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BINOCULAR FIELD IN PIGEONS: BEHAVIORAL MEASURES OF STIMULUS DETECTION AND CODING

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INTRODUCTION

It has been claimed that pigeons possess an ovoid binocular visual field, with its absolute amplitude along the vertical axis. There is, however, disagreement on the size of the binocular window, partly because of the different pigeon breeds and the particular techniques used in the experiments. Walls (41) stated that pigeons have a binocular field 24° width. More recently, optical techniques on alert pigeons, indicated an extension of about 110° along the vertical axis with an absolute horizontal amplitude of 41° at an elevation of 25° below the bill (22, 31). On the contrary, ophthalmoscopic reflex techniques on anaesthetised birds provided measures of the binocular window ranging from 110° to 135° on the vertical axis and from 22,5° to 37,4° on the horizontal axis (29, 33, 36). Also the estimate of the meridian position of the absolute horizontal amplitude differed among the authors. Martin and Young (29) as well as Nalbach *et al.* (36) reported that it was above the bill of about 20° and 15°, respectively; whereas McFadden and Reymond (33) derived a measure of about ± 5° around the eye-beak axis. In addition, anatomical measures from the eye-cup provided a computed binocular field of 18° around the eye-beak axis (18).

Taken together all these measures provide an indicative evaluation of the actual extent of binocular field. However, they are far from being exhaustive since they represent theoretical estimations not supported by a functional correlate, especially considering the role played by the eye movements, responsible for a significant shift in the binocular overlap (3, 17, 18, 20, 28, 30, 36).

Unfortunately, the few studies carried out with behavioral perimetry using head fixed pigeons were not aimed to map and value the extent of binocular field (16, 27). In addition, the unique investigation on visual detection in free moving animals (43) did not provide any estimation of the field.

It has been demonstrated that during pecking response the approaching to the target is successive to head fixation stops (F1-F2), in which the decision to peck and the coding of stimulus properties have been made (1, 16, 19, 39, 44, 45). Thus, taking advantage of motor stereotype of the pecking response and improving the "behavioral fixation" procedure (2), we attempted to bring together the requirements of a perimetric measure with a free moving experimental condition (9). By videorecording pigeon pecking responses to a spot displayed at different positions in the frontal field, we suggested that binocular field was a round area about 24° width, and centred on the eye-beak axis.