

## Biotech Innovations

### Robots Induce Parkinson Disease Hallucinations

About 50% of patients with Parkinson disease (PD) experience the sensation that someone is nearby when no one is present. Minor hallucinations including these so-called presence hallucinations often appear early in the disease course, manifesting before motor symptoms in as many as a third of patients. What's more, PD hallucinations are associated with psychosis, cognitive decline, and death, making them a potential marker for poor clinical outcomes. Yet because many patients are reluctant to report these hallucinations and physicians may not ask about them, they often go undiagnosed.

Now, a team of researchers in Europe has developed a technique to induce presence hallucinations among patients with PD in a controlled setting. Their [study](#) in *Science Translational Medicine* described using a robot to trigger the hallucinations. As patients repeatedly poked their index finger into a small tabletop robot facing them, a robotic device behind them reproduced the movement, poking them in the back. Robot-induced presence hallucinations were more likely to occur and were more intense when the pokes didn't occur simultaneously. Some patients with PD and presence hallucinations reported that the robot-induced phenomenon resembled what they experience in daily life.

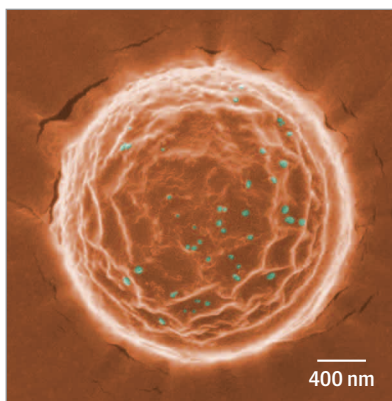
The researchers identified a network of frontotemporal brain regions associated with robotic-induced presence hallucinations among healthy study participants and patients with non-PD neurological conditions who had presence hallucinations. Brain scans at rest showed that patients with PD who experience the hallucinations in their daily lives have altered functional connectivity patterns in this network. Lower functional connectivity in the left frontotemporal network was associated with a lower cognitive score in the study.

Patients with PD and presence hallucinations were more likely to have robot-induced hallucinations and rated their intensity as being stronger than those who don't

routinely experience the phenomenon. If validated in clinical trials, the researchers said the robotic approach might be used to predict patients' disease course.

### "Nanotraps" Designed to Capture and Clear SARS-CoV-2

An interdisciplinary team led by University of Chicago researchers is designing biodegradable nanomedicines to capture and clear the novel coronavirus. The "nanotraps" are dotted with angiotensin-converting enzyme 2 (ACE2) receptors or SARS-CoV-2 neutralizing antibodies that bind the virus and prevent it from infecting cells.



The researchers tested the virus-trapping particles' safety and effectiveness in several experiments. When a SARS-CoV-2 pseudovirus and the nanotraps engineered with antibodies were injected into a healthy human lung in an ex vivo lung perfusion system, tissue sampling confirmed that the particles blocked infection. Both types of nanotraps also blocked human cell line infection with a SARS-CoV-2 pseudovirus.

The researchers incorporated a specific phospholipid into the particles' surface to trigger macrophage immune cells to engulf and clear the virus. To test this, they added Nanotrap-ACE2 to a culture of human lung epithelial cells, pseudovirus, and macrophages. The particles captured the virus and were engulfed by the immune cells, with negligible incorporation into epithelial cells.

Investigational soluble recombinant ACE2 proteins and anti-SARS-CoV-2 neu-

tralizing antibodies haven't been highly potent against the virus. The new nanoparticles were 10 times more effective than soluble neutralizing antibodies at inhibiting authentic SARS-CoV-2 infection in a monkey epithelial cell line. The nanotraps were also found to be safe in both human cell lines and mice.

The results pave the way for clinical trials, the researchers wrote in *Matter*. The nanotraps can be stored in a standard freezer and have the potential to be formulated into a nasal spray or inhaler, an oral or ocular liquid, or an injection.

### Mobile Device App Helps Distinguish Toddlers With Autism

A prototype app reliably distinguished toddlers with autism from those with typical development in a National Institutes of Health-funded [study](#). The app uses a tablet or smartphone's camera to record eye-gaze patterns while children watch short videos on the device.

The study involved 993 patients with an average age of about 21 months who were seen at 4 Duke Children's Primary Care clinics. The kids watched custom-made videos of people in social situations—smiling, making eye contact, and having conversations. Computer vision analysis of the gaze patterns revealed quantifiable differences in how the children visually tracked the social cues, which predicted with high accuracy those who went on to receive an autism spectrum disorder (ASD) diagnosis after traditional screening.

The app is also able to track kids' facial expressions, response to their names, and sensorimotor behaviors that develop in the first year. These behaviors will be combined with gaze patterns to develop a screening tool that is now being tested with infants as young as 6 months.

Writing in *JAMA Pediatrics*, the researchers said they hope the app can "ultimately increase the accuracy, exportability, accessibility, and scalability of ASD screening, allowing improved risk detection and earlier intervention." — Jennifer Abbasi

**Note:** Source references are available through embedded hyperlinks in the article text online.