

Introduction

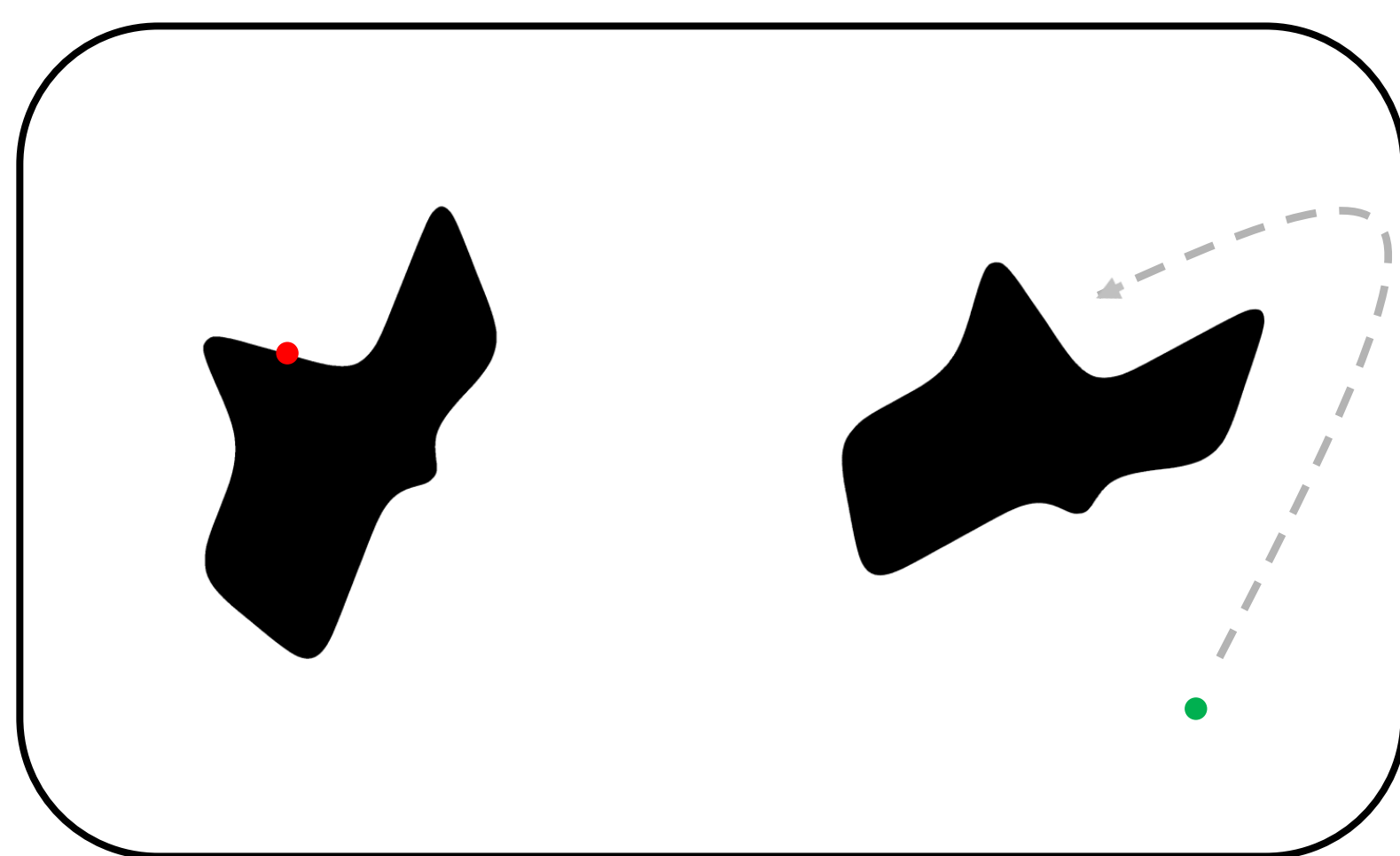


Can we perceive transformations applied to shapes?
How do transformations affect the perception of shapes and space?

- We ask for example to what extent...
 - ...participants can infer (*causal history*; Leyton, 1989) and follow the transformation that produced one shape from the other (accuracy).
 - ...different levels of transformation influence this accuracy.
 - ...contour curvature influences this accuracy.
 - ...transformations extend to the space around shapes (egocentric vs. object-based reference frame).

