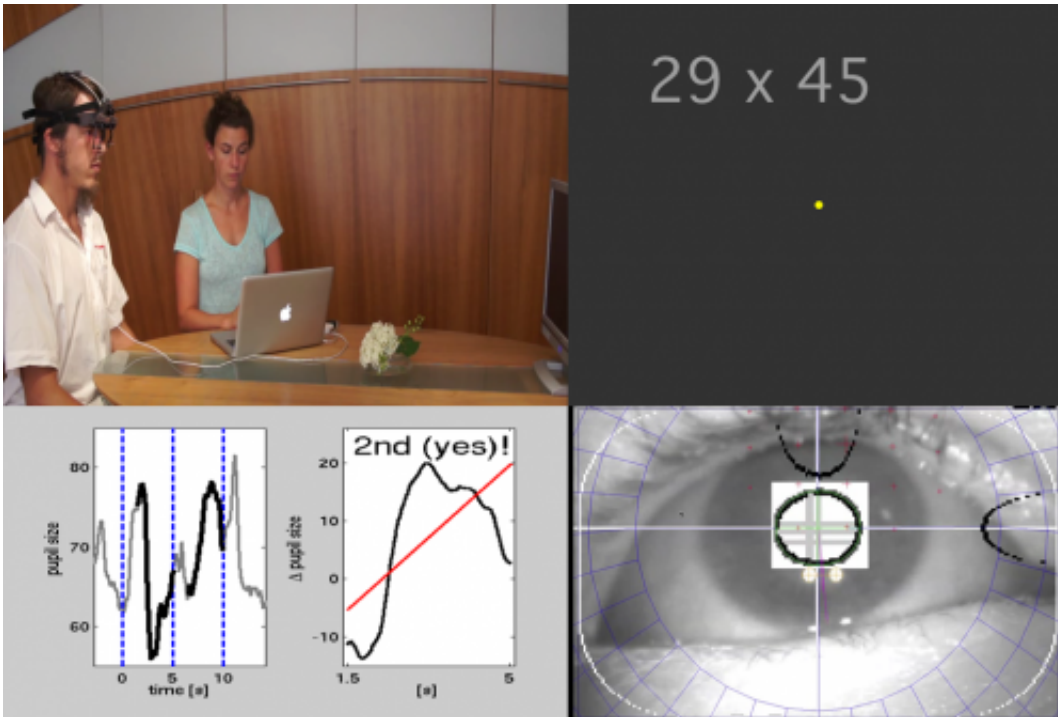


Questions answered with the pupils of your eyes (w/ Video)

August 5 2013



This is a still frame, depicting essentially the final frame of the movie, only that in the upper right the computation is still depicted. Credit: *Current Biology*, Stoll et al.

Patients who are otherwise completely unable to communicate can answer yes or no questions within seconds with the help of a simple system—consisting of just a laptop and camera—that measures nothing but the size of their pupils. The tool, described and demonstrated in

Current Biology, a Cell Press publication, on August 5 takes advantage of changes in pupil size that naturally occur when people do mental arithmetic. It requires no specialized equipment or training at all.

The new pupil response system might not only help those who are severely motor-impaired communicate, but might also be extended to assessing the mental state of patients whose state of consciousness is unclear, the researchers say.

"It is remarkable that a [physiological system](#) as simple as the pupil has such a rich repertoire of responses that it can be used for a task as complex as communication," says Wolfgang Einhäuser of Philipps-Universität Marburg in Germany.

The researchers asked healthy people to solve a [math problem](#) only when the correct answer to a yes or no question was shown to them on a screen. The mental load associated with solving that problem caused an automatic increase in pupil size, which the researchers showed they could measure and translate into an accurate answer to questions like "Are you 20 years old?"

They then tested out their pupil response algorithm on seven "typical" locked-in patients who had suffered [brain damage](#) following a stroke. In many cases, they were able to discern an answer based on pupil size alone.

"We find it remarkable that the system worked almost perfectly in all healthy [observers](#) and then could be transferred directly from them to the patients, with no need for training or parameter adjustment," Einhäuser says.

While the system could still use improvement in terms of speed and accuracy, those are technical hurdles Einhäuser is confident they can

readily overcome. Their measures of pupil response could already make an important difference for those who need it most.

"For patients with altered state of consciousness—those who are in a coma or other unresponsive state—any communication is a big step forward," he says.

More information: *Current Biology* Vol 23 No 15

Provided by Cell Press

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