Where is the line?
Category boundaries of familiar and unfamiliar objects

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Introduction

Categorization is a critical component of object recognition.
For example, categorization allows to retrieve semantic knowledge about new objects, helping us in building inferences and interacting with objects.

Which **mechanisms** drive categorization?

Are objects categorized just based on **object similarity** or more **sophisticated processes** (e.g., the presence of distinctive object features)?
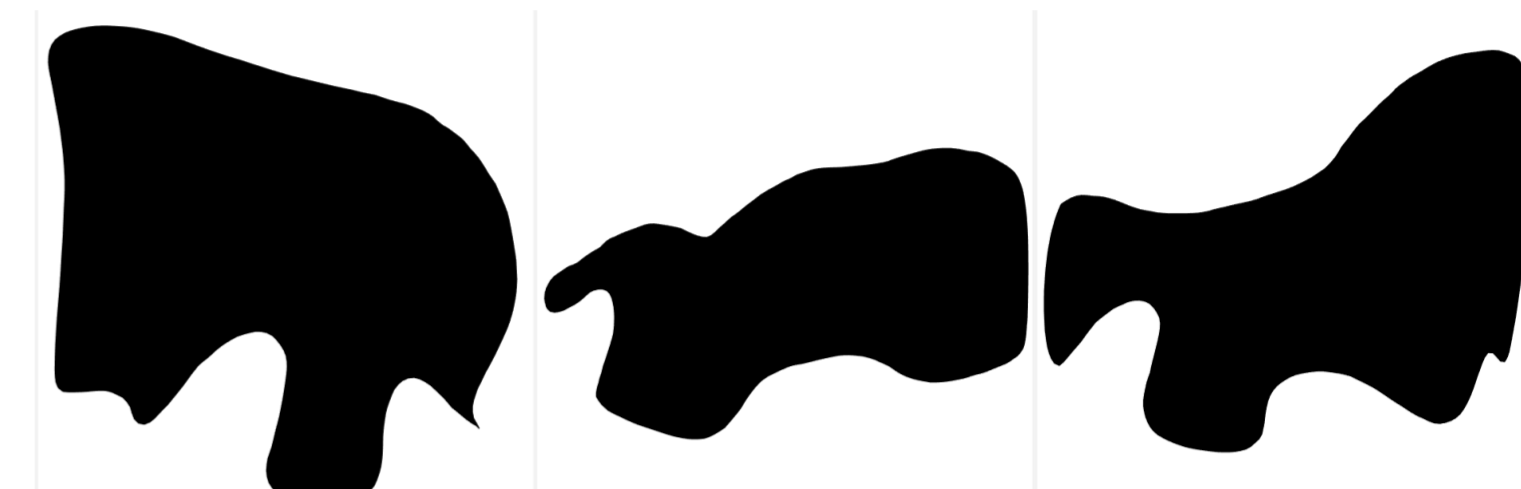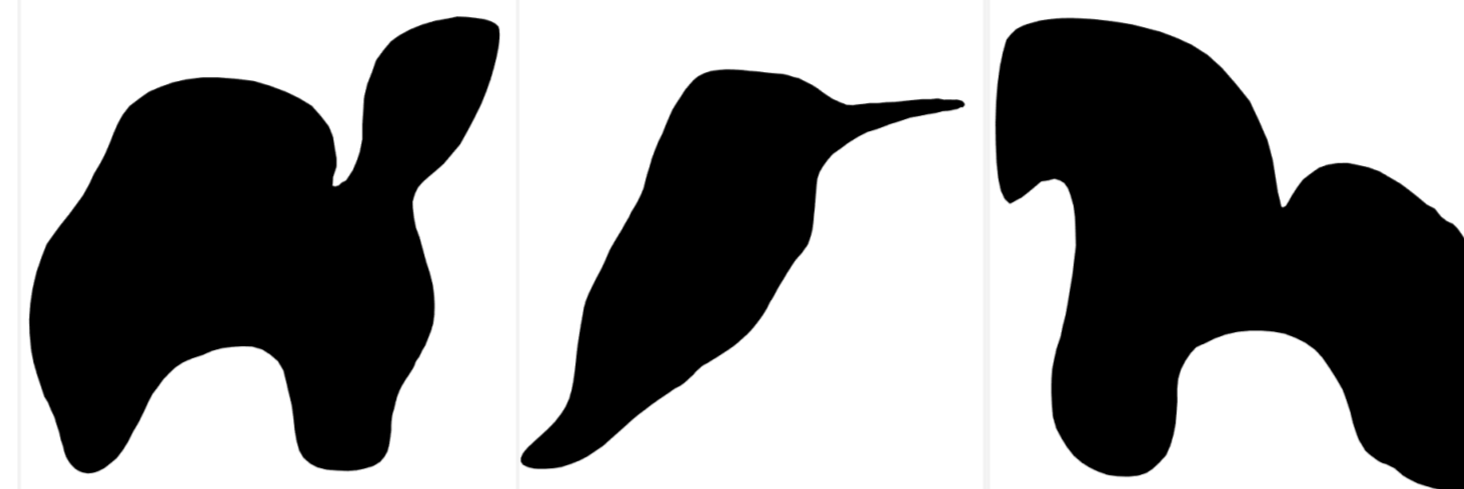
Task