Paradigm

- Dot matching task (Phillips, Todd, Koenderink, & Kappers, 1997)

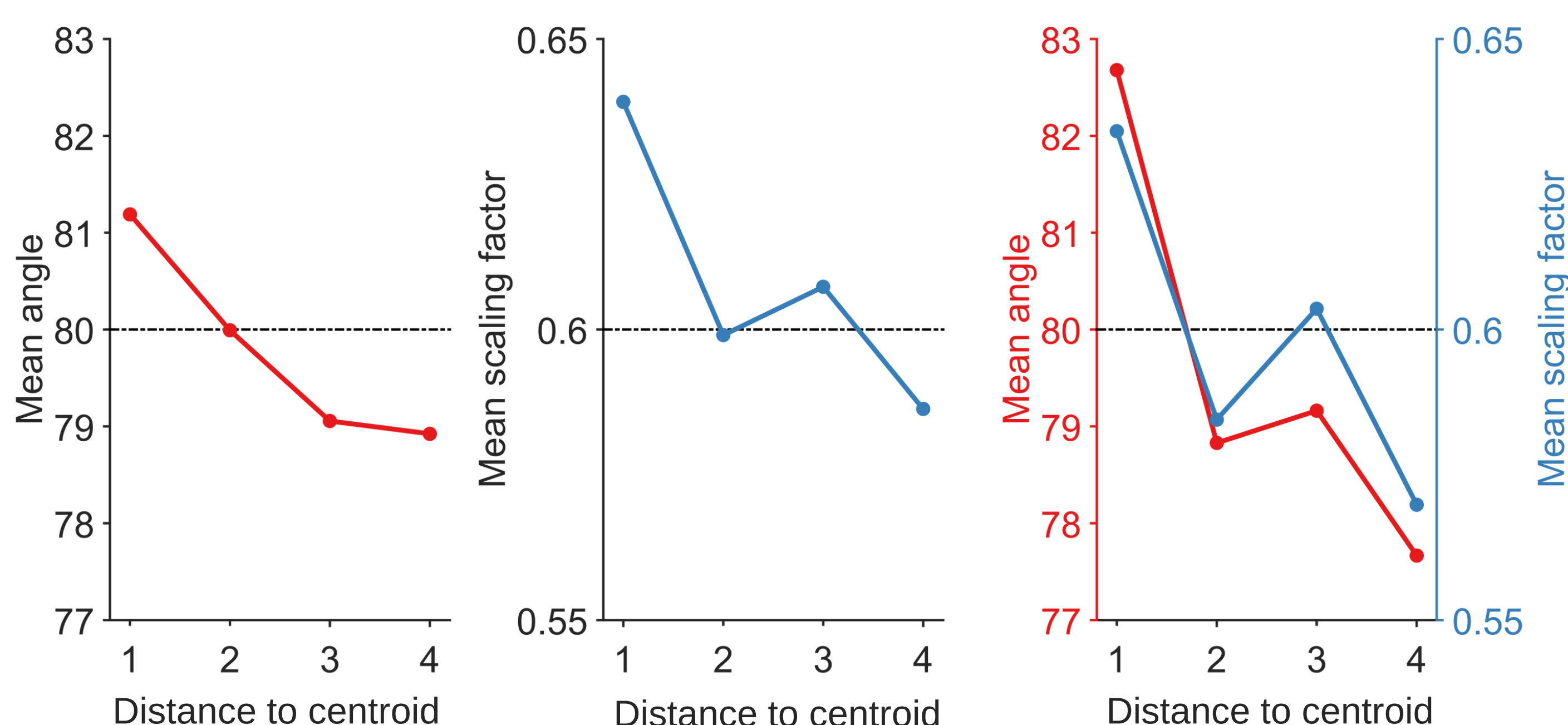
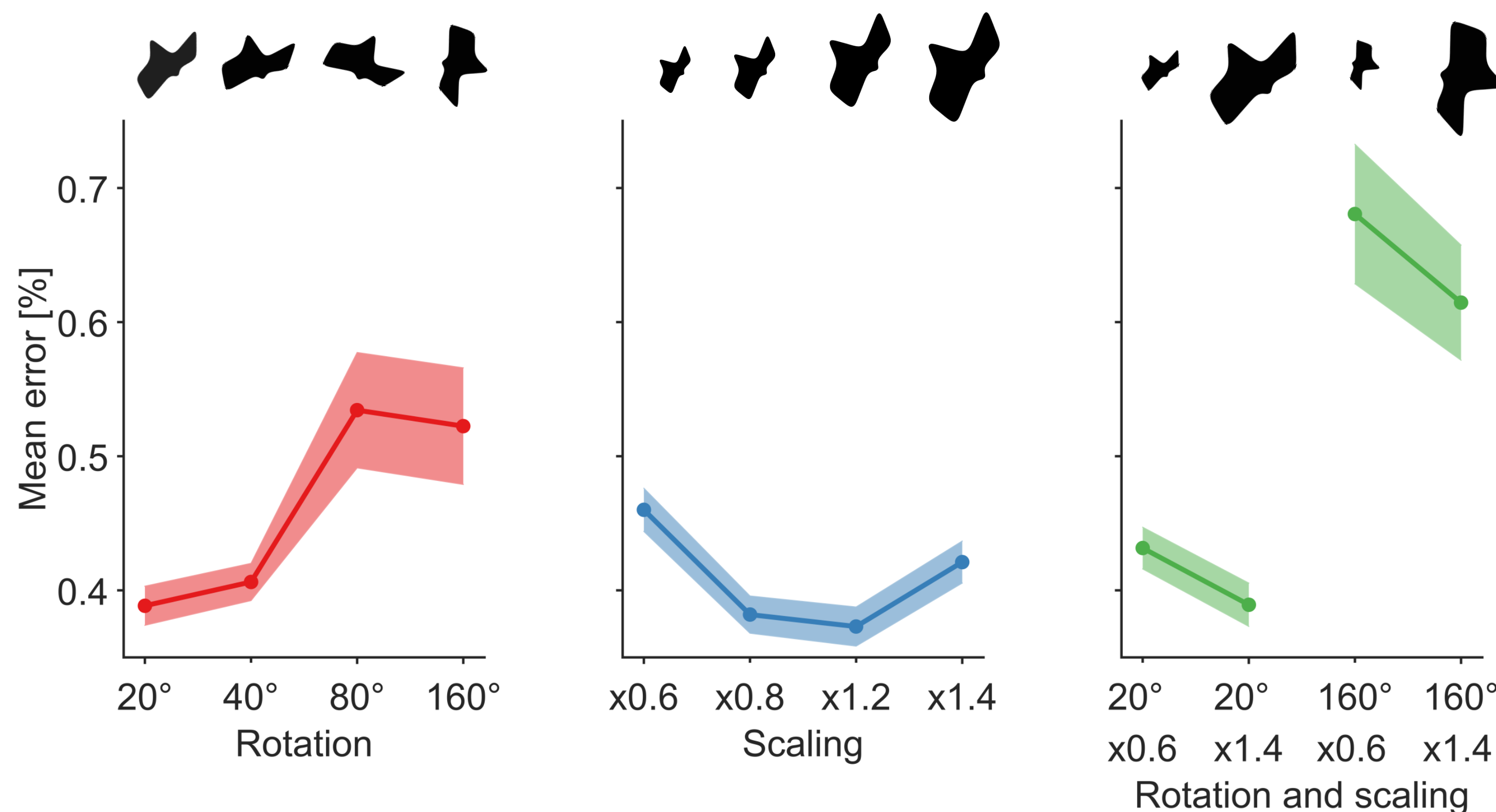


