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Investigating neural mechanisms underlying division of labor in Temnothorax *ants.*

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In social insects, behavioral variation among nestmates is a fundamental feature of division of labor. However, the extent to which worker behavioral variation is regulated by peripheral versus central nervous processes remains poorly understood. Using a response threshold framework, we tested the hypothesis that behavioral variation arises from differences in the peripheral sense organs. We found considerable variation in the number of antennal sensory hairs (sensilla) among individuals in *Temnothorax rugatulus* ants. Yet, variation was not observed in other peripheral sensory structures, such as the ommatidia of the compound eye, suggesting that sensilla variation is not random, but rather has a functional consequence for sensory thresholds. However, we found no correlation between sensilla number and likelihood of task performance or overall activity level in the colony, suggesting that response thresholds do not arise from the peripheral nervous system. As such, the central nervous system may play a more important role in establishing response thresholds, implying that thresholds are potentially flexible, capable of modulation via neuroplasticity. In addition, using a controlled behavioral assay we found that workers that were mostly inactive within a colony context were significantly more responsive to 2-heptanone, an alarm pheromone component, than highly active workers. This suggests the possibility that these inactive workers may serve as a defensive reserve, only becoming active in response to threat. Our results raise questions about the functional consequence of variable sensory organ number in the periphery and suggest a potential role for higher cognitive processes of the central nervous system in creating response thresholds and thus behavioral variation among nestmates.