with support from the National Institute of Neurological Disorders and Stroke at the National Institutes of Health.

Perfectionism and Eating Disorders: Complex Issue

Jan. 22, 2013 — **Two aspects of perfectionism are involved in body dissatisfaction and the development of eating disorders**, according to a study of over a thousand women published this week in BioMed Central's open access journal, *Journal of Eating Disorders*. **Adaptive perfectionism is high standards driving a person towards achieving a goal body image, and maladaptive perfectionism is concerned with mistakes and other people's opinions. The finding indicates that both are involved in heightened concerns about body image, which in turn places people at risk of developing an eating disorder.**

Over a thousand women representing a cross section of the population (aged 28-40) were involved in this study. They ranged from underweight to morbidly obese, with a BMI of 14 to 64, and overall, the further these women were away from a healthy BMI, the bigger the difference between their current and ideal body images.

While perfectionism is recognized as an important factor in eating disorders, the exact role of perfectionism in perceived body image has been difficult to pin down. Tracey Wade and Marika Tiggemann, from Flinders University, found that **women who desired the lowest BMI and the smallest body size tended to be more concerned about making mistakes, and more worried about organization and higher self doubt than everyone else.**

Prof Tracey Wade explained, **"While some perfectionism is normal and necessary there becomes a point at which it becomes and unhelpful and vicious cycle. Knowing that**

perfectionism of any sort is a risk factor for eating disorders suggests we should tackle 'all or nothing' attitudes with clients, as well as helping them to become less invested in defining their self worth in terms of their ability to achieve high standards.'

Of Course the Tooth Fairy's Real: How Parents Lie in the U.S. and China

Jan. 21, 2013 — **Almost everyone teaches their children that lying is always wrong. But the vast majority of parents lie to their children in order to get them to behave**, according to new research published in the *International Journal of Psychology*. The study by Gail Heyman of the University of California-San Diego and her colleagues found certain variations but generally **similar trends in the way parents from the US and China use the slippery concept of 'truth' to their advantage:**

The percentage of parents who reported lying to their children for the purpose of getting them to behave appropriately was higher in China (98%) than in the U.S. (84%), but rates for other types of lies were similar between the two countries. A possible explanation for this difference is that **Chinese parents are more likely than in the U.S. to demand compliance from their kids, and will go to greater lengths to make it happen.**

Both Chinese and American parents seem to be comfortable lying to their children in order to promote positive feelings, and to support belief in the existence of fantasy characters like the Tooth Fairy. **Parents in both countries reported telling lies about a wide range of similar topics, including ones designed to influence their children's eating habits, or to dissuade children's pleas for toys or treats when shopping!**

Certain specific lies are extremely common among parents in both countries, such as a false threat to abandon a child who refuses to follow the parent while away from home.

There are good reasons however to be cautious about lying to children. Previous studies have shown that **when young children are deciding whom to trust they are sensitive to people's history of being honest or dishonest with them personally, so when parents lie to their children it may undermine the child's sense of trust.**

These findings suggest parents should choose their battles wisely: is it *really* that important for them to finish all their peas? Alternative ways to encourage children to behave -- such as a system of rewards -- might have less risk of confusing them with conflicting ideas about honesty. Above all this study shows the need to stimulate debate about the acceptability of lying under different circumstances, and how children should be best raised to understand the value of honesty.

'Quadruple Helix' DNA Discovered in Human Cells

Jan. 20, 2013 — **In 1953, Cambridge researchers Watson and Crick published a paper describing the interweaving 'double helix' DNA structure -- the chemical code for all life. Now, in the year of that scientific landmark's 60th Anniversary, Cambridge researchers have published a paper proving that four-stranded 'quadruple helix' DNA structures -- known as G-quadruplexes -- also exist within the human genome. They form in regions of DNA that are rich in the building block guanine, usually abbreviated to 'G'.**

The findings mark the culmination of over 10 years investigation by scientists to show these complex structures in vivo -- in living human cells -- working from the hypothetical, through computational modelling to synthetic lab experiments and finally the identification in human cancer cells using fluorescent biomarkers.

The research, published January 20 in *Nature Chemistry* and funded by Cancer Research UK, goes on to show clear links between concentrations of four-stranded quadruplexes and the process of DNA replication, which is pivotal to cell division and production.

By targeting quadruplexes with synthetic molecules that trap and contain these DNA structures -- preventing cells from replicating their DNA and consequently blocking cell division -- scientists believe it may be possible to halt the runaway cell proliferation at the root of cancer.

"We are seeing links between trapping the quadruplexes with molecules and the ability to stop cells dividing, which is hugely exciting," said Professor Shankar Balasubramanian from the University of Cambridge's Department of Chemistry and Cambridge Research Institute, whose group produced the research.

"The research indicates that quadruplexes are more likely to occur in genes of cells that are rapidly dividing, such as cancer cells. For us, it strongly supports a new paradigm to be investigated -- using these four-stranded structures as targets for personalised treatments in the future."

Physical studies over the last couple of decades had shown that quadruplex DNA can form in vitro -- in the 'test tube', but the structure was considered to be a curiosity rather than a feature found in nature. The researchers now know for the first time that they actually form in the DNA of human cells. "This research further highlights the potential for exploiting these unusual DNA structures to beat cancer -- the next part of this pipeline is to figure out how to target them in tumour cells," said Dr Julie Sharp, senior science information manager at Cancer Research UK.

"It's been sixty years since its structure was solved but work like this shows us that the story of DNA continues to twist and turn." The study published January 20 was led by Giulia Biffi, a researcher in Balasubramanian's lab at the Cambridge Research Institute. By building on previous research, Biffi was able to generate antibody proteins that detect and bind to areas in a

human genome rich in quadruplex-structured DNA, proving their existence in living human cells.

Using fluorescence to mark the antibodies, the researchers could then identify 'hot spots' for the occurrence of four-stranded DNA -- both where in the genome and, critically, at what stage of cell division. While quadruplex DNA is found fairly consistently throughout the genome of human cells and their division cycles, a marked increase was shown when the fluorescent staining grew more intense during the 's-phase' -- the point in a cell cycle where DNA replicates before the cell divides.

