

## **Impairment of attention choice in left spatial neglect patients: A behavioral study.**

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### **Abstract**

The aim of this study was to explore the changes in object-based and space-based attention choice in left spatial neglect. Eleven subjects with left spatial neglect were designated as viewer-centered neglect (viewer-centered group, n=5) or combined viewer-centered with object-centered neglect (combined group, n=6). All recruited subjects completed a modified cue-target paradigm, and their Response Times (RTs) to valid and invalid cues were recorded and analysed. The mean RT for targets located in the left space was longer than the mean RT for targets in the right space, especially in the combined group. Furthermore, with an invalid cue prompt, the RT was longer when attention was shifted between objects than when shifted within objects in any group, regardless of targets in left or right spaces. However, when attention shifted towards the left, the RT increased. Subjects with left spatial neglect manifest impairment of space-based attention choice and a disengagement disorder of the right space (or engagement disorder of the left space).

**Keywords:** Left spatial neglect, Attention choice, Object-based attention, Space-based attention.

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### **Introduction**

Left spatial neglect is a common attention disorder after right hemisphere stroke [1-3]. The ability to focus one's attention on important environmental stimuli, whether space-based [4] or object-based [5], while ignoring irrelevant stimuli is fundamental to human cognition and intellectual function [6]. Unilateral spatial neglect patients always show viewer-centered neglect or stimulus-centered neglect [7] and visual input is represented in two modes simultaneously [8], which may be relevant to different attention selection disorders [9].

Schindler et al. [10] used a modified experimental paradigm on patients with strokes of the right hemisphere, including patients with left spatial neglect, no spatial neglect, and healthy controls. The researchers found that only those patients with left spatial neglect had disorders in transferring their attention between objects, rather than within objects. Their results showed that the attention disorder was object-based rather than space-based. Egly et al. [11] modified the classical cue-target paradigm to show that both space-based attention and object-based attention could be defined in the same experimental paradigm. The patients in Schindler's study were not grouped by their neglects, which would be considered an influencing factor in this study to analyse the differences in choice by patients with different neglect models.

### **Materials and Methods**

#### **Patient characteristics**

This study comprised 11 cases of left spatial neglect caused by right-hemisphere stroke: 9 males and 2 females, all of whom had normal vision or vision corrected to normal. Other patient characteristics included age ( $51.7 \pm 11.82$  y; range, 32-66 y), years of education ( $11.5 \pm 3.15$  y), Mini-Mental State Examination (MMSE) score ( $27.1 \pm 1.93$ ), and handedness (10 patients were right-handed, and 1 was left-handed). This study was conducted in accordance with the declaration of Helsinki. This study was conducted with approval from the Ethics Committee of Hebei General Hospital. Written informed consent was obtained from all participants. Because this study required patients to cooperate, we performed relatively strict screening. All patients were in good physical and mental condition; therefore, no patients were excluded from the study.

Patients showed typical symptoms of left spatial neglect, such as watching the right space (or staring at the right) without awareness while the head rolled to the left, eating food on the right side, ignoring the contents of the right side of the paper while reading, etc. Neglect tests included line cancellation, line bisection, the clock drawing test, star cancellation, gap detection, and scene copy testing [12,13]. If positive results were shown in at least two of the tests above, the patient was