SCIENCE & ENVIRONMENT

How vision loss can affect the brain

A growing body of evidence suggests that when people's brains have to work harder to see, declines in language, memory and attention could follow, writes Jane E Brody

edical practice tends to divide its clients you and me — into specialties defined by body parts: ophthalmology, neurology, gastroenterology, psychiatry and the like. But in fact, the human body doesn't function in silos. Rather, it works as an integrated whole, and what goes awry in one part of the body can affect several others.

I've written about the potential harm of hearing loss to brain health, as well as to the health of our bones, hearts and emotional well-being. Untreated hearing loss can increase the risk of dementia. Even those with slightly less than perfect hearing can have measurable cognitive deficits.

Now, a growing body of research is demonstrating that vision loss can affect the brain's function, too. As with hearing, if the brain has to work extra hard to make sense of what our eyes see, it can take a toll on cognitive function.

The latest study, published in JAMA Network Open in July, followed 1,202 men and women ages 60 to 94 for an average of nearly seven years. All were part of the Baltimore Longitudinal Study of Ageing, and had vision and cognition tests every one to four years between 2003 and 2019.

The researchers found that those who scored poorly on initial tests of visual acuity - how well, for example, they could see the letters on an eye chart from a given distancewere more likely to have cognitive decline over time, including deficits in language, memory, attention and the ability to identify and locate objects in space.

Other vision issues, like with depth perception and the ability to see contrasts, also had deleterious effects on cognitive ability.

The lead researcher, Bonnielin Swenor, an epidemiologist at the Johns Hopkins Wilmer Eye Institute, said that the new study "adds to mounting longitudinal data showing that vision impairment can lead to cognitive decline in older adults.

Correcting poor vision

Lest you think that the relationship is reversed -that cognitive decline impairs vision-another study that Swenor participated in showed that when both functions were considered, vision impairment was two times more likely to affect cognitive decline than the other way around. This study, published in 2018 in JAMA Ophthalmology and led by Diane Zheng from the University of Miami Miller School of Medicine, included 2,520 community-dwelling adults ages 65 to 84, whose vision and cognitive function were periodically tested. She and her



vision as one ages may be an effective way to minimise the decline in cognitive function in older adults.

"When people have vision loss, they change the way they live their lives. They decrease their physical activity and they decrease their social activity, both of which are so important for maintaining a healthy brain," Swenor said. "It puts them on a fast tack to cognitive decline."

But identifying and correcting vision loss early on can help, Zheng said. She suggested regular eye checkups – at least once every two years, and more often if you have diabetes, glaucoma or other conditions that may damage vision. "Make sure you can see well through your glasses," she urged.

Case in point: The cost of a single hip replacement resulting from a vision-impaired fall would exceed the cost of many hundreds of eye exams and needed vision corrections.

There are "vision impairments that glasses won't fix," Swenor said, like age-related mac- 50 years, I've noticed that road barriers that

co-authors concluded that maintaining good ular degeneration and glaucoma. Retinal disease began to compromise Swenor's vision in her mid-20s. Those with problems like hers can benefit from something called low vision rehabilitation, a sort of physical therapy for the eyes that helps visually impaired people adapt to common situations and help them function better in society.

> Swenor, for instance, can see objects in a high-contrast situation, like a black cat against a white fence, but has trouble seeing the difference between similar colours. She can't pour white milk into a white mug without spilling it, for example. Her solution: Use a dark-coloured mug. Finding such accommodations is an ongoing task, but it enables her to continue to function well professionally and socially.

> Society, too, needs to help people with visual impairment function safely outside the home. Most things in hospitals are white, for example, which creates safety hazards for people with diminished contrast sensitivity. As a driver of

used to be the same colour as the road surface are now more often rendered in high contrast colours like orange or yellow, which undoubtedly reduces crashes even for people who can see perfectly.

"We need to create a more inclusive society that accommodates people with vision impairment." Swenor said.

Fostering brain health

People who have trouble with depth perception can also incorporate helpful design features into the home. Placing coloured strips on stair risers, varying textures of furniture and colour-coding objects can all improve the ability to navigate safely. People who can no longer read books may also listen to audiobooks, podcasts or music instead. Swenor said.

The link between visual impairment and cognitive impairment "is not a doomsday message," she added. "There are many ways to foster brain health for people with vision loss.' **The New York Times**





The earth is ellipsoid, almost like an orange: bulged at the centre with an equatorial radius of 6,378 km and flattened at the top and bottom with a polar radius of 6,356 km. Geologists across different national surveying organisations have approximated the shape of the earth, assuming the centre and two radii (major and minor axis) of the earth. The one used widely is called the World Geodetic System 84 (WGS 84) datum.

