Title: Attneave's Cat revisited: Points of high curvature are not important for object recognition

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The importance of curvature in visual object recognition has long been a subject of debate beginning with Attneave's seminal argument that points of maximum curvature are most useful for recognizing objects (1954). More recently, this result has been both replicated by Norman et al (2001) and challenged by Kennedy and Domander (1985), the latter group claiming that recognition is well served by points of minimal curvature, and still better served by points located between areas of maximal and minimal curvature.

The question of curvature in recognition was reevaluated in the current study in which subjects were asked to identify a series of objects reduced to a set of circular dots placed around the external boundary of the object. Dots were distributed in one of four conditions ranging from tightly clustered around curvature maxima to evenly distributed around the object boundary (see Fig 1). Subject performance was lowest (41% correct) when dots were selectively placed at and around curvature maxima and was highest (81% correct) when dots were evenly distributed around the object, irrespective of curvature.

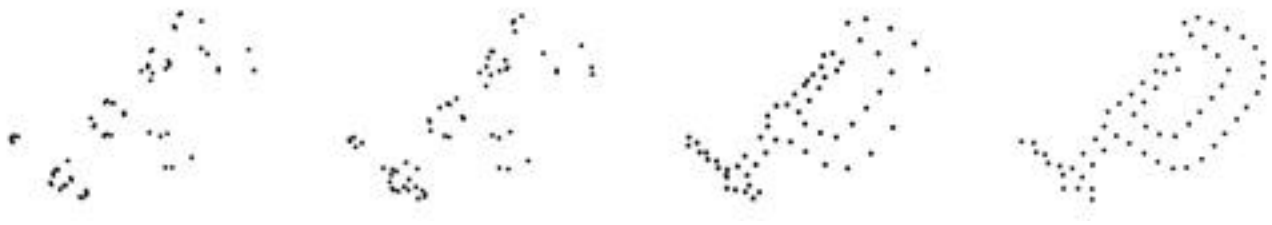

Figure 1: Dot spacing conditions. Objects were displayed in one of four conditions that varied in dot position relative to curvature maxima. Shown above is a "c-clamp" object displayed as a set of dots clustered tightly around curvature maxima (far left), as a set of dots evenly distributed around the object irrespective of curvature (far right), and at two intermediate spacing levels (center left and center right).

In a second experiment, objects were displayed as a randomly selected set of boundary dots. Reverse correlation was used to identify the set of points that appeared most frequently during successful trials and those points that appeared most frequently during unsuccessful trials. In terms of measured curvature, "successful points" identified in this manner did not differ significantly from "unsuccessful points." In an attempt to confirm the relative importance of each set of points, a follow-up experiment was performed in which naïve subjects who were shown the successful points and asked to identify the object significantly outperformed naïve subjects who were shown the same number of unsuccessful points (67% correct vs. 38% correct, $p < 0.00001$).

While these data suggest that successful object recognition does not rely exclusively on points of high curvature, it may still be the case that regions of high curvature are critical for visual object processing.