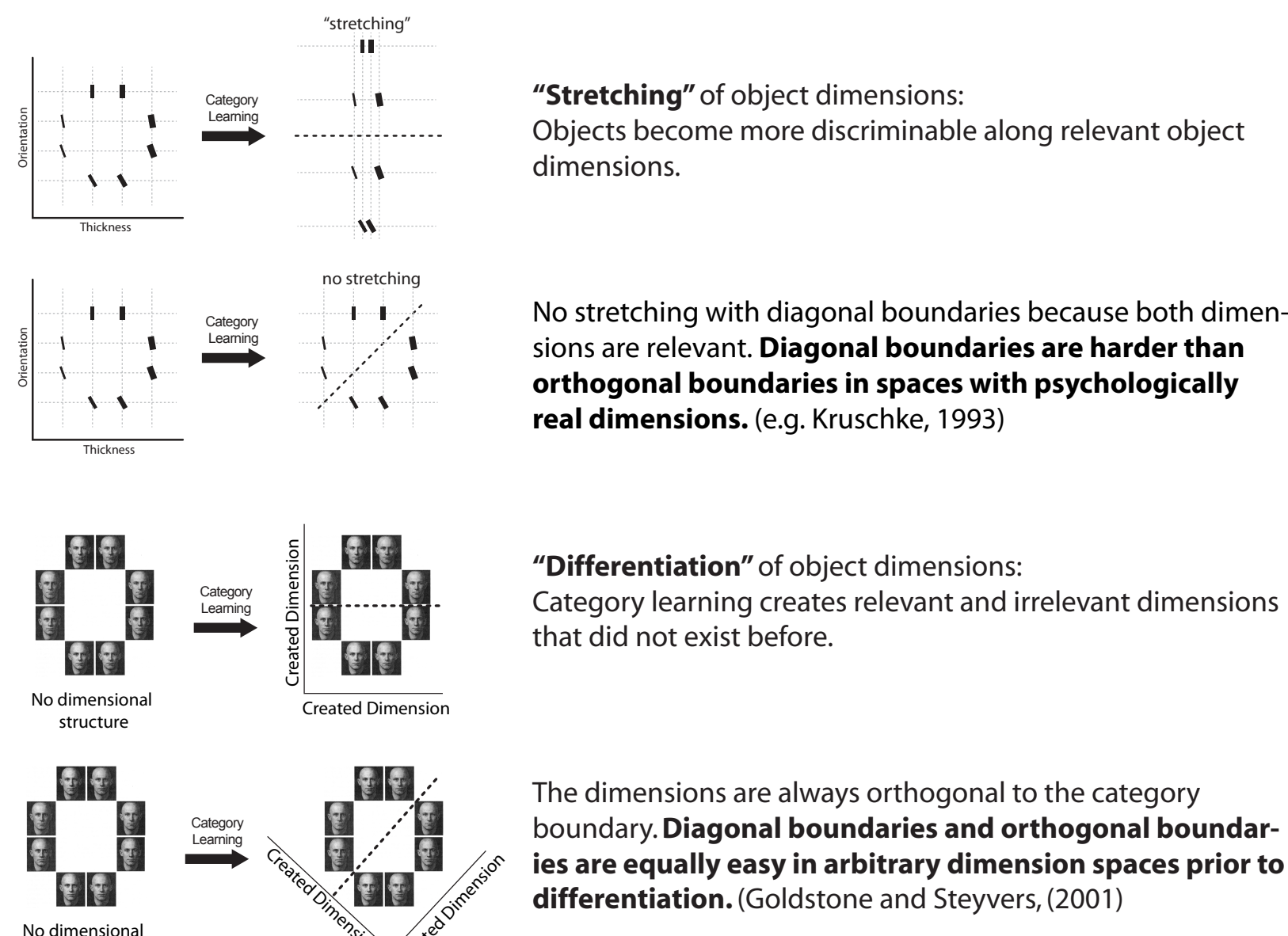


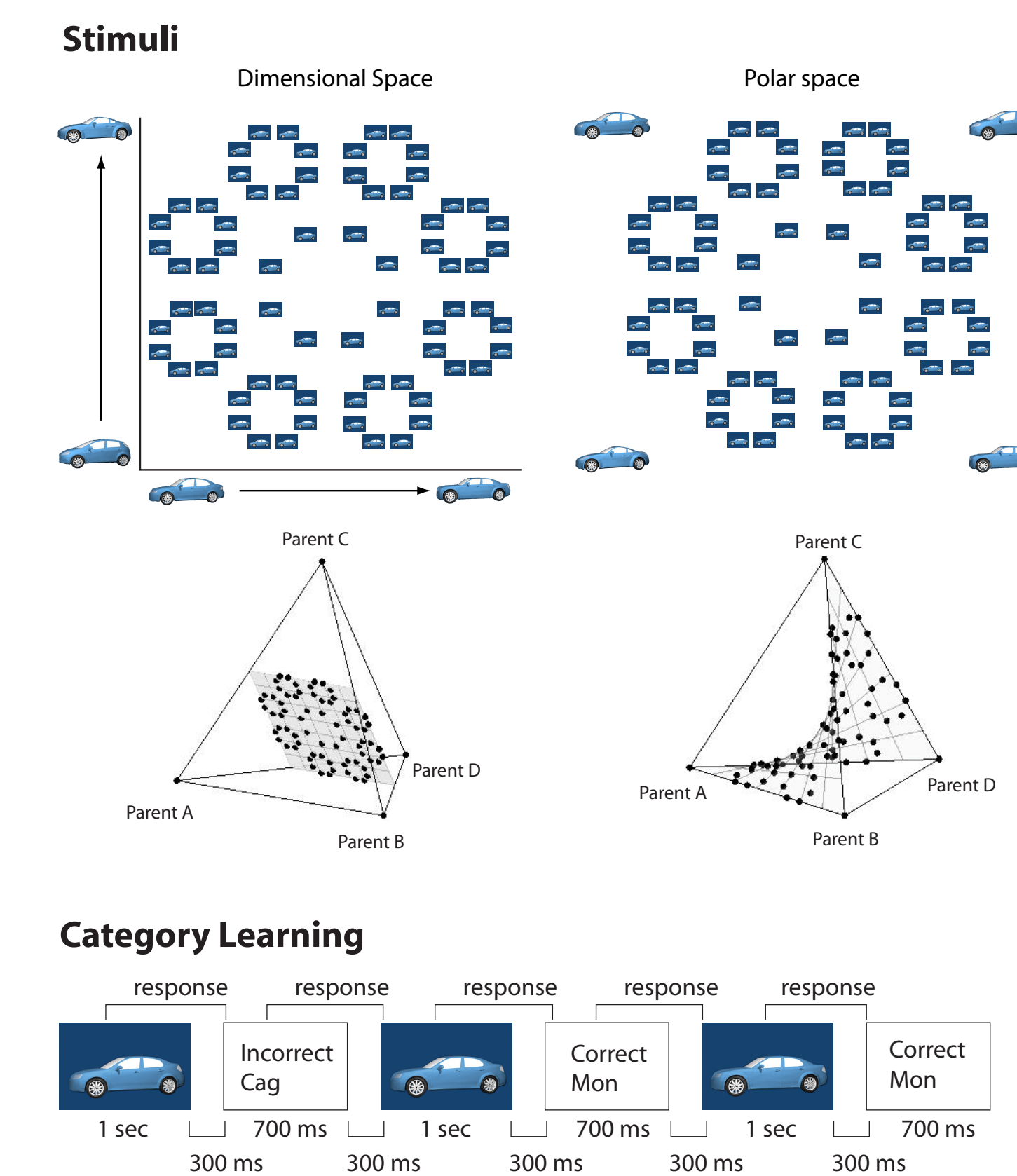