Cancers are usually driven by genes called oncogenes that have mutated to increase DNA replication -- causing cell proliferation to spiral out of control, and leading to tumour growth. The increased DNA replication rate in oncogenes leads to an intensity in the quadruplex structures. This means that potentially damaging cellular activity can be targeted with synthetic molecules or other forms of treatments.

"We have found that by trapping the quadruplex DNA with synthetic molecules we can sequester and stabilise them, providing important insights into how we might grind cell division to a halt," said Balasubramanian. "There is a lot we don't know yet. One thought is that these quadruplex structures might be a bit of a nuisance during DNA replication -- like knots or tangles that form.

"Did they evolve for a function? It's a philosophical question as to whether they are there by design or not -- but they exist and nature has to deal with them. Maybe by targeting them we are contributing to the disruption they cause." The study showed that if an inhibitor is used to block DNA replication, quadruplex levels go down -- proving the idea that DNA is dynamic, with structures constantly being formed and unformed.

The researchers also previously found that an overactive gene with higher levels of Quadruplex DNA is more vulnerable to external interference. "The data supports the idea that certain cancer genes can be usefully interfered with by small molecules designed to bind specific DNA sequences," said Balasubramanian.

"Many current cancer treatments attack DNA, but it's not clear what the rules are. We don't even know where in the genome some of them react -- it can be a scattergun approach. "The possibility that particular cancer cells harbouring genes with these motifs can now be targeted, and appear to be more vulnerable to interference than normal cells, is a thrilling prospect.

"The 'quadruple helix' DNA structure may well be the key to new ways of selectively inhibiting the proliferation of cancer cells. The confirmation of its existence in human cells is a real landmark."

One Form of Neuron Turned Into Another in Brain

Jan. 20, 2013 — A new finding by Harvard stem cell biologists **turns one of the basics of neurobiology on its head -- demonstrating that it is possible to turn one type of already differentiated neuron into another within the brain.**

The discovery by Paola Arlotta and Caroline Rouaux "tells you that **maybe the brain is not as immutable as we always thought, because at least during an early window of time one can reprogram the identity of one neuronal class into another,**" said Arlotta, an Associate Professor in Harvard's Department of Stem Cell and Regenerative Biology (SCRB).

The principle of direct lineage reprogramming of differentiated cells within the body was first proven by SCRB co-chair and Harvard Stem Cell Institute (HSCI) co-director Doug Melton and colleagues five years ago, when they reprogrammed exocrine pancreatic cells directly into insulin producing beta cells. Arlotta and Rouaux now have proven that neurons too can change their mind. The work is being published on-line Jan. 20 by the journal *Nature Cell Biology*.

In their experiments, Arlotta targeted callosal projection neurons, which connect the two hemispheres of the brain, and turned them into neurons similar to corticospinal motor neurons, one of two populations of neurons destroyed in Amyotrophic Lateral Sclerosis (ALS), also known as Lou Gehrig's disease. To achieve such reprogramming of neuronal identity, the researchers used a transcription factor called Fezf2, which long as been known for playing a central role in the development of corticospinal neurons in the embryo.

What makes the finding even more significant is that the work was done in the brains of living mice, rather than in collections of cells in laboratory dishes. The mice were young, so researchers still do not know if neuronal reprogramming will be possible in older laboratory animals -- and humans. If it is possible, this has enormous implications for the treatment of neurodegenerative diseases.

"Neurodegenerative diseases typically effect a specific population of neurons, leaving many others untouched. For example, in ALS it is corticospinal motor neurons in the brain and motor neurons in the spinal cord, among the many neurons of the nervous system, that selectively die," Arlotta said. "What if one could take neurons that are spared in a given disease and turn them directly into the neurons that die off? In ALS, if you could generate even a small percentage of corticospinal motor neurons, it would likely be sufficient to recover basic functioning," she said.

The experiments that led to the new finding began five years ago, when "we wondered: in nature you never seen a neuron change identity; are we just not seeing it, or is this the reality? Can we take one type of neuron and turn it into another?" Arlotta and Rouaux asked themselves.

Over the course of the five years, the researchers analyzed "thousands and thousands of neurons, looking for many molecular markers as well as new connectivity that would indicate that reprogramming was occurring," Arlotta said. "We could have had this two years ago, but while this was a conceptually very simple set of experiments, it was technically difficult. The work was meant to test important dogmas on the irreversible nature of neurons in vivo. We had to prove, without a shadow of a doubt, that this was happening."

The work in Arlotta's lab is focused on the cerebral cortex, but "it opens the door to reprogramming in other areas of the central nervous system," she said. Arlotta, an HSCI principal faculty member, is now working with colleague Takao Hensch, of Harvard's Department of Molecular and Cellular Biology, to explicate the physiology of the reprogrammed neurons, and learn how they communicate within pre-existing neuronal networks.

"My hope is that this will facilitate work in a new field of neurobiology that explores the boundaries and power of neuronal reprogramming to re-engineer circuits relevant to disease," said Paola Arlotta.

Epigenetics Explains Rheumatism? Genes and Their Regulatory 'Tags' Conspire to Promote Rheumatoid Arthritis

Jan. 20, 2013 — In one of the first genome-wide studies to hunt for both genes and their regulatory "tags" in patients suffering from a common disease, **researchers have found a clear role for the tags in mediating genetic risk for rheumatoid arthritis (RA), an immune disorder that afflicts an estimated 1.5 million American adults.** By teasing apart the tagging events that result from RA from those that help cause it, the scientists say **they were able to spot tagged DNA sequences that may be important for the development of RA.** And they suspect their experimental **method can be applied to predict similar risk factors for other common, noninfectious diseases, like type II diabetes and heart ailments.**

In a report published in *Nature Biotechnology* Jan. 20, the researchers at Johns Hopkins and the Karolinska Institutet say their study **bridges the gap between whole-genome genetic sequencing and diseases that have no single or direct genetic cause.**

Most genetic changes associated with disease do not occur in protein-coding regions of DNA, but in their regulatory regions, explains Andrew Feinberg, M.D., M.P.H., a Gilman scholar, professor of molecular medicine and director of the Center for Epigenetics at the Johns Hopkins University School of Medicine's Institute for Basic Biomedical Sciences. **"Our study analyzed both and shows how genetics and epigenetics can work together to cause disease," he says.**

