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Hemispheric Asymmetries in the Attentional Blink

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Abstract

The *attentional blink* (AB) refers to a decrement in detecting the occurrence of a probe item if it closely follows a previous target item in a stream of stimuli in rapid serial visual presentation (RSVP). In a series of experiments I investigated the question of hemispheric asymmetries in the AB.

Experiment 1 was a simplification of the experiment by Raymond et al. (1992) to determine whether the particular stimuli and task conditions of my study would produce an AB. In Experiments 2 and 3, two RSVP streams were presented in parallel, one in each visual field. The AB occurred only when participants both identified and located the target, and not when they simply located it. When targets and probes were both presented in the right visual field (RVF), the typical AB pattern was obtained, sparing probes in the first post-target location ("lag 1 sparing"). However, the AB was greatly attenuated when both target and probe were in the left visual field (LVF). When target and probe were in different spatial locations, there was a strong decrement in detecting the probe in the first post-target position—again more marked in the RVF. Cross-stream decrements may reflect the transient effects of shifting attention, while the AB itself appeared to be largely restricted to within-stream sequences, and to processing by the left cerebral hemisphere.

Experiment 4 was a further behavioural study, in which I examined differences in functional cerebral asymmetries modulated by gonadal steroid hormones during the menstrual cycle in women. Twenty-one right handed women, with regular menstrual cycle, were tested with a double RSVP task (one stream in each visual field) during the low steroid menses and the high steroid midluteal phase. An AB was obtained bilaterally in the midluteal phase, while during menses the probe detection deficit was evident only

in the RVF. Low steroid levels appeared to stabilize functional cerebral asymmetries. In contrast, high levels of estradiol and progesterone in the midluteal phase appeared to reduce functional asymmetries due to a selective enhancement of the AB in the right hemisphere.

In Experiment 5 and 6 I recorded event-related potentials (ERPs) to examine the temporal course of the AB. Probe-related ERPs were compared between the control condition and the experimental condition when the probe was presented in the blink period (post-target position 2-4) and in the no-blink period (post-target position 6-8). In the control condition in which the subjects were told to ignore the target, there was a negative peak around 300 ms following the probe, regardless of whether the probe was presented during the blink phase or during the no-blink phase. The same peak was found for the experimental condition when the probe was presented during the no-blink phase, but was missed for probes presented during the blink phase. This finding provides strong evidence that the AB reflects an impairment in a postperceptual stage of probe processing, probably at the stage of working memory. I replicated the finding (Vogel, Luck, & Shapiro, 1998) that the AB and the P3 elicited by the target component are related. Source localisation of electrophysiological activities using low-resolution electromagnetic tomography (LORETA; Pascual-Marqui, Michel, & Lehmann, 1994) revealed reduced activation during the AB in the left cerebral hemisphere when letters were used as stimuli, whereas the right hemisphere showed reduced activation when symbols were used.

List of Symbols/Abbreviations

AB	Attentional blink
Ag	Silver
AgCl	Silver chloride
ANOVA	Analysis of variance
BA	Brodmann area
β	Regression weight
CC	Control condition
CSTM	Conceptual short-term memory
C_z	Common vertex
EC	Experimental condition
EEG	Electoencephalogram
EOG	Electooculomogram
ERPs	Event-related potentials
fMRI	Functional magnetic resonance imaging
GABA	Gamma-amino-butane-acid
GFP	Global field power
IPL	Inferior parietal lobe
LORETA	Low-resolution electromagnetic tomography
LQ	Asymmetry index
LTM	Long-term memory
LVF	Left visual field
N1	Negative deflection about 100 ms
N400	Negative deflection about 400 ms
n.s.	Not significant
N_z	Nasal vertex
P1	Positive deflection about 100 ms
P3	Positive deflection about 300 ms
PCA	Principal component analysis
PMS	Premenstrual syndrome
RSVP	Rapid serial visual presentation

RVF	Right visual field
SD	Standard deviation
sess	Session
SOA	Stimuli onset asynchrony
STC	Short-term consolidation
STCI-S18	State-trait-cheerfulness-inventory
STG	Superior temporal gyrus
STM	Short-term memory
TW	Time window
VHF	Visual half field
VSTM	Visual short-term memory

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