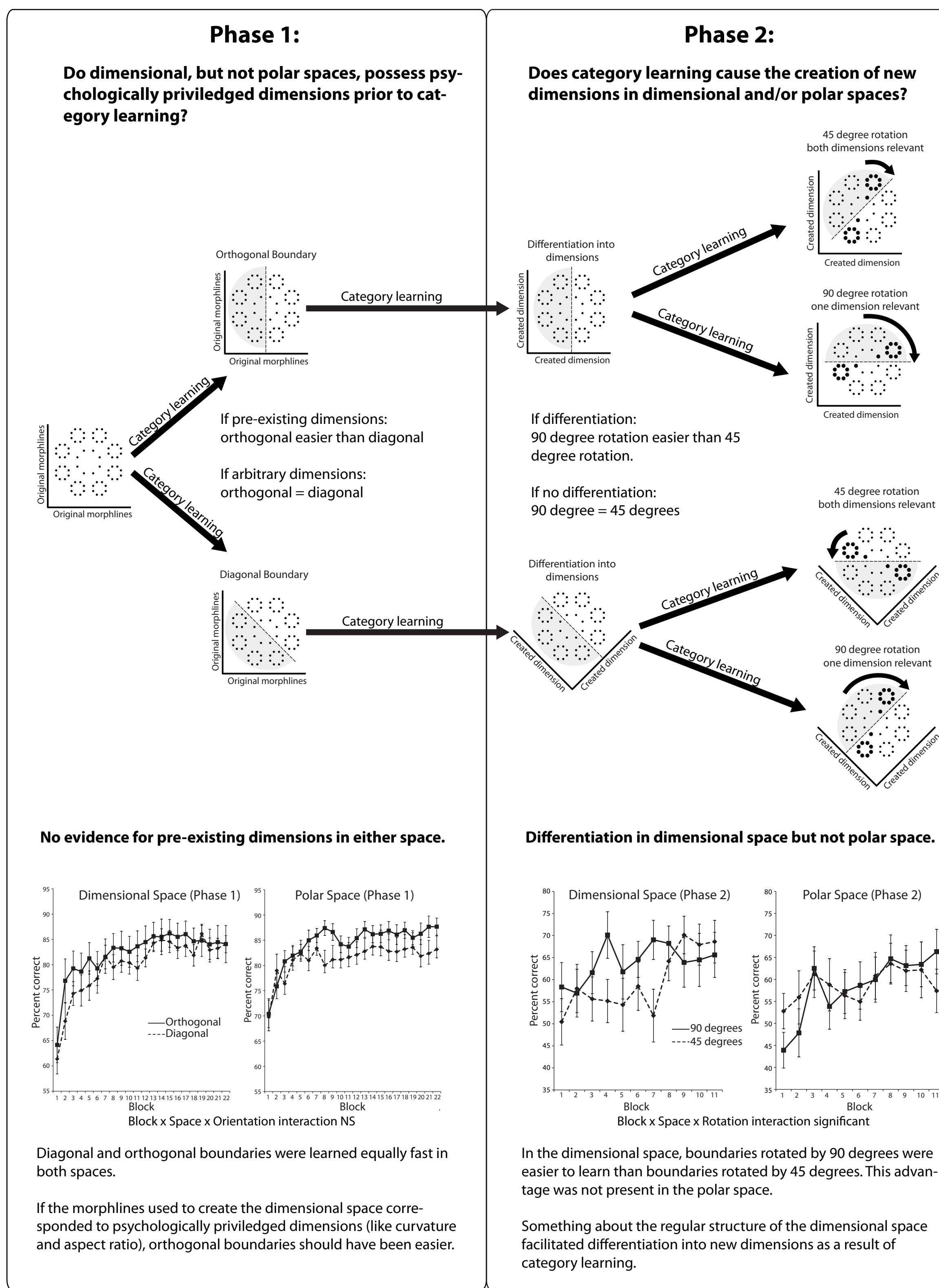
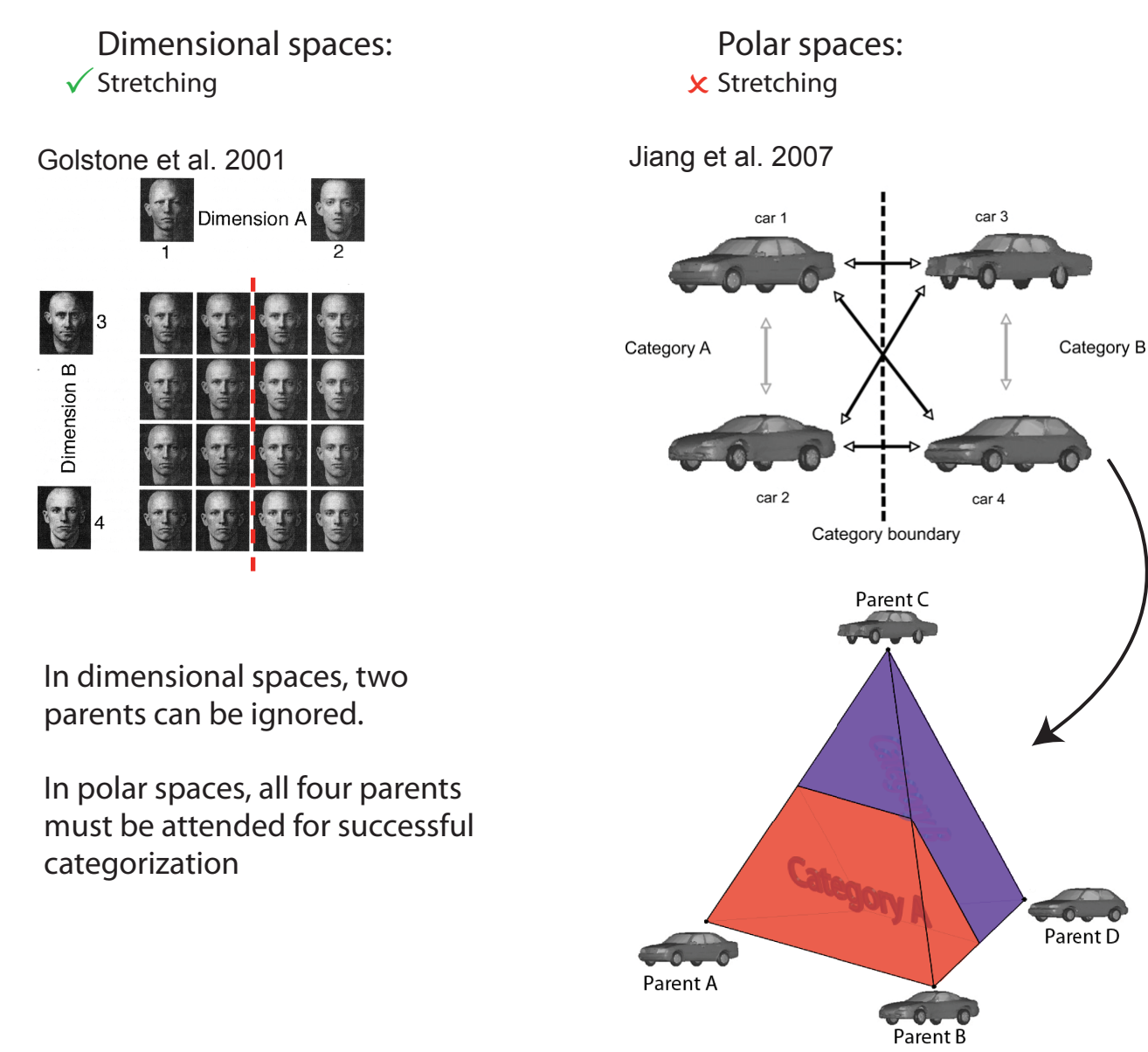
Background: How does category learning change visual perception?



