E27. Using crowding to determine whether an object is identified as a whole or by parts —

ISOLATING TO RECOGNIZE

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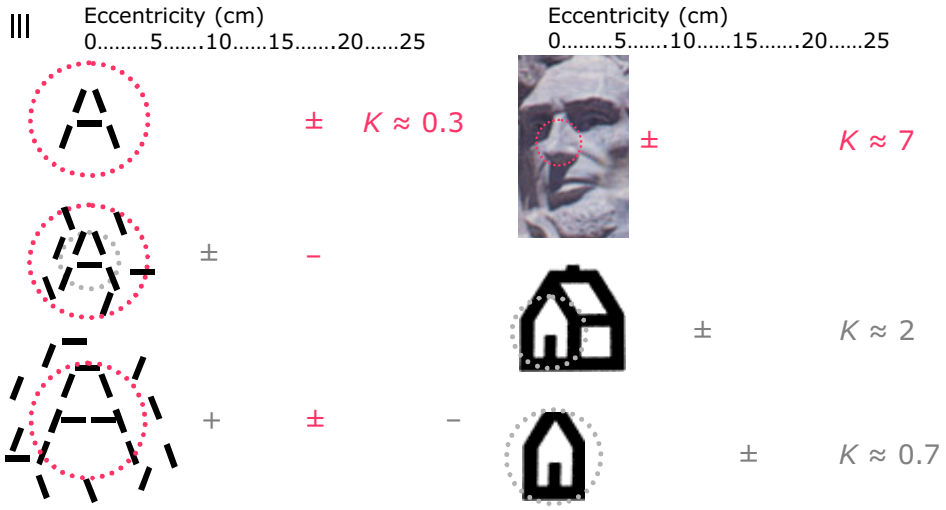
Since Gestalt, scientists have asked whether we recognize objects holistically or by parts. "Crowding" provides an answer. Classically, crowding is the impairment of recognition of letters or objects in the periphery by neighboring objects. The neighboring objects have no effect if spaced farther than a critical spacing, which defines an ***isolation field*** around the target. Bouma (1970) showed that this isolation field has a diameter of roughly half the eccentricity (distance from fixation). Here we examine basic-level identification of familiar objects, including drawings, photos, silhouettes, letters, words, symbols, signs, icons, and logos. We asked the observer, "What is it?" and measured the threshold eccentricity beyond which each object could not be recognized. From these thresholds we computed $K = A_{object}/A_{isolated}$, the ratio of the area of the object to the area of the isolation field at that eccentricity, $A_{isolated}$ = (eccentricity/2)^2. Three different sets of familiar objects all yield unimodal distributions peaking at $K < 1$. The demos below indicate that threshold is determined by the size of the isolated part. When $K < 1$ the whole object is contained inside the isolation field and recognition is "holistic". When $K > 1$ recognition requires isolation of a part that is $1/K$ of the whole and recognition is "by parts".

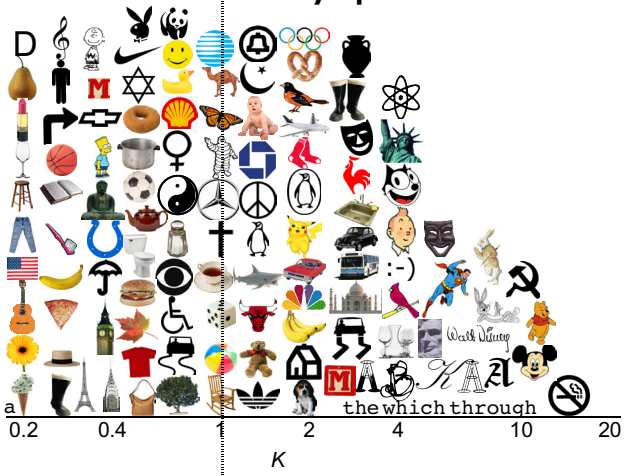


DEMOS Each dotted circle is the isolation field corresponding to the same-colored fixation point. Find the farthest point that you can fixate and still identify the object. We found threshold at the ±. Identification succeeds at + and fails at -. By itself the 'A' is recognized holistically. Putting chaff inside the isolation field obscures the 'A'. The 'A' is recognized only if the isolation field excludes the chaff. The famous president is identifiable only when his nose and other facial features are isolated from each other. The complete house is identified only when its front is isolated. The front, by itself, is identified holistically.

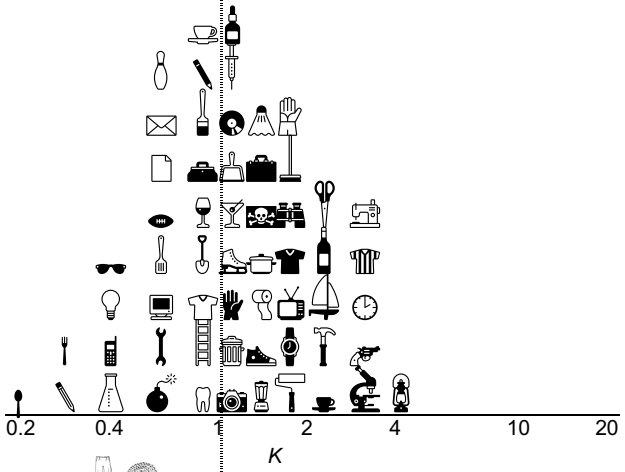
Pelli, D. G., Martelli, M., and Majaj, N. J. (2004) Using crowding to determine whether an object is identified as a whole or by parts. *Vision Sciences Society,* Sarasota, Florida, April 30-May 5, 2004. http://psych.nyu.edu/pelli/#posters

Holistic $K \leq 1$ By parts $K > 1$

132 familiar objects from diverse sources.



The 59 most familiar of the Poppi pictograms designed by Friedl (2003). http://emigre.com/EF.php?fid=198



Objects 142-191 from Snodgrass & Vanderwart (1980). *J Exp Psychol Hum Learn*, *6*, 174-215.