Masked Priming Awareness Assessed with Discrimination and the PRP

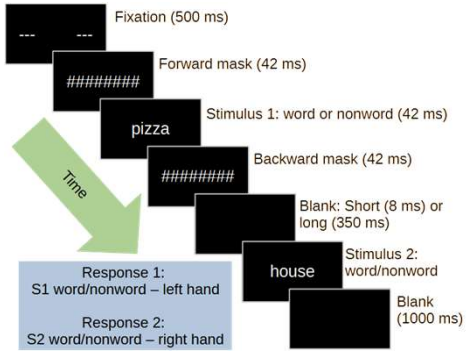
Gary D. Fisk - Georgia Southwestern State University
Steven J. Haase - Shippensburg University

Introduction

Masked priming has been used for decades to study potentially unconscious perceptual processing. Assessing the degree of masked stimulus awareness can take a variety of approaches: self-reports, direct tasks (e.g., prime discrimination), and rating scales (e.g., Perceptual Awareness Scale). Unfortunately, all of these methods have shortcomings. The present experiments combine masked stimulus discrimination (word vs. nonword; a direct task) with the Psychological Refractory Period effect (PRP; Pashler, 1994) in a hybrid paradigm.

Hypothesis: Discrimination accuracy plus the PRP effect will be more sensitive and informative for the assessment of masked prime stimulus awareness than discrimination accuracy alone.

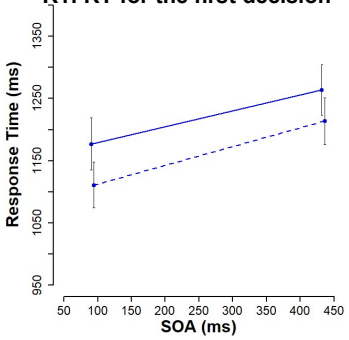
Methods



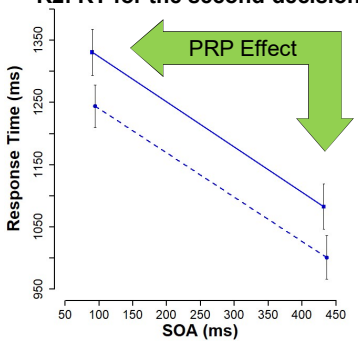
Young adult participants (N = 47) viewed a briefly presented, masked word or nonword stimulus (S1; 42 ms) that was immediately followed by a second unmasked word or nonword stimulus (S2). The first response (R1) was a time-urgent lexical judgment (word or nonword?) of S1 with the left hand. The second response (R2) was a time-urgent lexical decision of S2 performed with the right hand. The R1 – R2 stimulus onset asynchrony (SOA) conditions were either 92 or 434 ms.

Results

R1: RT for the first decision



R2: RT for the second decision

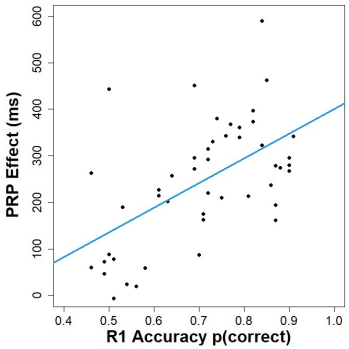


#1. For R1, masked stimulus decision response times were slower for the long SOA. In contrast, R2 was slower for the short SOA: the PRP effect.
Response x SOA interaction: $F(1, 46) = 5005.8$, $p < .001$

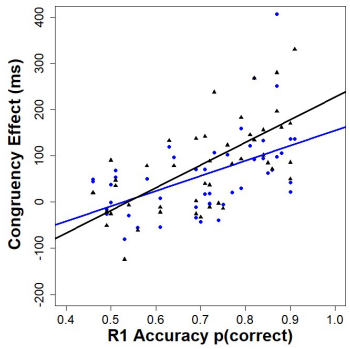
#2. A congruency effect occurred, with slower responses on incongruent trials.
Congruency main effect: $F(1, 46) = 24.98$, $p < .001$

#3. Stimulus masking decreased S1 visibility.
R1 discrimination accuracy < R2: $M = .71$ vs. $M = .92$, $F(1, 46) = 152.3$, $p < .001$.
R1 short SOA < R1 long SOA: $M = .66$ vs. $M = .75$, Response x SOA $F(1, 46) = 36.8$, $p < .001$

PRP



Congruency



#4. R1 discrimination accuracy is correlated with PRP and congruency.
PRP: $r = .56$, $p < .001$; R1 congruency: $r = .41$, $p < .001$; R2 congruency: $r = .55$, $p < .001$

#5. R1 discrimination accuracy was above chance-level performance (.50).
Short SOA: $t(46) = 8.49$, $p < .001$, $d = 1.24$; Long SOA: $t(46) = 10.62$, $p < .001$, $d = 1.55$

Discussion

The PRP effect occurs when a first stimulus requiring a response occurs in close temporal proximity to a second stimulus requiring a response. This robust phenomenon was comparable in size to a Stroop effect.

Higher levels of masked prime discrimination accuracy are associated with larger PRP and priming effects, suggesting a possible processing bottleneck or cost of awareness. Eliminating awareness of the masked stimulus is thus likely to also eliminate both PRP and priming effects. This dose-response dependency is evidence against the possibility of purely unaware perceptual processing.

The present results do not provide a strong test of unconscious perception because discrimination accuracy was above null awareness (i.e., R1 accuracy was greater than .50). However, these relationships suggests that PRP effects and priming effects will be decreased or zero when discrimination sensitivity is at or near null awareness. The possibility of measurable perception at lower visibilities might be investigated in future studies.

Reference

Pashler, H. (1994). Dual-task interference in simple tasks: data and theory. *Psychological Bulletin*, *116*(2), 220-244. doi: 10.1037/0033-2909.116.2.220

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