

Comparison of the Colvard, Procyon, and Neuroptics pupillometers for measuring pupil diameter under low ambient illumination.

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Abstract

PURPOSE: To compare three different pupillometers (Colvard, Procyon, and Neuroptics) for determining pupil diameter at 0.04 and 0.4 lux ambient illumination.

METHODS: In 92 eyes of 46 healthy volunteers, pupil diameter was measured at 0.04 and 0.4 lux. After dark adaptation for 2 minutes, measurements were performed with each device by two examiners. Interobserver agreement, instrument agreement, and repeatability were analyzed.

RESULTS: Mean pupil diameter was 6.63 \pm 0.68 mm, 6.24 \pm 1.01 mm, and 6.99 \pm 0.67 mm at 0.04 lux and 6.22 \pm 0.74, 4.64 \pm 1.04, and 6.73 \pm 0.72 mm at 0.4 lux with the Colvard, Procyon, and Neuroptics pupillometers, respectively. The interobserver disagreement ranged within narrower limits for the Colvard (0.04 lux: -1.0 to 0.5 mm; 0.4 lux: -0.75 to 1.0 mm) and Neuroptics (0.04 lux: -1.0 to 0.5 mm; 0.4 lux: -1.7 to 0.7 mm) than for the Procyon (0.04 lux: -0.74 to 1.14 mm; 0.4 lux -1.82 to 2.4 mm) under both light conditions. Instrument agreement ranged within narrower limits for the Colvard versus Neuroptics (0.04 lux: -1.3 to 0.75 mm; 0.4 lux: -1.55 to 1.40 mm) than for the Neuroptics versus Procyon (0.04 lux: -1.06 to 2.69 mm; 0.4 lux: 0.18 to 3.69 mm) or Colvard versus Procyon (0.04 lux: -0.63 to 2.60 mm; 0.4 lux: -0.32 to 3.13 mm) at both light levels. At 0.04 lux, repeatability showed no measurement difference outside \pm 0.5 mm for the Colvard and Neuroptics; for the Procyon, 25% of consecutive measurements showed a difference $>\pm$ 0.5 mm. At 0.4 lux, 2.5% of consecutive measurements for the Colvard and 5% for the Neuroptics differed by $>\pm$ 0.5 mm; for the Procyon, 13% of measurements differed by more than this amount.

CONCLUSIONS: Pupil diameters under both light conditions were largest with the Neuroptics pupillometer and smallest with the Procyon. The most "examiner independent" Procyon pupillometer performed poorly. The underestimation of the pupil diameter might have severe consequences for refractive surgery patients. ***The Neuroptics pupillometer showed a high interobserver agreement and repeatability and therefore high safety.***