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In Recognizing Faces, the Whole is Not Greater Than the Sum of Its Parts

How do we recognize a face? To date, most research has answered "holistically": We look at all the features—eyes, nose, mouth—simultaneously and, perceiving the relationships among them, gain an advantage over taking in each feature individually. Now a new study overturns this theory. The researchers—Jason M. Gold and Patrick J. Mundy of the Indiana University and Bosco S. Tjan of the University of Southern California—found that people's performance in recognizing a whole face is no better than their performance with each individual feature shown alone. "Surprisingly, the whole was not greater than the sum of its parts," says Gold. The findings appear in the journal *Psychological Science*, which is published by the [Association for Psychological Science](#).

To predict each participant's best possible performance in putting together the individual features, the investigators used a theoretical model called an "optimal Bayesian integrator" (OBI). The OBI measures someone's success in perceiving a series of sources of information—in this case, facial features—and combines them as if they were using the sources together just as they would when perceiving them one by one. Their score recognizing the combination of features (the whole face) should equal the sum of the individual-feature scores. If the whole-face performance exceeds this sum, it implies that the relationships among the features enhanced the information processing—that is, "holistic" facial recognition exists.

In the first experiment participants were shown fuzzy images of three male and three female faces. Then either one feature—a left or right eye, nose, or mouth—or all four in proper face-like relationships appeared on the screen. That image would disappear and, if they saw an eye, all six eyes would appear; if a whole face, six whole faces. The participants clicked on the feature or face they'd just seen. In a second experiment, the whole-face images were superimposed on face-shaped ovals—in case such context helps holistic recognition, as is often claimed. In both experiments, participants' performance with the whole faces was no better than with the isolated features—and no better than the OBI—indicating that the facial features were not processed holistically when shown in combination.

"The OBI offers a clearly defined mathematical framework for studying what historically has been a rather loosely defined set of concepts," says Gold.

The findings may offer promise in understanding the cognitive disorder prosopagnosia, the inability to recognize faces, and could also help in constructing better face-recognition software for security. But the real value, says Gold, is in basic research. "If you want to understand the complexities of the human mind, then understanding the basic processes that underlie how we perceive patterns and objects is an important part of that puzzle."

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For more information about this study, please contact: Jason M. Gold at jgold@indiana.edu.

The APS journal *Psychological Science* is the highest ranked empirical journal in psychology. For a copy of the article "The Perception of a Face Is No More Than the Sum of Its Parts" and access to other *Psychological Science* research findings, please contact **Lucy Hyde** at 202-293-9300 or lh Hyde@psychologicalscience.org.

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