Rheumatoid arthritis is a debilitating disease that causes inflammation, stiffness, pain and disfigurement in joints, especially the small joints of the hands and feet. It is thought to be an

autoimmune disease, meaning that the body's immune system attacks its own tissues, an assault led primarily by white blood cells. According to Feinberg, several DNA mutations are known to confer risk for RA, but **there seem to be additional factors that suppress or enhance that risk. One probable factor involves chemical "tags" that attach to DNA sequences, part of a so-called epigenetic system that helps regulate when and how DNA sequences are "read," how they're used to create proteins and how they affect the onset or progress of disease.**

To complicate matters, Feinberg notes, **the attachment of the tags to particular DNA sequences can itself be regulated by genes.** "The details of what causes a particular sequence to be tagged are unclear, but it seems that **some tagging events depend on certain DNA sequences.** In other words, those tagging events are under genetic control," he says. **Other tagging events, however, seem to depend on cellular processes and environmental changes, some of which could be the result, rather than the cause, of disease.**

To tease apart these two types of tagging events, the researchers catalogued DNA sequences and their tagging patterns in the white blood cells of more than 300 people with and without one form of RA.

The team then began filtering out the tags that did not appear to affect RA risk. For example, if tags were seen on the same DNA sequence in those with and without RA, it was assumed that the tags at those sites were irrelevant to the cause or development of the disease. Then, from among the RA-relevant tags, they narrowed in on tags whose placement seemed to be dependent on DNA sequence. Finally, they made sure that the DNA sequences identified were themselves more prevalent in patients with RA. In this way, they created a list of DNA sequences associated with altered DNA tagging patterns, both of which were associated with RA.

Ultimately, the team identified 10 DNA sites that were tagged differently in RA patients and whose tagging seemed to affect risk for RA. Nine of the 10 sites were within a region of the genome known to play an important role in autoimmune diseases, while the 10th was on a gene that had never before been associated with the disease. "Since RA is a disease in which the body's immune system turns on itself, current treatments often involve suppressing the entire immune system, which can have serious side effects," Feinberg says. "The results of this study may allow clinicians to instead directly target the culpable genes and/or their tags."

"Our method allows us to predict which tagging sites are most important in the development of a disease. In this study, we looked for tagging sites under genetic control, but similar tags can be triggered by environmental exposures, like smoking, so there are many applications for this type of work," says Yun Liu, Ph.D., a lead researcher on the project.

The study also may shed light on how evolution works, explains Feinberg. "It seems that natural selection might not simply be selecting for an individual's current fitness level but also for the adaptability of future generations given an unknown future. We think that certain genetic sequences may be biologically beneficial and conserved over time because they increase the amount of variation found in tagging patterns, giving individuals a greater chance of adapting to environmental changes."

Other authors of the report include Martin J. Aryee, M. Daniele Fallin, Arni Runarsson and Margaret Taub of the Johns Hopkins University School of Medicine; and Leonid Padyukov, Espen Hesselberg, Lovisa Reinius, Nathalie Acevedo, Marcus Ronninger, Lementy Shchetynsky, Annika Scheynius, Juha Kere, Lars Alfredsson, Lars Klareskog and Tomas J. Ekström of the Karolinska Institutet, Sweden.

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Surprising Connections Between Our Well-Being and Giving, Getting, and Gratitude

Jan. 19, 2013 — We all know that getting a good night's sleep is good for our general health and well-being. But new research is highlighting a more surprising benefit of good sleep: more feelings of gratitude for relationships.

"A plethora of research highlights the importance of getting a good night's sleep for physical and psychological well-being, yet in our society, people still seem to take pride in needing, and getting, little sleep," says Amie Gordon of the University of California, Berkeley. "And in the past, research has shown that gratitude promotes good sleep, but our research looks at the link in the other direction and, to our knowledge, is **the first to show that everyday experiences of poor sleep are negatively associated with gratitude toward others -- an important emotion that helps form and maintain close social bonds.**"

Social psychologists are increasingly finding that **"prosocial" behavior -- including expressing gratitude and giving to others -- is key to our psychological well-being.** Even how we choose to spend our money on purchases affects our health and happiness. And children develop specific ways to help others from a very young age. Gordon and other researchers will be presenting some of these latest findings at the Society for Personality and Social Psychology (SPSP) annual meeting January 19 in New Orleans.

Sleeping to feel grateful

A large body of research has documented that people who experience gratitude are happier and healthier. In three new studies, Gordon and Serena Chen, also of the the University of California, Berkeley, explored how poor sleep affects people's feelings of gratitude.

In the first study, people who experienced a poor night's sleep were less grateful after listing five things in life for which they were appreciative than were people who had slept well the night before. The researchers adapted the Pittsburgh Sleep Quality Index, which measures sleep quality and number of hours slept, among other variables, to evaluate the previous night's sleep.

In the second study, participants recorded their sleep from the previous night for two weeks and their feelings of gratitude. The researchers found a decline in gratitude associated with poor sleep, and those participants reported feeling more selfish those days.

The final study looked at heterosexual couples and found that people tend to feel less grateful toward their romantic partners if either they or their partners generally sleep poorly. "In line with this finding, people reported feeling less appreciated by their partners if they or their partner tends to sleep poorly, suggesting that the lack of gratitude is transmitted to the partner," Gordon says.

"Poor sleep is not just experienced in isolation," Gordon says. "Instead, it influences our interactions with others, such as our ability to be grateful, a vital social emotion."

Giving away money to feel wealthy

Just as expressing gratitude confers benefits, so too does giving to others. New research shows that people all around the world -- from Canada to Uganda, from South Africa to India -- derive more happiness from spending money on others than they do on themselves.

"For the first time, we show that giving away money or spending it on others confers the ironic psychological benefit of increasing the giver's sense of wealth," says Michael Norton of Harvard Business School and co-author with Elizabeth Dunn of the University of British Columbia of the upcoming book *Happy Money: The Science of Smarter Spending*. In a suite of new, not-yet published, studies, Norton and colleagues showed that charitable giving makes people feel wealthier.