"*The object that is repeatedly shown across trials is a bird/turtle/horse. Please decide whether the two objects shown belong to the same category.*"

"*The object that is repeatedly shown across trials is unfamiliar. Please decide whether the two objects shown belong to the same category.*"
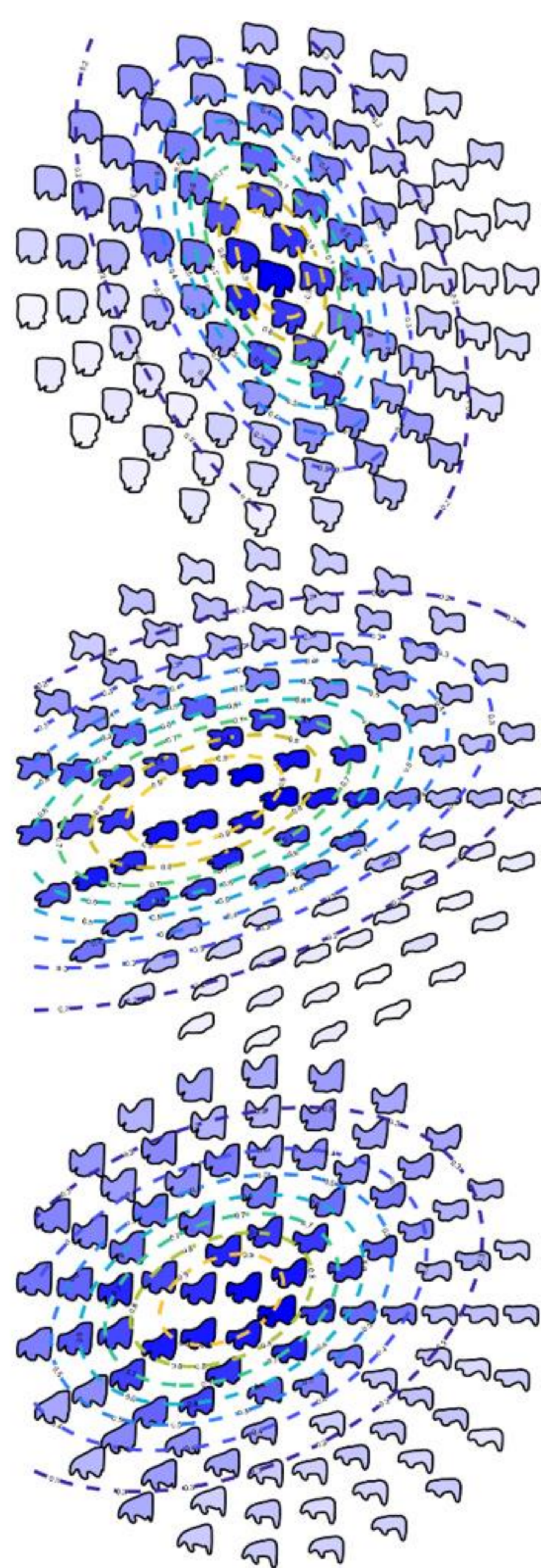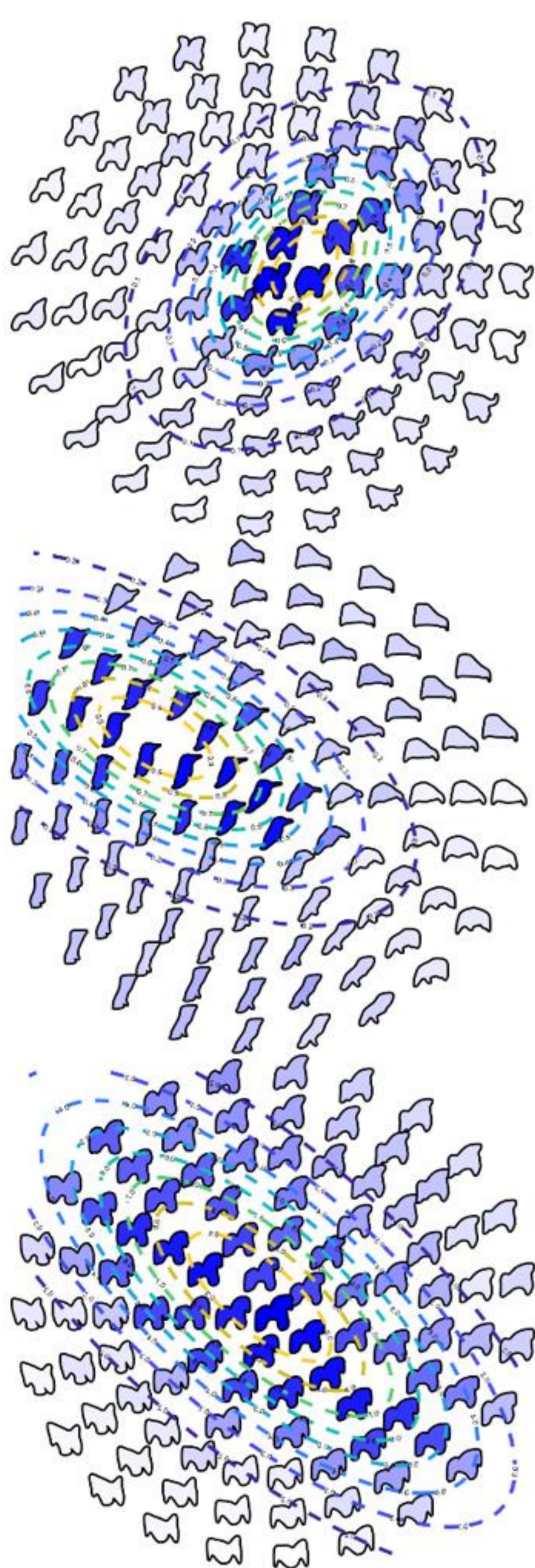
Base objects

Familiar (left) and unfamiliar (right) base objects. The experiment was conducted by N=10 observers on each object. Each observer conducted the experiment on 1 familiar and 1 unfamiliar base object. Objects were selected based on a naming task, N=20.

