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# Who's got the global advantage? Visual field differences in processing of global and local shape

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## Introduction

In 1979 Martin<sup>a</sup> reported a right visual field (VF) advantage for local level responses and a left VF advantage for global level responses in Navon's classical paradigm<sup>b</sup> with compound letters (Figure 1). These findings have since been confirmed in split-brain patients, in patients with unilateral brain damage, and in functional imaging with normal subjects<sup>c</sup>. Despite this apparent convergence, VF differences in normal subjects seem flimsy and are reported in some studies but not others<sup>d</sup>. This inconsistency may reflect small effects combined with small samples.

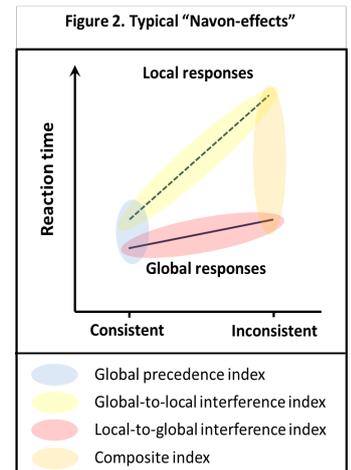
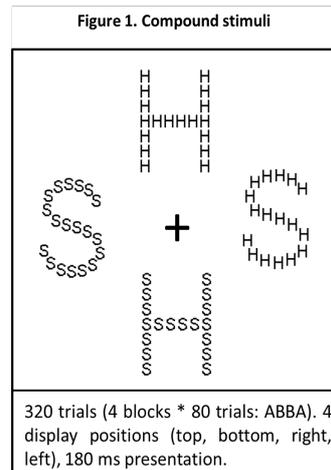
## Method

We examined four indexes (standardized differences;  $d$ ) derived from Navon's paradigm (Figure 2) in a large sample ( $n = 337$ ) of right-handed psychology students (261 females; mean age = 23 / SD = 4.6).

- Global precedence (RT on Local consistent trials – RT on Global consistent trials).
- Global-to-local interference (RT on Local inconsistent trials – RT on Local consistent trials).
- Local-to-global Interference (RT on Global inconsistent trials – RT on Global consistent trials).
- Composite index (RT on Local inconsistent trials - RT Global on inconsistent trials).

## Results

We obtained the effects usually found in Navon's paradigm (Figure 2 & Table 1). Significant VF differences were observed for the global-to-local interference index but not for the global precedence index (Table 2 & Figure 3).



Index	Mean ( $d$ )	95% CI	% $d > .2$	Reliability
Global-Local Precedence index	.58	.54, .63	83	.82
Global-to-Local Interference index	.59	.56, .62	91	.69
Local-to-Global Interference index	.14	.12, .16	37	.20
Composite index	1.0	.95, 1.1	94	.89

Table 1. Mean values (Cohen's  $d$ ) and 95% confidence intervals for the four indexes derived from Navon's paradigm. Also shown is the percentage of individuals who had a score above  $d = .2$  on the indexes and the Spearman-Brown-corrected split-half reliability associated with the indexes.

Contrast	$M_{Dif}$	95% CI	$t$	$p$	$d_z$
Global-Local Precedence index [left-VF – right-VF]	.03	.02, -.08	1.14	.256	.06
Global-Local Precedence index [lower-VF – upper-VF]	.05	.03, -.005	1.79	.074	.1
Global-to-Local Interference index [left-VF – right-VF]	.14	.08, .19	4.87	.000	.27
Global-to-Local Interference index [lower-VF – upper-VF]	-.07	-.13, -.01	-2.47	.014	.13

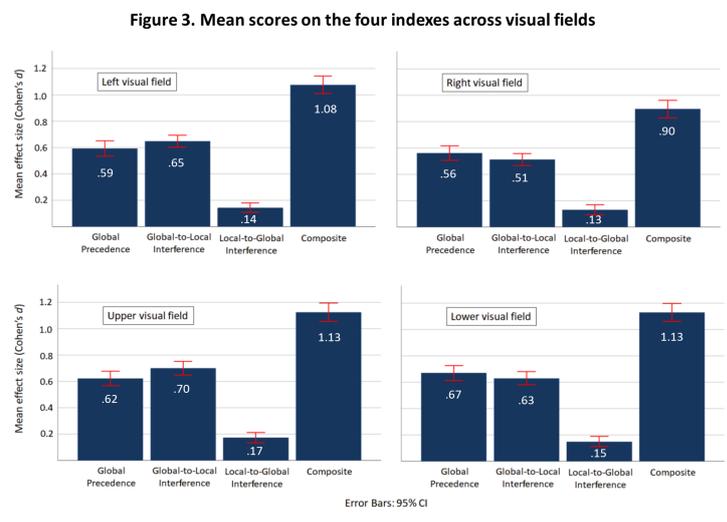
Table 2. Statistics (paired-sample  $t$ -test) associated with the four contrasts examining visual field effects.

## Conclusions

- The pattern of effects is rather similar across VFs (Figure 3).
- No evidence for a left VF / right hemisphere advantage for global shape processing per se (higher global precedence scores).
- Evidence for greater global-to-local interference effects in left vs right VF and upper vs. lower VF (right hemisphere ventrally).

## Speculation

VF effects in Navon's paradigm may not reflect a general right hemisphere primacy for global shape processing (and left hemisphere primacy for local shape processing). Instead the VF effects might reflect that the right hemisphere is more efficient in integrating information at different spatial scales making it harder to resolve conflicts when information at different levels turn out inconsistent.



a. Martin (1979). *Neuropsychologia*, 17: 33-40.

b. Navon (1977). *Cognitive Psychology*, 9: 353-83

c. Ivry & Robertson (1998). *The two sides of perception*. Cambridge: MIT Press.

d. Blanca & Lopez-Montiel (2009). *Span J Psychol*, 12, 21-31.