This research follows on other recent work published in *Psychological Science* by Norton and colleagues that shows that giving time to others -- from helping with homework to shoveling a neighbors' driveway -- actually makes people feel that they have more time. "In fact, giving time away alleviates people's sense of time famine even more than receiving unexpected windfalls of free time."

That people feel wealthier from spending money on others may explain why poor individuals tend to give away a higher fraction of their income than members of the middle class do. In one study, researchers reported that Americans earning less than \$20,000 a year give a higher percentage of their income to charity than others earning up to \$300,000 a year.

"Our results suggest when the poor give money away, that very act might mitigate their feelings of poverty," Norton says. "More broadly than this specific benefit, our investigation contributes to the growing body of research documenting the benefits of prosocial behavior, which include greater happiness, reduced mortality, and better immune function."

Buying experiences to feel happy

In related research, psychologists are finding that spending money on experiential purchases, such as vacations, concerts, and meals out, tends to bring us more happiness than material

purchases, such as clothing, jewelry, or electronic gadgets. Amit Kumar and Thomas Gilovich of Cornell University are investigating one potential explanation for this difference: that experiences prompt storytelling more than possessions do.

In new research, they asked participants to recall either a significant experiential purchase or a significant material purchase. They then asked them how much they had talked about the purchase they recalled, and questions related to the satisfaction they derived from their purchase. Participants rated a higher satisfaction for experiences than for possessions, which was because they were more likely to talk about the experiences with other people.

In another experiment, the researchers measured what happens when people cannot talk about their purchases. They asked participants if they would be willing to pay a price to be able to talk about a beach vacation (experiential purchase) or an electronic good (material purchase). "Participants were more likely to switch from a better purchase that they could not talk about to a lesser purchase that they could talk about in the experiential condition than in the material one," Kumar says.

"Well-being is likely to be enhanced by shifting the balance of spending in our consumer society away from material goods and towards experiential ones," Kumar says. "This research also suggests that there are benefits to be had not only by nudging people to choose experiences over possessions, but also by encouraging people to share stories about their experiences."

Knowing what is best to help others

The roots for how we give to others form at a very young age. Children, it turns out, are very sophisticated givers -- not only coming to someone's aid when needed but also coming up with the best strategy for doing so, often independent of an adult's instruction.

In new research, Kristina Olson of Yale University and Alia Martin have found that children often will act, thinking they know better than others what is best for them or others. In a series of experiments, the researchers investigate whether 3-year-old children will help someone by ignoring the specific request and instead offering a better alternative.

In one study, for example, when an experimenter asks the child for a specific marker, but the child knows that marker does not work, the child will instead offer up a better marker. In another study, a pre-recorded child asks the child participant to give her a piece of chocolate via a tube that supposedly connects them. If the participant knows that chocolate makes the other child sick, the participant will decide to give her fruit snacks instead.

"Perhaps most provocatively, children will selectively decide not to help in this way if they don't like the person," Olson says. "For example, if an experimenter has previously been mean, children won't warn the adult of a potential harm -- such as something sharp in the container they are reaching in -- but will if the experimenter was not mean."

"These results suggest that children are able to help adults and peers already by the preschool years in rather complex ways, even when the beneficiary is misguided about what he or she

wants," Olson says. "Children don't just blindly do as they are requested, but rather consider a person's goal and consider alternative possible ways to achieve that goal."

Loneliness, Like Chronic Stress, Taxes the Immune System, Researchers Find

Jan. 19, 2013 — New research links loneliness to a number of dysfunctional immune responses, suggesting that **being lonely has the potential to harm overall health.**

Researchers found that **people who were more lonely showed signs of elevated latent herpes virus reactivation and produced more inflammation-related proteins in response to acute stress than did people who felt more socially connected.**

These proteins signal the presence of inflammation, and chronic inflammation is linked to numerous conditions, including coronary heart disease, Type 2 diabetes, arthritis and Alzheimer's disease, as well as the frailty and functional decline that can accompany aging.

Reactivation of a latent herpes virus is known to be associated with stress, suggesting that loneliness functions as a chronic stressor that triggers a poorly controlled immune response.

"It is clear from previous research that poor-quality relationships are linked to a number of health problems, including premature mortality and all sorts of other very serious health conditions. And people who are lonely clearly feel like they are in poor-quality relationships," said Lisa Jaremka, a postdoctoral fellow at the Institute for Behavioral Medicine Research at Ohio State University and lead author of the research.

"One reason this type of research is important is to understand how loneliness and relationships broadly affect health. The more we understand about the process, the more potential there is to counter those negative effects -- to perhaps intervene. If we don't know the physiological processes, what are we going to do to change them?"

The results are based on a series of studies conducted with two populations: a healthy group of overweight middle-aged adults and a group of breast cancer survivors. The researchers measured loneliness in all studies using the UCLA Loneliness Scale, a questionnaire that assesses perceptions of social isolation and loneliness.

Jaremka will present the research January 19 at the Society for Personality and Social Psychology annual meeting in New Orleans.

The researchers first sought to obtain a snapshot of immune system behavior related to loneliness by gauging levels of antibodies in the blood that are produced when herpes viruses are reactivated.

Participants were 200 breast cancer survivors who were between two months and three years past completion of cancer treatment with an average age of 51 years. Their blood was analyzed for the presence of antibodies against Epstein-Barr virus and cytomegalovirus.

Both are herpes viruses that infect a majority of Americans. About half of infections do not produce illness, but once a person is infected, the viruses remain dormant in the body and can be reactivated, resulting in elevated antibody levels, or titers -- again, often producing no symptoms but hinting at regulatory problems in the cellular immune system.

Lonelier participants had higher levels of antibodies against cytomegalovirus than did less lonely participants, and those higher antibody levels were related to more pain, depression and fatigue symptoms. No difference was seen in Epstein-Barr virus antibody levels, possibly because this reactivation is linked to age and many of these participants were somewhat older, meaning reactivation related to loneliness would be difficult to detect, Jaremka said.

Previous research has suggested that stress can promote reactivation of these viruses, also resulting in elevated antibody titers. "The same processes involved in stress and reactivation of these viruses is probably also relevant to the loneliness findings," Jaremka said. "Loneliness has been thought of in many ways as a chronic stressor -- a socially painful situation that can last for quite a long time."