## Results and Analysis

Familiar Objects   ### Unfamiliar Objects

Object spaces for all 6 investigated base objects pooled across all participants with fitted bivariate Gaussian boundaries. Object spaces were created using a generative neural network (1). Colors indicate the proportion of YES answers, showing how much participants judged each object to be in the same category as the base object.
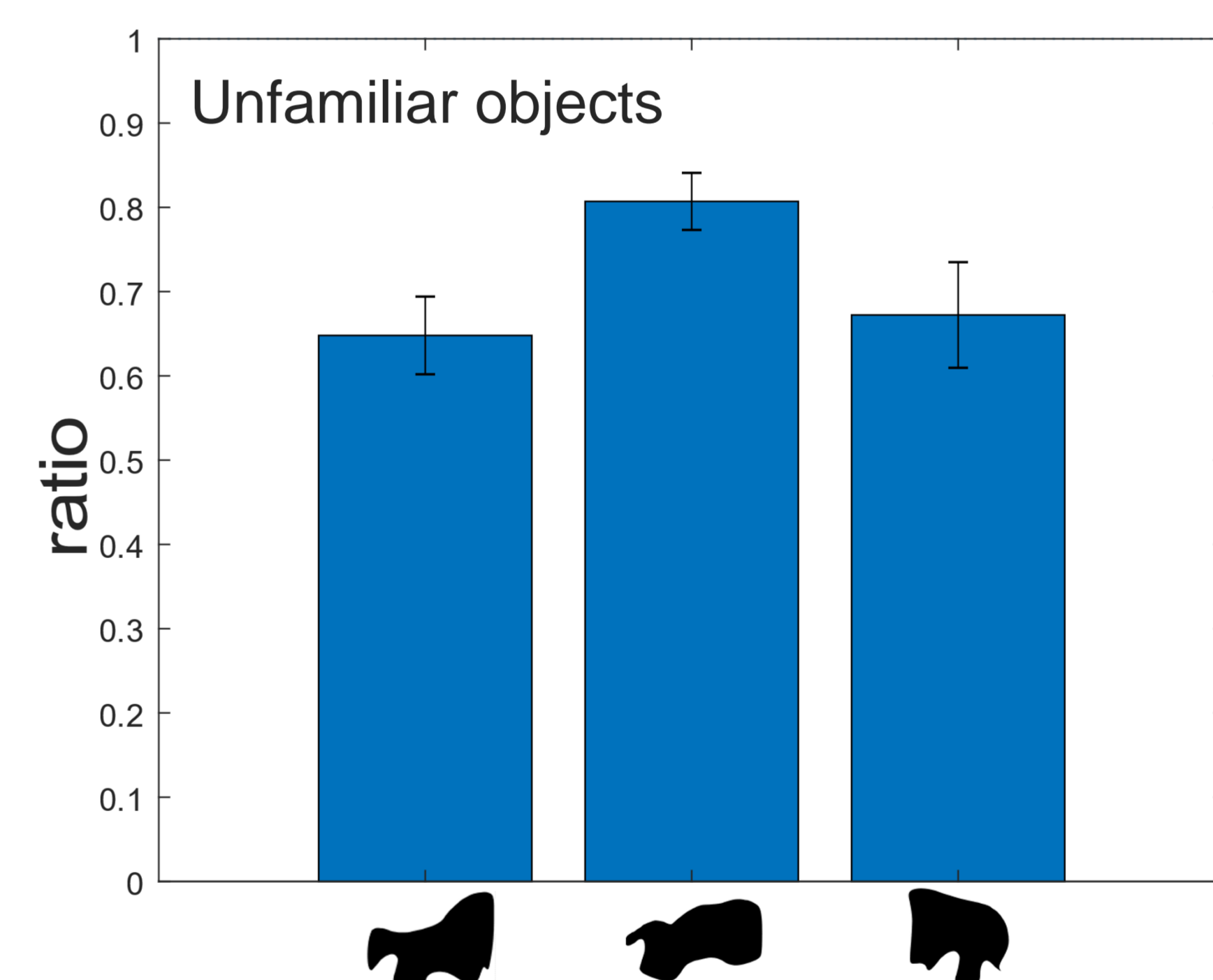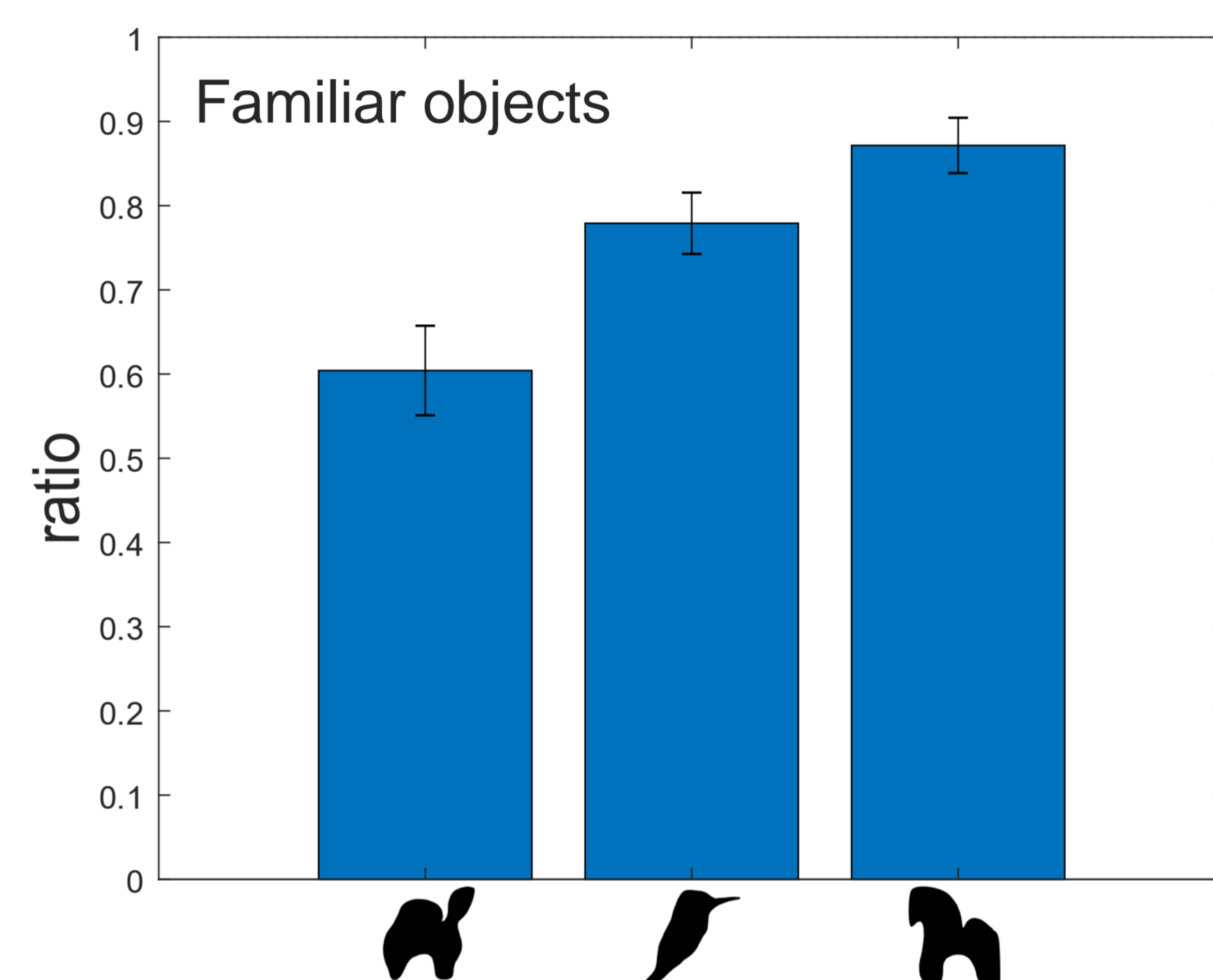
