



# Beautiful duckling

**For the American coot, looks do matter for nestlings when it comes to getting fed by parents**

5 ANANTHANARAYANAN

In the story, the ugly duckling thrives and grows to be a swan. This, however, is not how it works as little ones need to look good if they want to be fed.

Bruce E Lyon and Daizaburo Shizuk, from the Universities of California, at Santa Cruz, and Nebraska-Lincoln, in a paper in the Proceedings of the Academy of Sciences (PNAS), describe an instance that is the reverse of the ugly duckling, of brightly coloured chicks that are the most likely to grow, and end up as drab and dull, but healthy adults. And along the way, the authors of the paper discover mechanisms behind the colours of these chicks' feathers, according to the order in which they are born.

The American coot, also known as the mud hen, is an ordinary, grey and black, waterside bird, found in North America. A long-standing surprise is that many of the coot's eggs hatch into surprisingly brightly coloured chicks. "American coot babies are among the most ornamented offspring found in nature, sporting vividly orange-red natal plumage, a bright red beak, and other red parts around the face and pate," says the paper in PNAS. What could be the purpose of this feature? Even Charles

Darwin, the paper says, wondered how the appearance of the feature could be understood — it led to no advantage of survival or foraging, nor in mating, as the features did not persist in the adult coot.

The authors of the paper in PNAS note that offspring ornamentation is typically found in birds or animals where young ones need parental care for some time. In the case of the American coot, they observe, parents show distinct preference, at feeding time, for chicks that have the most ornamentation. Why the parent birds show this preference, however, has not been resolved.

In order to understand the context of this parental preference, and to determine whose interest the ornamentation and its effects served, the authors took a close look at how the nature and extent of colouration varied, both within families and between different families. The reason for looking at how colours varied between different families was that the practice of brood parasitism is common among American coots.

Brood parasitism is when birds lay their eggs in the nests of other birds, as a means of promoting their own offspring at the cost of others. If parasitic chicks could manage to receive better attention from their fos-

ter parents by virtue of their bright colours, this could be a driver for colouration to develop.

What is seen in the field, however, is that the chicks that hatch from the earliest eggs are the least brightly coloured — and it is those, early eggs, that the parasitic birds lay in the nests of other birds. As the chicks that emerge from the first eggs that are laid have the least bright colours, and it is the biology of the mother that determines the colouration of the chicks that emerge from the eggs, this rules out the possibility that a mother makes use of colouration to benefit her own chicks, which are born in foster nests.

The fact that it is the later born chicks that are more brightly coloured, however, suggests that colouration could act as a signal of the chicks' age to the parents, to guide a parental strategy of rationing out the nourishment that they bring to the nest. Different aspects of the colours of chicks, and how they fared — the associations between the different colour traits that were found, the relation of the colour and the hatching order and the difference in colouration between parasitic chicks and chicks born in their own nests, were hence studied, based on a survey of 1,431 chicks.

A feature that suggests an expla-

nation of the colouration and the parental behaviour is the fact that the American coot lays many more eggs than the number of chicks that she does or can raise and feed. The coot thus needs to limit the number of chicks that survive and then to see that those that do receive a fair share of the limited food resources.

The American coot usually lays nine to 10 eggs, which hatch, one after another, over the course of two to 11 days. During the first 10 days or so, after the eggs have hatched, the parents show no preference and feed whichever chick that reaches them. The chicks that are born first, from the eggs that were the earliest laid, have a head start and they dominate, grabbing the best of the food the parents bring. The first few days after the last egg has hatched are thus a scramble and period of the greatest chick mortality, and as many as half the chicks perish from starvation.

In about 10 days, however, the parents move in, to equalise the competition — which they do by preferential feeding of last born, brightest coloured chicks, and even hostility towards the older, and stronger chicks. The result is that smaller but brighter coloured chicks start feeding better and they soon catch up with their plainer coloured siblings.

"They start out by creating an unequal playing field, which allows culling the brood, and then they intervene and level the field. The orange plumage seems to be a feature that helps them do that," co-author Bruce Lyon is quoted as saying, in a notice put out by the University of California at Santa Cruz.

The paper describes a strategy of the American coot, to start by producing in plenty what they can without consuming great resources, and then to trim the brood, to leave just the number of chicks that can be supported, to grow into adulthood. This is more efficient than to start by laying a limited number of eggs. This is a small economy, but fewer eggs would lead to less than the optimum number of chicks in a year when food is plentiful. In good years, if there were more eggs to start with, more chicks would be there to survive the first, harsh days.