In an additional set of studies, the scientists sought to determine how loneliness affected the production of proinflammatory proteins, or cytokines, in response to stress. These studies were conducted with 144 women from the same group of breast cancer survivors and a group of 134 overweight middle-aged and older adults with no major health problems.

Baseline blood samples were taken from all participants, who were then subjected to stress -- they were asked to deliver an impromptu five-minute speech and perform a mental arithmetic task in front of a video camera and three panelists. Researchers followed by stimulating the participants' immune systems with lipopolysaccharide, a compound found on bacterial cell walls that is known to trigger an immune response.

In both populations, those who were lonelier produced significantly higher levels of a cytokine called interleukin-6, or IL-6, in response to acute stress than did participants who were more socially connected. Levels of another cytokine, tumor necrosis factor-alpha, also rose more dramatically in lonelier participants than in less lonely participants, but the findings were significant by statistical standards in only one study group, the healthy adults.

In the study with breast cancer survivors, researchers also tested for levels of the cytokine interleukin 1-beta, which was produced at higher levels in lonelier participants. When the scientists controlled for a number of factors, including sleep quality, age and general health measures, the results were the same. "We saw consistency in the sense that more lonely people in both studies had more inflammation than less lonely people," Jaremka said.

"It's also important to remember the flip side, which is that people who feel very socially connected are experiencing more positive outcomes," she said.

When Mom Is CEO at Home, Workplace Ambitions Take a Back Seat

Jan. 18, 2013 — **When mom is the boss at home, she may have a harder time being the boss at work.** New research suggests that **women, but not men, become less interested in pursuing workplace power when they view that they are in control of decision-making in the home. This shift in thinking affects career choices without women even being aware.**

"Women don't know that they are backing off from workplace power because of how they are thinking about their role at home," says Melissa Williams of Emory University. "As a result, women may make decisions such as not going after a high-status promotion at work, or not seeking to work full time, without realizing why," explains Williams who will be presenting her findings on January 18 at the Society of Personality and Social Psychology (SPSP) annual meeting in New Orleans.

Her new study is one of several at the SPSP meeting that will explore a continued gender gap in workplace power -- from how women versus men view their roles in the home to how gender stereotypes form at a young age to how these attitudes affect women's likelihood of pursuing careers in science and math. "Even as we see great gains made by women in the workforce, we continue to also see disproportionately larger numbers of women leaving successful careers, or diverting their career paths to ones with fewer hours and greater flexibility, but that also hold less status," says Bernadette Park of the University of Colorado Boulder.

When women rule at home

We often speak about women as being decision-making experts or powerholders in the home setting -- for example, expecting that men will defer to their wives' decisions regarding clothing. But while people intend these references to be complimentary to women, Williams says, "such language may have a negative effect on the decisions they make about their lives outside the home, without them being aware of it."

To test this effect, Williams and colleagues first surveyed people to gauge their views of power in household decisions-making. Both men and women perceived power over household decisions as being desirable and making a person feel powerful.

They then asked men and women aged 18 to 30 years old to imagine that they were married and had a child in one of three conditions: either they make many of the decisions; they make decisions together with their spouse; or they perform most of the household tasks with no mention of household decision-making power. Women were less interested in pursuing work goals when they had household power, compared to sharing equal power with a spouse. Men's interest in work goals, however, was unaffected by their household power.

Also, women's interest in workplace power did not change simply by imagining that they were performing household tasks. "It is only when such tasks are described as involving power that

they negatively affect women's motivation to pursue workplace power," Williams says. "We think this is because referring to women's household role as one involving power puts a positive spin on women's traditional role on the home, and makes it seem more appealing."

"It is one thing for a woman to choose to stay at home if she wishes her primary role be that of wife and mother," Williams says. "But when the language we use to talk about household chores makes such a role unconsciously more appealing to women, without the same effect on men, this is not what most people think of as making a free choice."

When mom and worker collide

Women have some even more basic obstacles to overcome when working at both home and in the workplace. According to new study, women experience conflict in managing their identities as a parent and a worker at the same time, much more so than men.

"The basic premise of this research is that cultural stereotypes of the 'ideal mom' conflict with stereotypes of the 'ideal worker' and in particular the 'ideal professional,' says Park of the University of Colorado Boulder. "In contrast, for men, successfully fulfilling the role of professional in part also fulfills obligations associated with the 'ideal dad,'" such as being a provider and being decisive. "For women, the identities of mom and professional are experienced in opposition or conflict with one another in a way that dad and professional are not for men."

Park and colleagues measured how easily women and men associate themselves with career versus family goals through a series of "implicit" association tests that measure how quickly people categorize words within the two goal domains. They found that women often had to "switch hats" in thinking about parenting versus work, while men primarily associated themselves with just work.

They also found that women performed more poorly on cognitive tasks after experiencing shifts in how they associate with these two identities, but not before. Men showed no such depletion of cognitive capacities. The researchers further found that when women received negative feedback related to a career-related task, they would more strongly "activate" their identity as a parent, "as if easing the sting of the failure," Park says.

The data together suggest that "one of the greatest challenges faced by women in trying to 'have it all' is that they experience a psychological conflict in their most basic identities not true of men," Park says. "Mentally, they have to shift back and forth between self-conceptions of self-as-mom versus self-as-professional and these two selves do not reside easily next to each other."

When children follow what you do not what you say

Even when women work full-time, they often still shoulder a disproportionate amount of domestic responsibilities at home. This division of labor can fundamentally change how children view their gender roles, even if parents teach their children to be egalitarian, according to new research.

"When it comes to learning gender roles, actions and implicit attitudes might speak louder than words," says Toni Schmader of the University of British Columbia. "Parents pride themselves on teaching their kids that they can be anything they want to be. However, parents' own behavior and entrenched cultural associations continue to reinforce more traditional gender roles."

Looking at male and female children between the ages of 7 and 13 and dads and moms, all in heterosexual cohabiting relationships, the researchers, led by Schmader and graduate student Alyssa Croft, tested implicit attitudes toward men and women in the workplace versus home. They also asked their parents about their paid work hours and relative contribution to domestic tasks at home and asked children about preferences for gender-stereotypical toys, shows, and future roles or occupations.