After differentiation, arbitrary dimension spaces start to behave more like separable dimension spaces. Diagonal boundaries relative to the created dimensions are harder than orthogonal boundaries.

What are the limits of differentiation?
Differentiation has been demonstrated in morphspaces of faces (Goldstone and Steyvers, 2001)... but differentiation is more difficult in other kinds of spaces (Op de Beeck et al. 2003)
What properties of shape spaces drive these differences?

Potential role of morph-space structure



Implications

Some shape spaces can be differentiated, but not all: category learning causes differentiation in dimensional but not polar morphspaces.

Past results concluding little effect of category learning on neural object representations likely do not generalize beyond polar spaces.

Consistent with this, a recent fMRI study found selective neural stretching for the diagnostic dimension in a dimensional space of morphed cars (Folstein, Palmeri, and Gauthier, under review).

Future neural and behavioral studies using morphspaces should take morphspace structure into account when interpreting results.

Models of visual learning should account for differences between dimensional and polar spaces.

References

Folstein, J. R., Palmeri, T. J., & Gauthier, I. (under review). Category learning increases discriminability of relevant object dimensions in visual cortex.

Goldstone, R. L., & Steyvers, M. (2001). The sensitization and differentiation of dimensions during category learning. *Journal of Experimental Psychology: General*, 130(1), 116-139.

Jiang, X., Bradley, E., Rini, R. A., Zeffiro, T., Vanmeter, J., & Riesenhuber, M. (2007). Categorization training results in shape- and category-selective human neural plasticity. *Neuron*, 53(6), 891-903.

Kruschke, J. K. (1993). Human category learning: implications for backpropagation models. *Connection Science*, 5, 3-36.

Op de Beeck, H. O., Wagemans, J., & Vogels, R. (2003). The effect of category learning on the representation of shape: Dimensions can be biased but not differentiated. *Journal of Experimental Psychology: General*, 132, 491-511.