What the study shows is that unlike devices which chicks maximise their fitness, the feature of juvenile colouration acts as a signal that helps the parents recognise the youngest chicks and implement a process of optimising the fitness of the species, the paper says.

The writer can be contacted at response@simplescience.in

PLUS POINTS

## At a greater risk



There has been a sharp rise in the number of heart attacks during pregnancy in India and Western countries despite improvements in treatment. Cardiac medicine experts, in their different studies, have expressed concern fearing a "delay in pregnancy among women, particularly working women with a history of high cholesterol with a smoking habit and sedentary lifestyle, causes heart attacks while pregnant, giving birth or during the two months following birth."

"Heart attack during pregnancy can severely harm maternal and foetal outcomes. This is an understated global health problem. With the changing landscape of greater acceptance of Western sedentary lifestyle and habits like smoking, the incidence of heart attack in pregnancy is markedly on the rise," said Dr Mohan Mallikarjuna Rao Edupuganti, a US-based doctor who is also a Fellow of the American College of Cardiology and the Royal Australasian College of Physicians, and is quadruple board certified in cardiology, nuclear cardiology, echocardiography and interventional cardiology.

Hormonal changes during pregnancy include a rise in progesterone and changes in the mucopolysaccharide composition of the wall of the coronary blood vessels. Sometimes, this may lead to a degeneration of the tunica media of the coronary blood vessel leading to a condition called spontaneous coronary artery dissection. The blood, instead of flowing into the lumen of the coronary artery, forces its way through the wall. The ineffective circulation leads to a heart attack. SCAD remains the most common cause of heart attack or myocardial infarction in pregnancy.

Atherosclerotic cardiovascular disease is contributory, as is a blood clot. The state of pregnancy changes the physical and chemical properties of blood, making it more sticky and leading to the formation of thrombus. Dr Edupuganti, through his numerous publications in prestigious cardiovascular journals, has raised awareness about these issues. He has used sophisticated imaging technologies like endovascular ultrasound and optical coherence tomography and a panel of biochemical tests (cardiac biomarkers).

Because labour and delivery stress



the heart even more, the chances of heart attack in women with accelerated co-morbidities is elevated. Dr Edupuganti stresses on the immediate identification and appropriate management of this emergent condition, including the use of pharmacologic methods of breaking the clot or percutaneous intervention and stent placement to maintain latency of the coronary vessel. Executive team-based-decisions go a long way in saving the mother and child. Great stress also needs to be placed on maintaining a healthy lifestyle, including maintenance of blood pressure, avoiding tobacco and adoption of a healthy diet.

Dr Edupuganti said that the mode of delivery and timing should take into consideration the gravida's cardiac status for foetal well-being. He has reviewed the safety of thrombolytic and anti-platelet medication given during pregnancy and lactation. He has also made the important observations regarding avoidance of subsequent pregnancies due to the catastrophe brought in by a heart attack during pregnancy.

Diabetes during pregnancy also enhances the risk of accelerated heart diseases and merits efficient management. Such attention is also required in woman with coexistent autoimmune diseases like systemic lupus erythematosus. Psychosocial stress and depression can lead to a condition called Takotsubo cardiomyopathy, leading to the apical ballooning of the heart and severe postpartum cardiac dysfunction.

Being an assistant professor of cardiology at the Oklahoma City Veterans Affairs hospital, Dr Edupuganti has also thrown light on obtaining appropriate drug history in order to accurately identify ischemic and peripartum cardiomyopathy.

"In light of overall improvements in cardiovascular disease prevention and treatment, there has been a sharp increase in heart attacks during pregnancy in India. The reason is that many women are choosing to have children later in life. A woman in her early 40s is at least six to eight times more likely to have the risk of heart attack than a woman in her 20s during pregnancy," said an interventional cardiologist associated with the Institute of Post Graduate Medical Education and Research in Kolkata.

SUBHENDU MAITI

# The healing power of dance

**From depression to Parkinson's disease, the way our body moves has the power to transform our mental states**

ADRIANNA MENDREK

Why do we stop dancing when we grow up? Why do we disconnect and alienate ourselves from the body? It is surprising to me that dance/movement therapy (DMT) is not more popular within the fields of psychology and psychotherapy globally.

For a couple of decades, I devoted my attention as a researcher in behavioural neurobiology and psychiatry almost exclusively to the brain and mental health, neglecting the rest of the body.

I was trained in the late 1990s, the decade of the brain. I have been mesmerised by the complexity of the brain, completely forgetting that it is part of the entire organism, intimately connected and reciprocally interacting with the entire body.

Interestingly, in my personal life my body has played a central role. My way to deal with any mental health problems has been through long walks, dancing and yoga.