The researchers found that regardless of whether parents explicitly endorsed gender-egalitarian roles, if their actual behaviors modeled a more traditional division of household labor, their children -- especially their daughters -- preferred more gender-typical toys, TV shows, and future occupations.

They also found that women performed more of the domestic tasks at home, even after controlling for fewer hours spent at work compared to men. "Looking specifically at parents who work full-time, we saw that women still reported doing nearly twice as much of the domestic work as men do," Schmader says. "In line with these trends, both parents and kids tended to associate women more than men with childcare and domestic work."

And they found that fathers' stereotypical beliefs and behavior are particularly important for their daughters' identities. "Girls might develop ideas of what is possible for them by the kind of roles their fathers seem to expect from women in general and their moms more specifically," Schmader says.

When girls see a new image of science

Where we often see the largest under-representation of women is in the area of science, technology, engineering and math (STEM). In a new study, making girls feel welcome in computer science and changing their stereotypes about the subject dramatically increased their interest in the field.

"Adolescence is a critical stage at which to recruit more females into these fields as they begin to make career-relevant decisions, yet gender differences in attitudes toward computing are already evident during this period," says Sapna Cheryan of the University of Washington. Therefore, Cheryan and colleagues sought to change prevailing cultural stereotypes of computer scientists to see how it affected young women.

They showed high-school students photos of two introductory computer science classrooms, one that contained highly stereotypical objects (e.g., Star Trek posters) and one that did not (e.g., nature posters). They told students that both courses covered the same material, had the same amount of homework, a male teacher, and a 50:50 gender proportion. Students rated their interest and their "sense of belonging" in both courses. With a stereotypical classroom, the girls' interest

in the course was lower than the boys' interest, but with the non-stereotypical class, it increased to the same level. Boys' interest did not change as a result of the stereotypes.

Such a low-cost approach for countering stereotypes of science as geeky and male-oriented can increase girls' sense of belonging and get them more interested in this field without harming boys in the process, Cheryan says. "Inspiring girls to enter technological fields is critical for ensuring women's participation in, and contributions to, cutting-edge technological innovation."

Powerful People Better at Shaking Off Rebuffs, Bonding With Others

Jan. 18, 2013 — **Employees often tiptoe around their bosses for fear of offending them.** But new research from the University of California, Berkeley, shows **people in power have thicker skin than one might think.** A UC Berkeley study has found that **people in authority positions -- whether at home or in the workplace -- are quicker to recover from mild rejection, and will seek out social bonding opportunities even if they've been rebuffed.**

"Powerful people appear to be better at dealing with the slings and arrows of social life, they're more buffered from the negative feelings that rejection typically elicits," said Maya Kuehn, a doctoral student in psychology at UC Berkeley and lead author of the study. She will present her findings on Jan. 18, at the annual conference of the Society for Personality and Social Psychology in New Orleans.

Kuehn and her fellow researchers conducted five experiments that examined power dynamics in workplace and in intimate relationships, focusing on how power influences responses to subtle acts of rejection. A total of 445 men and women between ages 18 and 82 participated in the study.

In one experiment, participants were assigned either high- or low-level positions in a workplace, then told they hadn't been invited to an office happy hour gathering. While low-level employees reported feeling stung by this rejection, the high-power ones were relatively unfazed and more likely to seek out other social bonding activities, such as a hiking club, to improve relations with their coworkers.

In another experiment, participants were told they would be working with someone in either a supervisory or a subordinate role. They corresponded with that person and received feedback that could be perceived as a snub or mild rejection. Those who had been assigned supervisory roles acted with indifference to perceived snubs from their underlings while subordinates took offense to comparable barbs from their bosses.

"When rejected instead of accepted, subordinates reported lower self-esteem and greater negative emotion, but supervisors did not show an adverse reaction to rejection," Kuehn said.

A similar power dynamic played out in an experiment involving romantic partners. Couples were brought into a lab setting and videotaped discussing problem-solving tasks, such as what to do if an airplane they were on crashed in the wilderness. Before these discussions, couples had rated each other in terms of who held the most power in their real-life relationships, and how responsive their partners had been to their needs that day.

The study found that the partners who perceived themselves as less powerful were less positive during the videotaped discussion when working on a solution with their mate. By comparison, the more dominant partners acted more upbeat and worked harder at connecting and getting their mates on their side.

Other co-authors of the study are UC Berkeley psychologists Serena Chen and Amie Gordon.

Good Bacteria in the Intestine Prevent Diabetes, Study Suggests

Jan. 18, 2013 — All humans have enormous numbers of bacteria and other micro-organisms in the lower intestine. In fact our bodies contain about ten times more bacteria than the number of our own cells and these tiny passengers are extremely important for our health. They help us digest our food and provide us with energy and vitamins. These 'friendly' commensal bacteria in the intestine help to stop the 'bad guys' such as *Salmonella* that cause infections, taking hold. Even the biochemical reactions that build up and maintain our bodies come from our intestinal bacteria as well as our own cells.

Pretty important that we get along with these little bacterial friends... definitely. But as in all beautiful relationships, things can sometimes turn sour. **If the bacteria in the intestine become unbalanced, inflammation and damage can occur at many different locations in the body.** The best known of these is the intestine itself: **the wrong intestinal bacteria can trigger Crohn's disease and ulcerative colitis. The liver also becomes damaged when intestinal bacteria are unbalanced.**

Research groups led by Professor Jayne Danska at the Sick Children's Hospital of the University of Toronto and Professor Andrew Macpherson in the Clinic for Visceral Surgery and Medicine at the Inselspital and the University of Bern have now shown that the influence of **the intestinal bacteria extends even deeper inside the body to influence the likelihood of getting diabetes.** In children and young people, **diabetes is caused by the immune cells of the body damaging the special cells in the pancreas that produce the hormone insulin.**

By chance, 30 years ago, before the development of genetic engineering techniques, Japanese investigators noticed that a strain of NOD laboratory mice tended to get diabetes. These mice (also by chance) have many of the same genes that make some humans susceptible to the disease. With the help of the special facilities of the University of Bern and in Canada, these teams have been able to show that the **intestinal bacteria, especially in male mice, can produce biochemicals and hormones that stop diabetes developing.**

Diabetes in young people is becoming more and more frequent, and doctors even talk about a diabetes epidemic. This increase in diabetic disease has happened over the last 40 years as our homes and environment have become cleaner and more hygienic. At the moment, once a child has diabetes, he or she requires life-long treatment.