But the earth's mass is not distributed uniformly, some portions being denser than others. Due to this, the Earth's gravitational pull is not uniform across points equidistant from its physical centre. If the earth were to be completely covered by water, then the top surface of the ocean would not be

at the same distance from the Earth's centre at all places. Then, a water-covered earth would not look like an ellipsoid but like a dented



sphere. Scientists call this shape a geoid. This creates a very interesting situa-

tion for a global mean sea level (MSL) reference to measure altitudes. Locally, the MSL is calculated as the difference between the mean high tide level and the mean low tide level. But sea level according to the geoid model is different!

In the geoid model, the MSL is a surface of the constant gravitational potential. As the geoid is irregularly shaped, the mean sea level is different from that of the physical perception and varies with low and high gravitational potentials. So, in places of low gravity, the ocean surface goes down or there is a 'dent' as compared to the level defined by the reference ellipsoid at that place. For example, if there is a geoid low of 100m, the sea level dips by 100m, implying, the geoid MSL is 100 m closer to the earth's centre. Geologists have observed that the geoid deviates between a maximum of +85m and a minimum of –106m. The North Atlantic Geoid High is near Iceland and the Indian Ocean Geoid Low-IOGL is located south of the Indian peninsula. **Research Matters**

A TRICK UP THEIR WING

Waiting for turtles

Handbook for bird

NURTURE OVER NATURE

Wild and wilful

fyou are looking for literature to introduce your children to the wonders that nature has to offer, a good place to start is perhaps Waiting for Turtles, a book by Pankaj Sekhsaria. The book, published by Karadi Tales — a children's publishing house, aims to raise awareness

about one of the oldest reptiles on the planet turtles.

While the book accomplishes this, it also brings to focus the ecological



diversity of the Andaman and Nicobar Islands, where the book is set. The concepts of ecological diversity, conservation etc are told through the story of a young boy Samrat whose mother is Seema. a sea-turtle researcher. They are both headed to the Tarmugli islands, where they wait for the green sea turtles. The landscape of the island is captured by Vipin Sketchplore. Pankaj Sekhsaria has been a long-time researcher of the Andaman and Nicobar Islands; this is his first children's book.

educators

ntroducing children to nature, among many other things, can encourage observational skills, help calm the mind and generate curiosity about one's surroundings. Birding is an activity that could accomplish the task of getting children to care about the planet and its inhabitants.

To help adults induct children into the often complex world of birdwatching, Mysuru-based Nature Conservation Foundation has come out with a book titled, Handbook for Bird Educators. The book is divided into four



chapters-the first section provides a glimpse into the world of birds, their habits of feeding, mating, migration, some common families of birds and also a list of resources that beginners may need. The sections that follow include activities and games that can be used to engage children and newcomers on birdwalks, evaluation and feedback techniques and follow-up activities

The informative book is interspersed with beautiful illustrations. Put together by Garima Bhatia, Abhisheka Krishnagopal, Suhel Quader, the book is aimed for educators who use nature in their teaching or for those who want to take birdwatching to a larger audience.

ritten by award-winning conservationist Neha Sinha, Wild and Wilful is a collection of 15 essays on India's most iconic animals. The essays, often peppered with tales of encounters with humans, attempts to decipher the complex and conflicting feelings that humans feel for these animals-appreciative of their beauty that manifests as awe and also a fear and wariness when they are forced to share

space with the very animals. Neha Sinha accomplishes this with ease, capturing the grace of animals like leopards, elephants, cobras and tigers with her beautiful prose while also exploring the trauma they are forced to face as human encroachments on nature grow. While exploring the complex topic, the book is not devoid of

humour. The chapter on Rhesus Macaque (or common monkeys), for example, hilariously describes the ordeal of men dressing up as langurs to chase away the burgeoning population of monkeys in the country's capital, even imitating their call. The book has hope too, the Nagas who once killed the Amur Falcons in great numbers are now their protectors, emphasising the need for local solutions to the conflict between humans and animals.

VARSHA GOWDA

SNIPPE<u>TS</u>

Female hummingbirds avoid harassment by looking like males

SABRINA IMBLER

n adult female white-necked Jacobin hummingbird is no stranger to invisible labour. When she lays an egg, the male hummingbird who played an equal role in the conception of said egg is nowhere to be seen. It is only thanks to her hours of weaving that the egg has a nest at all. When her chick hatches, she alone will feed it regurgitated food from her long bill.