Mean ratios of the ellipse's axes defining the bivariate Gaussian boundaries across observers using 1-(min(sd)/max(sd)), separately for familiar (top) and unfamiliar (bottom) base objects.
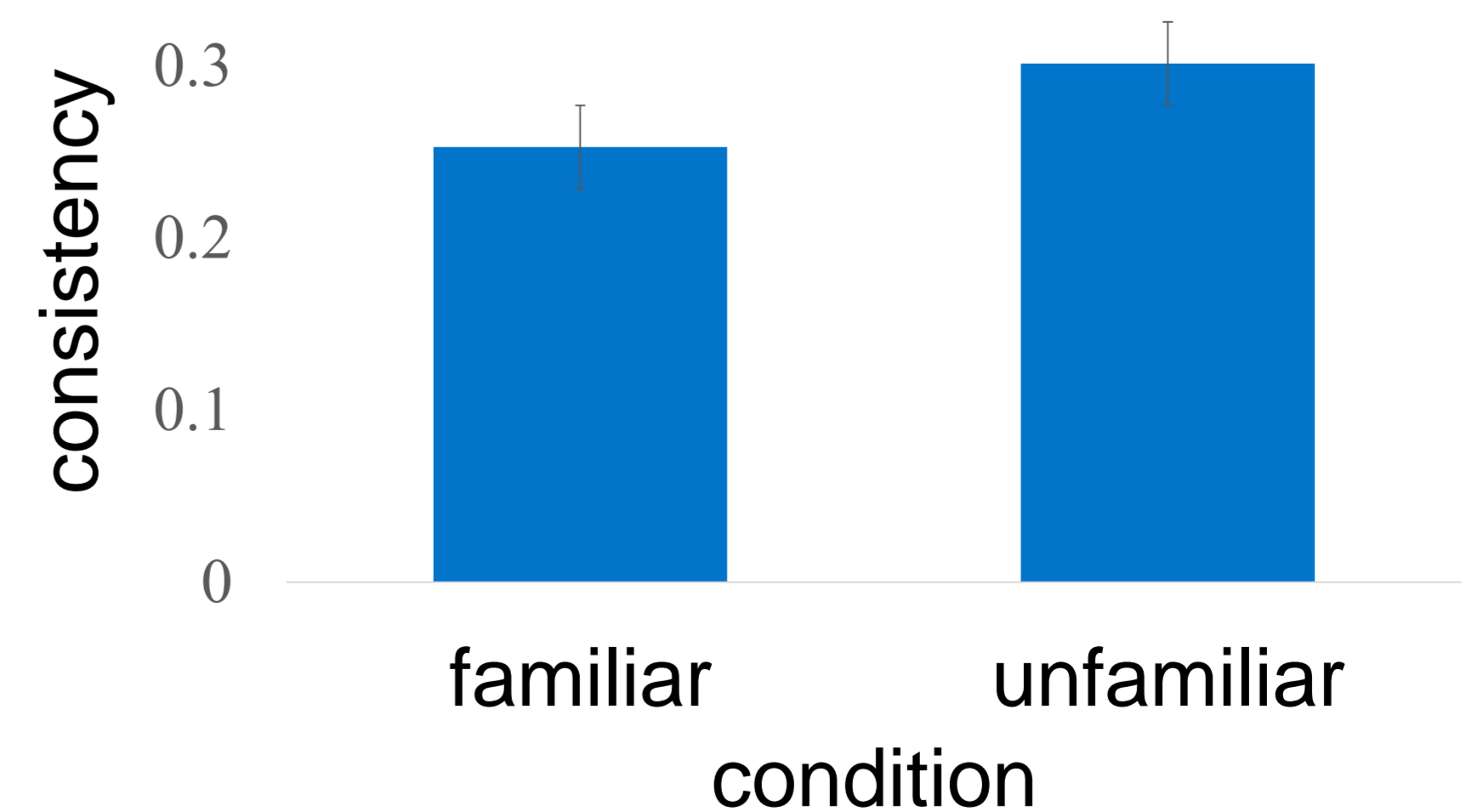
Consistency across observers defined as the mean standard deviations of responses across the base objects for familiar and unfamiliar objects.

Conclusion

Categorization of familiar and unfamiliar objects relies on the presence of distinctive object features. Higher consistency in categorization of familiar objects indicates that the underlying mechanisms are not the same for familiar and unfamiliar objects.

1: Goodfellow, I., Pouget-Abadie, J., Mirza, M., Xu, B., Warde-Farley, D., Ozair, S., Courville, A., & Bengio, Y. (2014). Generative adversarial nets. In Advances in neural information processing systems (pp. 2672-2680)