"We hope that our new understanding of how intestinal bacteria may protect susceptible children from developing diabetes, will allow us to start to develop new treatments to stop children getting the disease," says Andrew Macpherson of the University Bern.

How Repeated Aggression Triggers Social Aversion in Mice

Jan. 18, 2013 — **One of the mechanisms involved in the onset of stress-induced depression** has been highlighted in mice by researchers from CNRS, Inserm and UPMC (1). They have determined **the role of the corticosterone (stress hormone) receptor, in the long-term behavioral change triggered by chronic stress.** In mice subject to repeated aggressions, **this receptor participates in the development of social aversion by controlling the release of dopamine (2), a key chemical messenger. If this receptor is blocked, the animals become "resilient": although anxious, they overcome the trauma and no longer avoid contact with their fellow creatures.** This work is published in *Science* on 18 January 2013.

In vertebrates, **stress triggers a rapid release of glucocorticoid hormones, corticosterone in rodents and cortisol in humans.** This hormone **modifies the expression of numerous genes in such a way that the individual can best respond to the cause of stress.** However, **chronic or excessive stress can lead to depression, anxiety and social behavioral difficulties.**

Understanding the mechanisms involved is an important challenge in the treatment of stress-related psychiatric illnesses.

The researchers already suspected that **the emergence of depressive symptoms caused by stress brought into play not only the stress hormone but also the dopamine neurons releasing this neurotransmitter,** which is vital in controlling mood. To better understand this interdependence, the researchers subjected a group of mice to repeated attacks by stronger, aggressive congeners. After about ten days, the mice showed signs of anxiety and strong social aversion. In fact, when faced with a new congener, the aggressed mice preferred to avoid any contact. This social aversion is considered as a marker of depression.

The researchers repeated the experiment, but this time with various mouse strains in which the corticosterone receptor was absent in certain populations of neurons. In this way, they discovered that mice without this receptor in dopamine-sensitive neurons did not develop social aversion. Although anxious following repeated attacks, they did not however avoid contact with their fellow creatures. These rodents were thus more "resilient," in other words more resistant to stress, than "wild" mice.

In response to an aggression, a release of dopamine is always observed. However, scientists have noticed that, in mice without the corticosterone receptor in dopamine-sensitive neurons, this release is considerably reduced. In normal mice, dopamine-sensitive neurons thus control the release of this neurotransmitter through a feedback mechanism. In order to show that this release of dopamine triggers the development of social aversion, the researchers blocked the activity of dopamine-producing neurons. As a result, interest in congeners was restored in mice subject to aggression. Dopaminergic activity is therefore crucial for the appearance of social aversion.

This study shows the important role of the stress hormone in the onset of social aversion induced by repeated traumas. More generally, it partially reveals the neurobiological mechanisms and the cascade of reactions that underlie the onset of depression. These results could lead to new therapeutic prospects for treating depression by revealing alternative targets for medicines, particularly with regard to the dopaminergic system.

(1) More precisely, this work was conducted by a team from the laboratory "Physiopathologie des Maladies du Système Nerveux Central" (CNRS/Inserm/UPMC), in collaboration with the laboratory "Neurobiologie des Processus Adaptatifs" (CNRS/UPMC)

(2) Dopamine is a neurotransmitter, in other words a substance that modulates the activity of neurons in the brain.

How the Brain Copes With Multi Tasking Alters With Age

Jan. 18, 2013 — **The pattern of blood flow in the prefrontal cortex in the brains alters with age during multi-tasking**, finds a new study in BioMed Central's open access journal BMC Neuroscience. **Increased blood volume**, measured using oxygenated haemoglobin (Oxy-Hb) **increased at the start of multitasking in all age groups. But to perform the same tasks, healthy older people had a higher and more sustained increase in Oxy-Hb than younger people.**

Age related changes to the brain occur earliest in the prefrontal cortex, the area of the brain associated with memory, emotion, and higher decision making functions. It is changes to this area of the brain that are also associated with dementia, depression and other neuropsychiatric disorders. Some studies have shown that **regular physical activity and cognitive training can prevent cognitive decline** (use it or lose it!) but to establish what occurs in a healthy aging brain researchers from Japan and USA have compared brain activity during single and dual tasks for young (aged 21 to 25) and older (over 65) people.

Near infrared spectroscopy (NIRS) measurements of Oxy-Hb showed that blood flow to the prefrontal cortex was not affected by the physical task for either age group but was affected by the mental task. For both the young and the over 65s the start of the calculation task coincided with an increase in blood volume which reduced to baseline once the task was completed.

The main difference between the groups was only seen when performing the physical and mental tasks at the same time - older people had a higher prefrontal cortex response which lasted longer than the younger group.

Hironori Ohsugi, from Seirei Christopher University, and one of the team who performed this research explained "From our observations during the dual task it seems that the older people turn their attention to the calculation at the expense of the physical task, while younger people are able to maintain concentration on both. Since our subjects were all healthy it seems that this requirement for increased activation of the prefrontal cortex is part of normal decrease in brain function associated with aging. Further study will show whether or not dual task training can be used to maintain a more youthful brain."

Botox Beats Steroids for Painful Foot Condition, Plantar Fasciitis, Study Suggests

Jan. 17, 2013 — **Plantar fasciitis is the most frequent cause of chronic heel pain, leaving many sufferers unable to put their best foot forward for months at a time. Now a Mexican study suggests that physicians should turn to Botox rather than steroids to offer patients the fastest road to recovery.** The research appears in the journal *Foot & Ankle International*.

Plantar fasciitis results when connective tissues on the sole of the foot, the plantar fascia, become painfully inflamed. Physicians may suggest various therapies for this condition, including applying steroids, regular stretching exercises or injecting botulinum toxin A (BTX-A), also known as Botox.

