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Chicks' use of geometrical and nongeometrical information in environments of different sizes

Cinzia Chiandetti • Giorgio Vallortigara

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Abstract Previous research has revealed that domestic chicks are capable to conjoin geometric information provided by the metric arrangement of the walls of a rectangular arena and nongeometric information provided by local landmarks located within the arena in order to reorient themselves after being passively disoriented. In the same spatial task, it has been proved that disoriented children could use geometric information in combination with landmark information to relocate the target place in large but not in small experimental spaces. Chicks, in contrast, appear to be able to conjoin geometric and nongeometric information to reorient in both large and small spaces and also when displaced from a large to a small arena and vice versa. Yet, when tested with an affine transformation that alters the geometric relations between the local cues and the overall metric properties of the environment, they make more geometrical errors in the small than in the large environment.

Here we address the importance of the space's size in three different experiments. In Exp. 1 we trained chicks in a small or in a large rectangular arena with different panels at each corner and then we tested them in a large or in a small arena respectively with the panels displaced according to an affine transformation so as to provide contradictory geometric and nongeometric information. In Exp. 2 we trained chicks in a small or in a large rectangular arena with different panels at each corner and we removed at test all panels. In Exp. 3 we changed the shape of the arena from rectangular (during training) to square-shaped (at test) in order to disentangle the specific role of the geometric vs. nongeometric cues. While we could presume that in Exp. 1 chicks encode the target cue together with the nearest panel along the short wall in order to correctly reorient after the displacement of the landmarks, results showed that chicks did not process the distant cue but chose the reinforced panel even when located in the wrong position. After panels' removal (Exp. 2) chicks made stronger use of geometrical information in the small than in the large arena, and when the arena was changed in shape (Exp. 3) chicks resorted to landmark use much more in the large than in the small arena.

These findings suggest that chicks do encode both geometric and nongeometric information whatever the size of the environment but that they use the proper and more reliable cue in relation to the size of the experimental space. In small environments, when metric information from close walls is fully available, they rely mainly on geometric information, whereas in large environments, when metric information would require motion or extensive visual scanning of the surfaces of the environment, they rely on local cues available at the corners.

C. Chiandetti (✉) • G. Vallortigara
Department of Psychology and B.R.A.I.N.
Centre for Neuroscience, University of Trieste, Italy
e-mail: cchiandetti@units.it
URL:
http://www.psico.univ.trieste.it/labs/acnlab/eng_p/e00_home.html