



## Flies Rely on Numerosity to Assess the Relative Safety of the Group

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Numerosity, the ability to estimate the number or proportion of items in a set, has been reported throughout the animal kingdom. *Drosophila melanogaster* is no exemption and has previously been shown to be able to discriminate between groups with fewer or more members, and to prefer bigger group sizes [1][2]. Interestingly, we have found that flies exhibit numerosity sensitivity in a predation context, namely the safety in numbers effect. Previously we had found that moving conspecifics provide social safety cues that reduce freezing in response to looming threats [3]. Here we investigated how flies of both sexes integrate social motion cues across different group sizes. We uncovered that flies decrease their sensitivity to the total social motion in bigger groups and that flies respond to the fraction of moving flies independently of group size. Specifically, the probability of exiting freezing is similar when the same proportion of the group is moving, regardless of group size. Our results suggest that flies rely on relative, not absolute, measures of group activity. These results also indicate that numerosity processing enables scale-invariant assessment of social movement, allowing flies to flexibly gauge safety cues in a group. This work reveals a novel role for numerosity in social modulation of defensive responses, showing how simple nervous systems combine social sensory information to guide survival decisions.

**numerosity, freezing, social buffering, behavior, safety in numbers**