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TITLE Is myopic blur more important than sharp vision for positive-lens compensation?

Purpose: Chick eyes compensate for both positive and negative spectacle lenses. Can they distinguish myopic from hyperopic blur, or is the compensation bidirectional because sharper images are associated with positive lenses (when viewing nearby objects) and more blurred images are associated with negative lenses? We ask whether chicks can compensate for positive lenses if we severely limit the amount of sharp vision.

Methods: We measured axial dimensions by A-scan ultrasonography and refractive error (RE) before and after one of the following monocular treatments: (a) +7D lens blurred by diffuser, (b) Chick restrained in the center of a 60 cm drum during lens-wear (+10D lens worn 30min/4h; otherwise in dark), ensuring myopic blur, (c) Positive lens worn for brief periods (2min/2h) either in normal cage (+6D) or in drum (+10D), otherwise in normal light environment. Compensation was expressed as interocular differences in the change over 3 days in RE or vitreous chamber depth.

RESULTS: (a) Eyes compensated fully for positive lenses even if images were degraded by light (RE, +7.9 D; vit, -323mm) or medium (+7.8 D, -194mm) diffusers, but became myopic with dense diffusers (-5.0 D, +243mm). (b) Eyes also compensated for positive lenses even when viewing distant, and thus blurred, objects for only 30min/4hr (otherwise in dark; +4.43D, -203mm). (c) Eyes compensated even if birds were kept in a normal lighted cage except for 2min/2h, when they wore a positive lens either in their cage (+1.2D, -91mm) or in the drum (+2.0D, -101mm).

CONCLUSIONS: Despite considerable image degradation due to diffusers, chicks compensated for positive lenses, suggesting that sharp vision is not required. When we made sure that myopic blur was present during lens-wear by confining the chicks to the center of a drum, the compensation was as good as in unrestrained birds, also suggesting that myopic blur might be the cue normally used. Even with lenses worn for only 2min/2h (in drum or cage) with normal viewing the rest of the time, compensation occurred, suggesting a particular potency of myopic blur to change the growth of chick eyes.

ABSTRACT

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