



Saccadic Selectivity without Identification: Unconscious Perception?



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Introduction

We recorded eye movements in a visual search task to investigate unconscious perception. The study was designed to substantiate the problems related to the classical dissociation paradigm.

For more than 100 years, the **dissociation paradigm** has been the predominant approach to study unconscious perception. Typical experimental design:

C: a measure of conscious perception

U: a measure of unconscious perception

Dissociation: if **U(+)** and **C(-)** then unconscious perception (+)

Example: semantic priming without stimulus detection

The paradigm is flawed by two major problems, both related to **C**: the *validity* (assumption of exhaustiveness & exclusiveness) and *null sensitivity* of that measure (Reingold & Merikle, 1988).

Reingold & Merikle (1988) proposed an alternative approach - the **relative sensitivity approach** which is based on the following minimal a priori working assumption:

The sensitivity of a **direct** discrimination is assumed to be **greater than or equal to** the sensitivity of a **comparable indirect** discrimination to **conscious**, task relevant information.

Based on this working assumption, an unconscious influence is implicated whenever an **indirect** measure is **more sensitive** than a **comparable direct** measure to the same perceptual discrimination.

Schematic: if **indirect > direct**, then unconscious perception (+)

The minimal assumption underlying the relative sensitivity approach gives it an important methodological advantage over the association paradigm.

Method

Apparatus. The eyetracker employed in the experiment was the SR Research Ltd. EyeLink system. The system operates at a sampling rate of 250 Hz). It measures a participant's gaze position with an average error of less than 0.5 degrees of visual angle.



Stimuli and design.

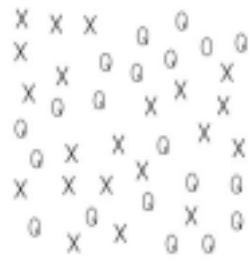
The **search target** was an **O**.

20 **Qs** served as similar distractors;

20 **Xs** were used as dissimilar distractors.

Figure 1a serves as an example display which also illustrates the **no-mask condition** (items fully visible for 5 sec).

1 Sample Displays



a) unmasked display



b) masked display

There were six masking conditions which differed in terms of the **exposure duration**: 33 ms vs. 50 ms vs. 67 ms vs. 83 ms vs. 100 ms vs. 117 ms.

First, all display items were superimposed by a mask, see Figure 1b for an example. The subjects could **unmask** the information by **moving their eyes**. The information remained unmasked depending on the exposure duration condition. Then the items were masked again, subjects moved their eyes in order to unmask the items again etc. After 5 seconds the stimuli remained masked.

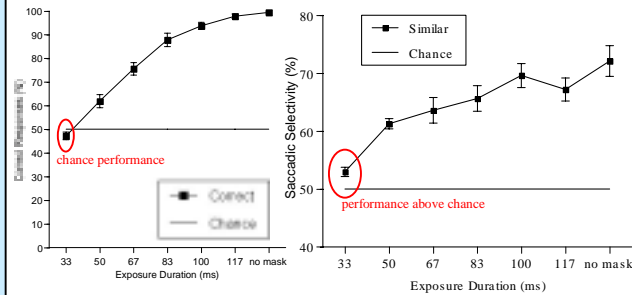
Procedure. Participants were asked to look for the target and indicate whether it was on the left or right side of the display.

Results

The **left-right decision** served as the **direct measure** of perception. Figure 2a shows the frequency of correct left-right decisions as a function of the exposure duration condition.

In the shortest exposure duration condition, subjects performed on chance level ($t(7) = -1.76, p = .122$). Otherwise (exposure duration > 33 ms), subjects performed better than chance ($t(7) \geq 4.3, p \leq .003$).

2 Experimental Results



a) left-right decision b) saccadic selectivity

Saccadic selectivity towards similar distractors served as the **indirect measure**. Subjects performed better than chance in all exposure duration conditions ($t(7) \geq 3.7, p \leq .007$), see Figure 2b. They fixated similar distractors more often than dissimilar ones, also in the shortest exposure duration condition. Consequently, saccadic selectivity occurred before accuracy in the left-right decisions.

Discussion

The result pattern is compatible with both the **indirect-without-direct** data pattern required by the **dissociation paradigm** as well as the **indirect-greater-than-direct** data pattern required by the **relative sensitivity approach**. The latter approach evades the methodological problems the classic approach is flawed with. Whether our direct and indirect measures are **comparable** (as required by the relative sensitivity approach) remains debatable.

Reingold, E. M., & Merikle, P. M. (1988). Using direct and indirect measures to study perception without awareness. *Perception & Psychophysics*, 44, 563-575.
Shen, J., Reingold, E. M., & Pomplun, M. (2000). Distractor ratio influences patterns of eye movements during visual search. *Perception*, 29, 241-250.