“Move the green dot to the position that corresponds to that of the red dot.”

- Sample points on contour and within and around the shape.

Exp. 1+2 : Rigid Transformations

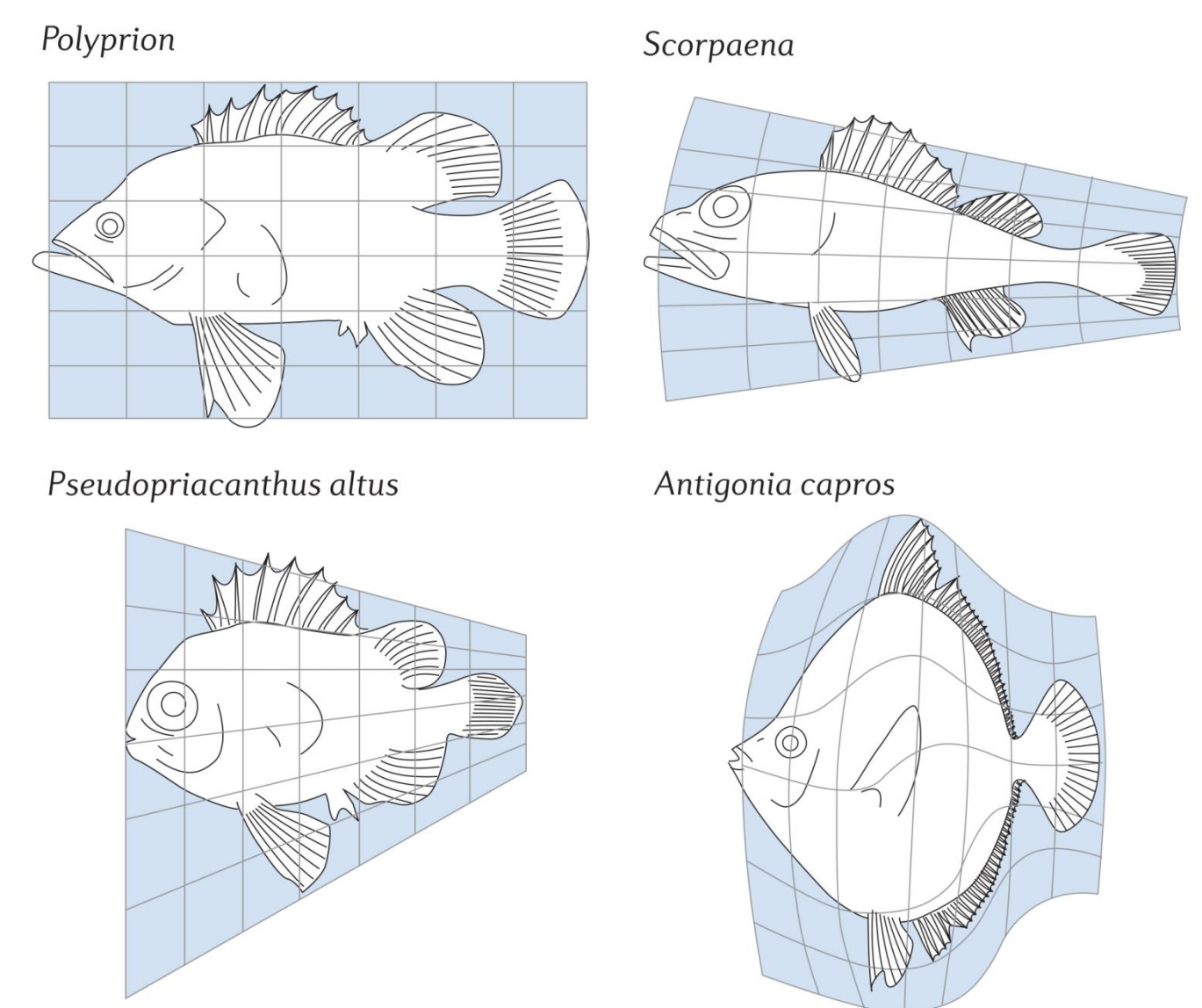
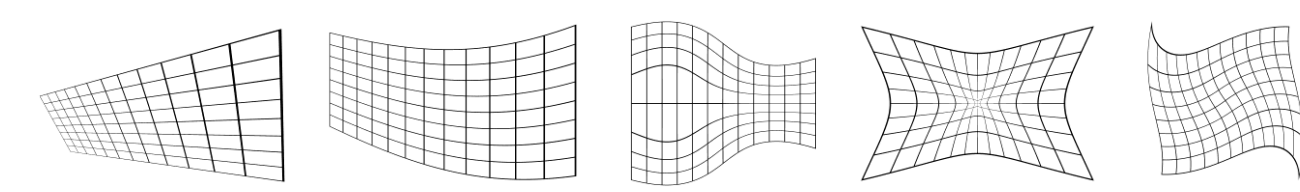
- Schmidt, Spröte, & Fleming (2015)