This is partly why in the last few years, as a professor in psychology at Bishop's University, I have started incorporating bodywork in my teaching and research, and why I entered a dance/movement therapy training programme in Canada this summer.

**Understanding the body in motion**

Dance/movement therapy goes beyond simply dancing. DMT uses dance and movement to promote

insight, integration and well-being, as well as to diminish undesirable symptoms in various clinical populations.

Unlike mainstream talk therapies, DMT uses the entire body to approach the client primarily on a non-verbal and creative level. The body in motion is both the medium and the message. DMT recognises the moving body as the centre of the human experience, and that body and mind are in constant reciprocal interaction.

Just like with more traditional psychotherapies, DMT can be applied in a wide range of ways. It may involve talking, different types of music or no music at all. It can be done in groups, with individuals or with couples. Therapists sometimes dance with their clients and at other times observe.

A group therapy session may involve a warm-up and check-in as to where we are at emotionally, mentally and physically. It may be followed by the development of a theme, which emerges spontaneously or has been prepared by a therapist (for example, working with difficult emotions). It ends with grounding (reconnecting with our bodies and selves in the present moment) and closure (for example, a gesture, a sound, a word).

All of this is done with our bodies in motion or stillness, but some verbal sharing, journaling, drawing and other elements may be added.

Dance/movement therapy has been around for several decades but it has never become widely popular, possibly due to a lack of well-designed research studies. This has changed and I would like to highlight here a few recent studies supporting the benefits of dance and DMT on emotional regulation, cognitive function and neural plasticity.

**A positive effect on depression**

One of the main reasons people dance is to modify their emotional state; typically, they strive to feel more joy and happiness and to reduce stress and anxiety. Since its inception, dance therapy, similar to somatic psychotherapies, has emphasised the reciprocal

interaction between body and mind, and the ability to regulate emotions via changes in body postures and movements.

The exploration of new movements can evoke novel perceptions and feelings. It may also facilitate seeing a wider range of possibilities in a given situation. Some new or old movement patterns may evoke repressed material and enhance better understanding of oneself and one's environment and history.

One of the most compelling studies supporting this idea examined complex improvised movements, and identified unique sets of movement components that can elicit the feelings of happiness, sadness, fear or anger. The associations between emotions and specific motor components have been used in the past for diagnosis or emotion recognition. This study goes further and proposes specific techniques for modifying emotions.

A recent systematic review of research on dance/movement therapy specifically found it to be effective in the treatment of adults with depression.

**Improvements in Parkinson's disease**

Dance typically involves learning sequences of steps and movements in space, in coordination with music. In other words, it requires substantial physical and cognitive engagement and, as such, it should improve not only muscle tone, strength, balance and coordination, but also memory, attention and visuospatial processing.

While comparing relatively long-term dance interventions (of six and 18 months) to conventional fitness training, several studies have found improvements in attention and verbal memory and neuroplasticity in healthy, older adults. Researchers also found improvements in memory and cognitive function for older adults with mild cognitive impairment after a 40-week dance programme.

In addition, a recent meta-analysis of seven randomised controlled trials



comparing the effects of dance therapy to non-dance interventions in Parkinson's disease found that dance was especially beneficial for executive function, the processes that help us plan, organise and regulate our actions.

**Changes in brain structure**

Dancing engages extensive areas of the cerebral cortex as well as several deep brain structures.

A recent descriptive systematic review included eight well-controlled studies, all of which demonstrated changes in brain structure following dance intervention. These changes included -- increased hippocampal and parahippocampal volume (involved in memory), increased gray matter volume in the precentral gyrus (involved in motor control) and white matter integrity in the corpus callosum (involved in communication between the two hemispheres).

Overall, these studies are compatible with the idea of using dance and DMT in various neurological and psychiatric disorders -- such as Parkinson's disease, Alzheimer's disease and mood disorders -- as well as in the general population.

**New possibilities for feeling and perceiving**

It is clear that dance has a powerful effect on the human body and psyche.

DMT from its inception emphasised that the body is inseparable from, and in constant reciprocal interaction with, the mind. As such, sensations, perceptions, emotions and thinking affect our body and the way we move. By observing the body we can deduce mental states.

Conversely, our posture and movements have the power to transform our mental states, evoke repressed memories, release spontaneity and creativity and reorganise our brains. New ways of moving and dancing may produce new ways of feeling and perceiving the world.

This is one of the most exciting and profound aspects of DMT and it is shocking that the body, movement and dance have been almost entirely ignored by mainstream psychotherapy.

It is time to change that!

The writer is professor, psychology department, Bishop's University, Canada. This article first appeared on www.theconversation.com

