

Paper wasps punish peers for misrepresenting their might

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This is a portrait of one *Polistes dominulus* paper wasp displaying aggressive behavior. Credit: Elizabeth Tibbetts

Falsely advertising one's fighting ability might seem like a good strategy for a wimp who wants to come off as a toughie, but in paper wasp societies, such deception is discouraged through punishment, experiments at the University of Michigan suggest.

The research, by evolutionary biologists Elizabeth Tibbetts and Amanda Izzo, will be published online Aug. 19 in the journal [Current Biology](#).

Rather than wasting energy by constantly fighting with rivals, many animals use signals that say, in effect, "Don't mess with me; I can whip you." But what's to prevent a weakling from gaining the upper hand by falsely signaling strength?

One explanation for why that doesn't often happen is that phony signalers are punished for their misdeeds. For cheaters to be punished, though, the deception must be detected. So how does an animal know its rival is cheating, and what does it gain by punishing the cheater? Those are questions Tibbetts and Izzo set out to explore, using the paper wasp *Polistes dominulus*, a widespread species that nests on the eaves of houses throughout the U.S. and Europe.

Polistes colonies are founded by females that engage in aggressive contests to determine who will rule the nest. A given wasp's facial pattern is a tipoff to its fighting ability -- dominant wasps have more fragmented facial patterns than subordinate wasps -- and the wasps use these patterns to quickly size up strangers before interacting.

"It's the animal version of a karate belt," said Tibbetts, an assistant professor of ecology and [evolutionary biology](#).



This is a portrait of nine *Polistes dominulus* paper wasps, illustrating the variation in facial patterns that functions as a signal of fighting ability Credit: Elizabeth Tibbetts

In their experiments, Tibbetts and graduate student Izzo altered some wasps' facial patterns with paint to make wimps resemble ruffians, creating a mismatch between appearance and behavior. With another group of wasps, the researchers left facial patterns untouched, but turned wusses into warriors by treating the wasps with a hormone that promotes [aggressive behavior](#). Again, a mismatch resulted: the wasps looked like weaklings but actually were good fighters. A third group of weak wasps had their faces and behavior altered, so they both looked and acted strong.

Each wasp was paired with an unaltered rival it had never met, and their

interactions were observed for two hours. The results were clear: wasps with a mismatch between facial signal and fighting ability were punished, while those whose signal and behavior matched were rarely picked on.

Interestingly, the type of punishment differed, depending on the type of mismatch. Wasps that looked strong but acted weak were treated more aggressively by rivals than were wasps in other treatment groups. Wasps that looked weak but acted strong, on the other hand, experienced little overt aggression, but their rivals refused to submit to them. "So there was still a cost," Tibbetts said. "They had trouble dominating their rivals."

[Wasps](#) that had both facial signal and fighting behavior artificially altered to make them look and act stronger than they originally were suffered neither fate, underscoring the conclusion that it's the mismatch between signal and behavior that provokes punishment.



These are two *Polistes dominulus* wasp queens interacting on their nest. Credit: Elizabeth Tibbetts

In nature, a female wasp's facial pattern reflects its hormonal level (and fighting ability), and the experimental results suggest this relationship is essential for the signaling system to work. The results also provide insight into how aggressive punishment benefits the punisher: When a wasp encounters a rival that looks strong but acts weak, fighting it out is a way of assessing the rival's true nature.

"This is not only costly for the inaccurate signaler, but it also benefits the receiver of the signal by allowing it to attain a higher dominance status than if it trusted the inaccurate signal," Tibbetts said. "In this way, simple self interest can produce behavior that functions as social punishment and maintains signal accuracy over evolutionary time."

But what's the point of having signals if rivals still have to do battle to test each other's true abilities? One explanation is that the receiver's behavior depends on context. In brief interactions over low-value resources, for example, there's little to be lost by trusting a rival's signal, whether or not it's accurate. But in long-term interactions or contests over valuable resources, it pays to challenge rivals and test their signal accuracy.

More information: *Current Biology*: www.cell.com/current-biology/

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