Steroid treatment is often used to treat plantar fasciitis, but it can cause complications. In an estimated 2-6 percent of patients, steroid treatment leads to the plantar fascia rupturing. Researchers from the Autonomous University of Nuevo Leon, Mexico devised a trial to compare steroid treatment with the botulinium toxin alternative, which works by blocking the neurotransmitter acetylcholine, weakening the muscles for several months.

The researchers set up a prospective, experimental, randomized, double-blinded, and controlled clinical trial, where patients were treated either with steroids or with Botox for their painful feet. Both groups were shown the same series of physical exercises to help their recovery.

Initially the two patient groups appeared to be recovering at a similar rate. However, the Botox group then took the lead in scores relating to foot pain, function and alignment. After six months, patients who received Botox injections were the clear winners, demonstrating more rapid and sustained improvement than their counterparts on the steroid regime.

"We found that a combination of BTX-A applications into the gastroc-soleus complex and plantar fascia stretching exercises yielded better results for the treatment of plantar fasciitis than intralesional steroids," says the study's corresponding author, Dr. Carlos Acosta-Olivo, adding that the plantar fascia stretching exercises were an important component of successful treatment.

A number of factors contribute towards the likelihood of developing plantar fasciitis, including tight hamstring muscles, or being overweight. The authors suggest incorporating measures of body mass index (BMI) into future studies. This was a relatively small-scale study, with just 36 patients completing the trial. However the results do indicate that given the risk of complications with steroids, Botox along with stretching exercises, could be the treatment of choice for this painful condition.

Understanding Personality for Decision-Making, Longevity, and Mental Health

Jan. 17, 2013 — Extraversion does not just explain differences between how people act at social events. **How extraverted you are may influence how the brain makes choices -- specifically whether you choose an immediate or delayed reward**, according to a new study. The work is part of a growing body of research on the vital role of understanding personality in society.

"Understanding how people differ from each other and how that affects various outcomes is something that we all do on an intuitive basis, but personality psychology attempts to bring scientific rigor to this process," says Colin DeYoung of the University of Minnesota, who worked on the new study. "Personality affects academic and job performance, social and political attitudes, the quality and stability of social relationships, physical health and mortality, and risk for mental disorder."

DeYoung is one of several researchers presenting new work in a special session January 17 about personality psychology at a conference in New Orleans. "DeYoung's research in biology and neuroscience aids in the development of theories of personality that provide explanations for persistent patterns of behavior and experience," says David Funder of the University of California, Riverside, who is the new president of the Society for Personality and Social Psychology (SPSP). "The researchers presenting at this session represent just what personality psychology can achieve and its relevance for important social issues -- from how personality affects health to guidance for the new DSM-5."

Personality to understand neural differences

In the new study, DeYoung and colleagues scanned people in an fMRI and asked them to choose between smaller immediate rewards or larger delayed rewards, for example \$15 today versus \$25 in three weeks. They then correlated their choices and associated brain activity to various personality traits.

They found that extraversion predicts neural activity in a region of the brain called the medial orbitofrontal cortex, which is involved in evaluating rewards. In the task, this region responded more strongly to the possibility of **immediate rewards than to the possibility of delayed rewards.** "This is a brain region where we have previously shown that **extraversion predicts the size of the region, so our new study provides some converging evidence for the importance of sensitivity to reward as the basis of extraversion,**" DeYoung says.

More broadly, DeYoung works on understanding "what makes people tick, by explaining the most important personality traits, what psychological processes those traits represent, and how those processes are generated by the brain," he says. "The brain is an incredibly complicated system, and I think it's impressive that neuroscience is making such great progress in understanding it. Linking brain function to personality is another step in understanding how the brain makes us who we are."

Personality to improve health

Researchers are also finding that **personality influences health over time**. In particular, new lifespan models that measure both personality and health early and late in life, and multiple times in between, are documenting that **health is the result not only of genetics and environmental factors but also of changeable personality characteristics**.

"Personality develops in childhood and is probably most malleable in childhood," says Sarah Hampson of the Oregon Research Institute. **Childhood is when habits first become established, so understanding how differences in personality affect health could point toward positive behaviors that would help children later in life.**

For example in a new study, soon to be published in *Health Psychology*, Hampson and colleagues found that children lower in conscientiousness -- traits including being irresponsible and careless -- had worse health 40 years later, including greater obesity and higher cholesterol. The study builds on past work showing that more conscientious children live longer.

The data come from more than 2,000 elementary school children in Hawaii who received personality assessments in the 1960s. Funded by the National Institute of Mental Health and the National Institute of Aging, researchers were able to complete medical and psychological examinations for 60% of the original group, who, as adults, agreed to further studies starting in 1998. They found that the children rated by their teachers as less conscientious had worse health status as adults, particularly for their cardiovascular and metabolic systems.

The work could point the way to childhood interventions, Hampson says. "Parents and schools shape personality, and this is our opportunity to support the development of conscientiousness -- planfulness, ability to delay gratification, self-control." She adds: "Society depends on such pro-social, self-regulated behavior."

Personality to evaluate mental health care

In the mental health community, researchers have known for some time that personality can greatly influence how patients respond to particular treatments. But until recently, the guidebook for treating mental illnesses -- the Diagnostic and Statistical Manual of Mental Disorders (DSM) -- has not fully incorporated such personality data.

"The influence of personality psychology has increased as it offers tools and methods that are relevant to solving problems in psychiatric classification, such as ways of developing models of

differences among people that are based on data as opposed to clinical speculation," says Robert Krueger of the University of Minnesota, who helped update the soon-to-be-published DSM-5.

"DSM-5 contains a model of personality traits that derives from work in personality psychology and recognizes that specific peoples' personalities can't easily be placed in categorical boxes," he explains. Using this model, a therapist can better tailor treatments for depression, for example, by distinguishing between a patient who is generally agreeable versus one who is typically at odds with other people. "The first person is likely to form a good working relationship with the therapist, whereas the second person is likely to be more challenging and require more effort by taking personality features into account alongside 'particular conditions,'" Krueger says.

The DSM-5 thus shows how personality psychology can be directly applied to mental health issues, Krueger says. "Indeed, DSM-5 may prove to be a watershed moment in the history of psychiatric classification because, more so than ever in the past, its construction was influenced by the methods and findings of personality psychology," Funder says.