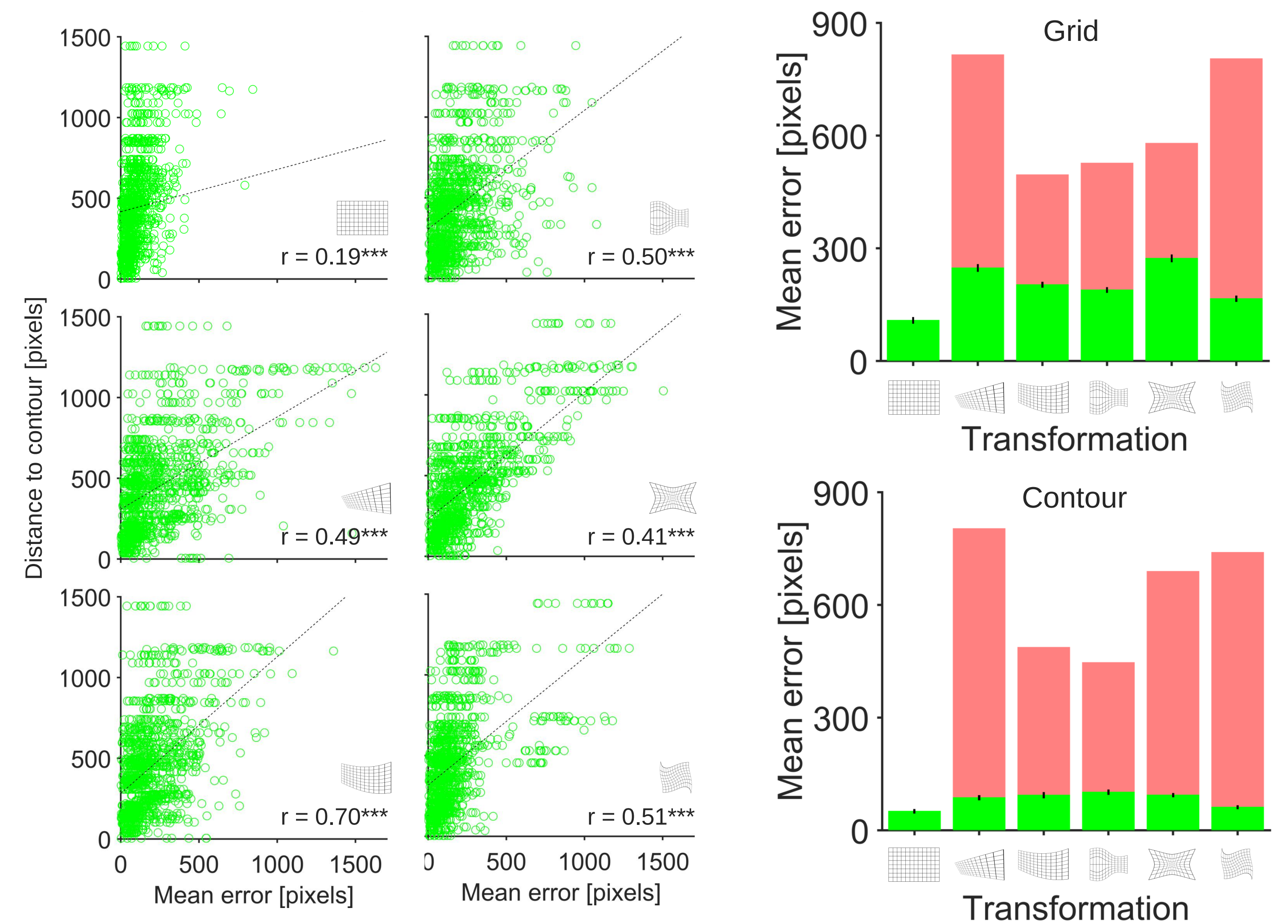
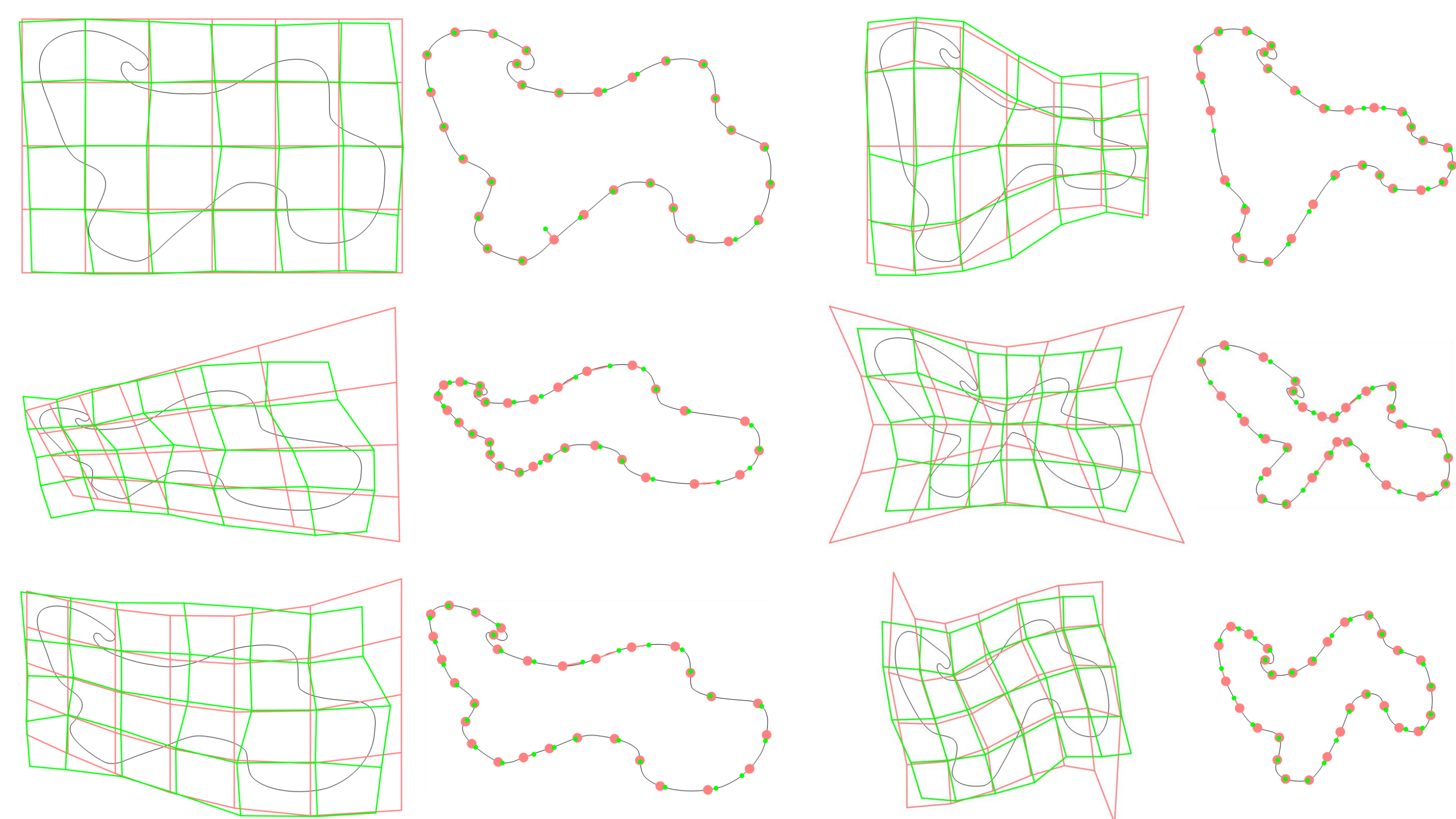
- Shape representations are very robust against rigid transformations.
- Still, they are modulated by (1) the type and level of transformation, (2) the distance to the contour, and (3) the contour curvature.
- Participants use object-centered reference frames so that space representations are transformed with the shapes.

Exp. 3 : Biological Growth

- How do complex, non-rigid transformations influence shape representation?
- Vector-field transformations similar to those used to describe biological growth (Thompson, 1942).



- Schmidt & Fleming (in preparation)



Discussion

Our results demonstrate a remarkable human ability to discount for rigid and non-rigid spatial transformations of objects in our environment. They suggest that shape features establish object-centered reference frames that determine participants' representations of transformed shapes and surrounding space.

Together, these findings suggest sophisticated mechanisms for the inference of shape, space, and correspondence across transformations. These mechanisms are crucial for object constancy and understanding of shape and transformations.

References

- Leyton, M. (1989). Inferring causal history from shape. *Cognitive Science*, 13, 357-387.
 Phillips, F., Todd, J. T., Koenderink, J. J., & Kappers, A. M. L. (1997). Perceptual localization of surface position. *Journal of Experimental Psychology: Human Perception and Performance*, 23, 1481-1492.
 Schmidt, F., Spröte, P., & Fleming, R. W. (2015). Perception of shape and space across rigid transformations. *Vision Research*, doi: <http://dx.doi.org/10.1016/j.visres.2015.04.011>
 Thompson, D. W. (1942). *On growth and form*. Cambridge, UK: Cambridge University Press.