And then there is the constant harassment. As the muted-green females visit flowers to sip on nectar, they are chased, pecked at and body-slammed by aggressive males of their species, whose heads are a flamboyant blue.

But some female white-necked Jacobins, which are found from Mexico to Brazil, have a trick up their wing: Instead of garbing themselves in green plumage, they take on bright blue ornamentation and appear essentially identical to male hummingbirds. Scientists



found these male look-alikes avoid harassment directed toward green females, according to a paper in Current Biology.

For the last 50 years, most scientists have relied on the theory of sexual selection, or mate choice, to explain why so many male birds have such foppish traits, such as a peacock's mirage of tail-feathers or a hummingbird's sapphire blue head, said Jay Falk, a postdoctoral researcher and an author of the paper.

But these theories can disintegrate when applied to female birds. which can evolve ornamentation of their own for evolutionary advan-

tages that have nothing to do with seeking male mates.

The white-necked Jacobin weighs as much as a nickel and a penny, and males grow as long as a toilet paper roll. The birds are also hams, often tail-fanning and back flipping to show off.

But their varying colours among females are a long-running mystery.

In 2015, to investigate why the female Jacobins resembled males, Falk went to the town of Gamboa, Panama, one of the hummingbirds' more accessible haunts.

The blue-headed females clearly enjoyed more personal space, but were there other benefits? Falk monitored the feeding behaviours of green females, blue-headed females and blue-headed males using implanted tracking tags. An analysis of 88,000 feeding visits over nine months revealed the blue-headed females visited feeders more frequently and for longer spells of time than green females. NYT

Humans can travel to Mars

ending human travellers to Mars would require scientists and engineers to overcome a range of technological and safety obstacles. One of them is the grave risk posed by particle radiation

from the sun, distant stars and galaxies.

Answering two key questions would go a long way towards overcoming that hurdle: Would particle radiation pose too grave a threat to human life through-

out a round trip to the red planet? And, could the very timing of a mission to Mars help shield astronauts and the spacecraft from the radiation?

In an article published in journal Space Weather, an international team of space scientists answers those two questions with a "no" and a "yes." That is, humans should be able to

safely travel to and from Mars, provided that the spacecraft has sufficient shielding and the round trip is shorter than approximately four years. And the timing of a human mission to Mars would indeed make a difference: The scientists de-

termined that the best time for a flight to leave Earth would be when solar activity is at its peak, known as the solar maximum. ScienceDaily

The grooviest cocoons

dult paper wasps are capa-ble builders, painstakingly mouth-crafting nests out of plant matter and spit. But they start out as larvae that carry out construc-

tion projects of their own. Just before these youngsters begin a metamorphosis into maturity, most paper wasp larvae sequester themselves in special nest compart-

ments with woven seals called cocoon caps, which they make out of silk threads.

the larvae may add a bit of dorm

room flare. The cocoon caps of several paper wasp species fluoresce yellow-green under ultraviolet light and lend the whole nest a groovy glow. This fluorescence, described for

the first time in the Journal of the Royal Society Interface, can be unusually bright: The silk of a species, Polistes brunetus, found in Vietnam's forests, glows three times brighter than the most fluorescent terrestrial animal

previously known. The discovery adds to a growing pantheon of surprising examples of natural fluorescence. NYT

A star collision

completely new type of supernova only theorised before has now been indirectly observed for the first time. Thanks to the Very Large Array Sky Survey, astronomers have found evidence of a star "going boom" prematurely due to a col-

lision with an extremely compact object, either a neutron star or a black hole.

As reported in Science, a merger-triggered core-collapse supernova has been a possibility

for a while but scientists had found no evidence for one. Now, Caltech graduate researcher Dillon Dong and colleagues have established that a very luminous radio source, VT J121001+4959647, was caused by a dead

star crashing into its companion star, causing it to explode early.

The team believes that a long time ago the system consisted of two stars orbiting close to each other. One of the stars went supernova, leaving behind an ex-



tremely compact object, either a black hole or a neutron star. Over time, the two spiralled closer and closer to each other. The compact object ripped layers off the star, creating a big donut of gas around the system and accelerating

their collision. Eventually, the companion hit the star and plunged into its core. This made the star collapse triggering a supernova explosion. IFLScience



There on the cusp of adulthood.