Ensemble representation for animacy: Effects of shape and category

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Background

Does ensemble perception of animacy only rely on low- or mid-level visual features?

Humans are efficient in extracting animacy information from ensembles with naturally varied image statistics (Yamanashi Leib et al., 2016).

But there appears to be a limitation of ensemble perception of animacy with visually controlled images (e.g., morphed silhouettes, Vladislav et al., 2020).

For single items, animacy information is not limited to low- and mid-level visual features but also category information beyond such visual features (e.g., see Long et al., 2017; He & Cheung, 2019; He et al., 2020).

Are observers able to extract animacy information from an ensemble of items with comparable image statistics?

Q1: Do observers show reliable ensemble perception for animacy?

Study 1: Accuracy for single animals or man-made objects showed significantly above-chance accuracy for both numerosity ratios (all p’s<0.0013 in both studies).

Reliable ensemble perception for animacy did not rely on low- or mid-level visual features, suggesting a category effect beyond such visual features.

Q2: As animals are often round and objects are often elongated, is ensemble perception for animacy modulated by shapes?

Significant Category × Shape interactions (Study 1: F(1,39)=110, p<0.0001; Study 2: F(1,43)=90, p<0.0001) revealed higher accuracy for round than elongated animals, and for elongated than round objects.

Ensemble judgment was higher for animals with round-shape images and for objects with elongated-shape images, suggesting a category-related shape effect.

Q3: Does the modulation of shape on the category effects in ensemble perception of animacy also occur for single-item perception?

Similarly, significant Category × Shape interaction (F(1,43)=4.5, p=0.0396) revealed higher accuracy for elongated tools than elongated animals.

Similar effects for both single-item and ensemble tasks suggest that both shape and category information support animacy perception at different levels.

Results

Methods

Ensemble displays: More animals or more objects?

Study 1: Fixed positions Study 2: Varied positions Study 3: Single item

Studies 1&2: 500ms presentation; N=43 & 44
Category (more animals vs. more man-made objects)
Shape (round vs. elongated)
Numerosity ratio (4:2 vs. 5:1)

Study 3: 100ms presentation, N=45
Category (animal vs. man-made object)
Shape (round vs. elongated)
In all studies, comparable gist statistics were comparable across categories. All studies were pre-registered.

Conclusion

Ensemble perception of animacy depends on rapid extraction of category information beyond low- and mid-level visual features and is facilitated by the expected shapes of the specific categories.

References