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Speed and accuracy in wasp nestmate recognition: vision and olfaction

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Social insects evolved highly developed recognition systems to accept nestmates but reject alien conspecifics. Chemical communication plays a crucial role in this ability. Recently it was discovered that visual quality signals and individual recognition also play a role in some species of social wasps. In the primitively eusocial wasp *Liostenogaster flavolineata* (Vespidae: Stenogastrinae), individuals differ in their cuticular hydrocarbon profiles according to colony membership and each female also possesses a unique facial pattern. Since both chemical and visual channels mediate the recognition abilities in these wasps, this species represents a model to understand how these senses are integrated during the perceptual processing and the extent to which wasps prioritize one channel over the other to discriminate aliens and nestmates. Here we reveal that although *L. flavolineata* females are able to discriminate between alien and nestmate females using only visual or chemical cues, the chemical profiles become redundant when the visual and chemical stimuli are presented together. Our findings indicate that resident wasps regulate the level of aggression towards intruders on the basis of the opponent's faces regardless of their cuticular hydrocarbons. Moreover, the visual sensory mode allows faster responses than chemical one either toward intruders and nestmates. However, in our experimental condition, the two sensory modes do not always have the same accuracy. Facial cues, when presented without odour cues, induce an increased number of erroneous attacks on nestmates (false alarms), odour cues, presented in isolation, result in an increased number of misses: erroneous acceptances of outsiders. The cost of incurring in these two different types of errors (i.e. attacking a nestmate or being peaceful to outsiders) might depend on the number of outsider visits experienced by colonies. The possible existence of tradeoffs in using one mode or another to recognise nestmates in diverse ecological contexts merits further investigation.