

Presented at ARVO '94,
Sarasota, Florida

1. Purpose

Evidence is accumulating that "intelligent" visual operations (e.g., determination of 3D orientation, lighting direction, and shadows) can be carried out rapidly at early levels.

Visual interpretation would be facilitated if highlights could be identified early on, and distinguished from "real" scene edges.

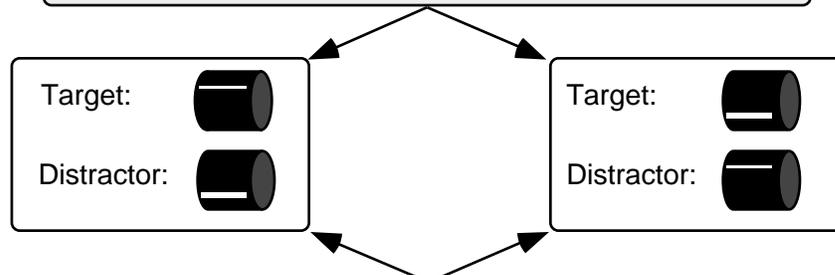
Question:

Are highlights identified by processes carried out rapidly at early levels?

2. Methods

Visual search for target with high/low stripe.
- 4 blocks of 60 trials each

Image: items differ only in position of stripe.
- search should have *same* speed
in the two conditions.



Scene: items differ in highlight direction.
- search may have *different* speed
in the two conditions.

3. Results

Target lit from above

Target: Distractor:

Target lit from below

Target: Distractor:

Search is slow when target corresponds to "normal" lighting — lighting from *above*. This could be due to an inability to signal "normal" lighting (obtained via highlights), or a discounting of "normal" highlights.

Search is fast when target corresponds to "abnormal" lighting — lighting from *below*. This could be due to an explicit signalling of "abnormal" lighting (obtained via highlights), or a discounting of distractor highlights.

Visual search relatively easy for targets with white stripe on bottom. Indicates search influenced by highlights.

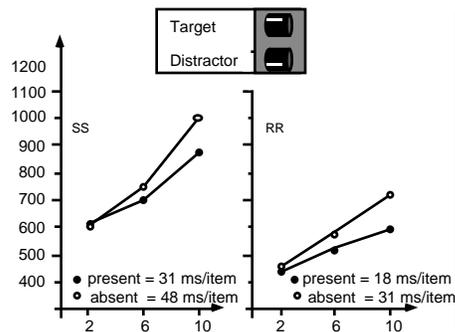
a. White Stripe + Black Cylinder



- stripe interpretable as highlight
- lighting source from above



- stripe interpretable as highlight
- lighting source from below



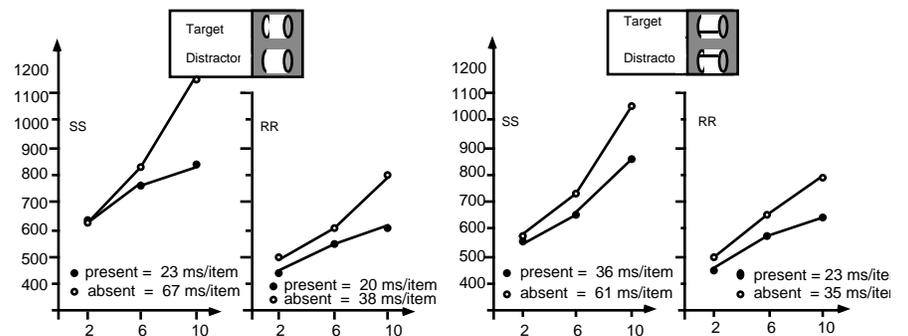
b. Black Stripe + White Cylinder



- stripe not interpretable as highlight
- surface marking on upper side

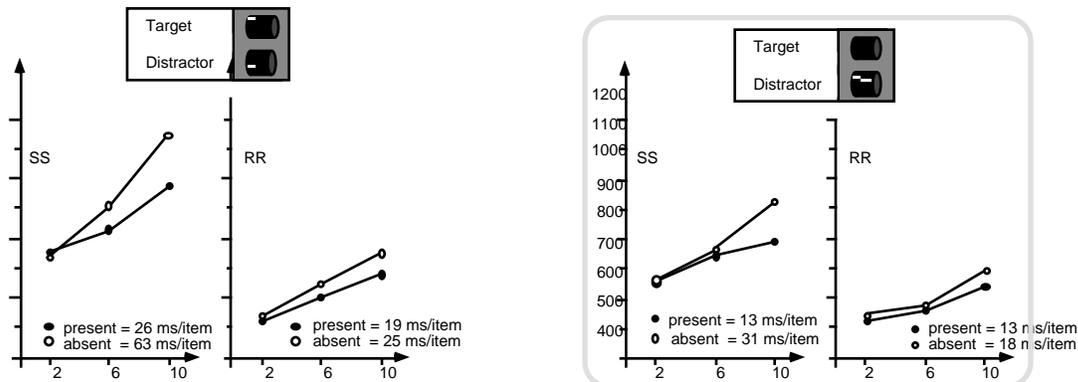


- stripe not interpretable as highlight
- surface marking on lower side



Visual search equally hard for targets with high or low dark stripe. Indicates search based on image lines or surface stripes.

4. Extensions



Visual search relatively easy for targets with broken white stripe on bottom.
Not as fast as for unbroken white stripe.
- possible effect of surface consistency.

5. Conclusions

A. Highlights are rapidly identified at early levels of visual processing.

Evidence: asymmetry in search rates
- only for white stripes.

B. Two different factors may be involved:
(i) lighting direction
(ii) consistency with surface

Evidence: (i) search faster for items with white regions on bottom
(ii) search fastest for cylinders with straight-line stripes.