# Pupil Reactivity

**Pupil reactivity** refers to the change in pupil size in response to light stimulus. It is a fundamental component of the neurological examination and provides key insights into brainstem function and intracranial dynamics.

## Assessment

- Use a penlight to shine light into each eye from the side.
- Observe for:
  - **Direct response**: constriction of the illuminated pupil.
  - **Consensual response**: simultaneous constriction of the opposite pupil.
- Evaluate the **speed** and **symmetry** of the response.

## Normal Response

- Pupils constrict briskly and equally to light.
- Indicates intact cranial nerves II (optic) and III (oculomotor), and midbrain integrity.

## Abnormal Findings

| Pattern | Description | Possible Causes |
|---|---|---|
| Fixed and dilated | No response to light | Uncal herniation, CN III palsy, brain death |
| Bilateral dilated, non-reactive | No response in both pupils | Severe hypoxia, anticholinergic overdose |
| Pinpoint, non-reactive | Very small, fixed pupils | Pontine hemorrhage, opioid toxicity |
| Sluggish reactivity | Slow constriction to light | Raised ICP, early herniation |

## Clinical Relevance

- Early detection of neurological deterioration (e.g. herniation syndrome).
- Monitoring in ICU and neurocritical care settings.
- Prognostic value in traumatic brain injury and coma.

## Related Pages

- glasgow_coma_scale
- cranial_nerve_examination
- brain_herniation_syndromes

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The Neurological Pupil index, or NPi, is an algorithm developed by NeurOptics, Inc., that removes subjectivity from the pupillary evaluation. A patient's pupil measurement (including variables such as

size, latency, constriction velocity, dilation velocity, etc.) is obtained using a pupillometer, and the measurement is compared against a normative model of pupil reaction to light and automatically graded by the NPi on a scale of 0 to 5. Pupil reactivity is express numerically so that changes in both pupil size and reactivity can be trended over time, just like other vital signs.