

The Effect of the Left-Field Eye Patching on Left Spatial Neglect

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Introduction

This report is the first study to investigate the effect of neglected-field eye patching for a patient with hemispatial neglect. In previous studies [1-6], right-field eye patching has been reported as technique to improve left spatial neglect. This technique was based on the concept of making left space attention easier by reducing excessive rightward attention. However, a definite opinion about the effect of the right-field eye patching has not been obtained.

Bisiach et al. [7] reported that patients with left spatial neglect selected well-shaped drawings in the judgement of their favorite drawings, although they had not been able to detect left-sided differences in paired drawings. This result shows that patients with left spatial neglect are insufficiently able to pay attention to visual information in the left space intentionally, although they take in the information unintentionally.

Corbetta et al. [8] mentioned that visual attentional function consists of top-down neural mechanisms which involve intentional attention and bottom-up neural mechanisms which involve unintentional attention. According to the bias competition model by Desimone et al. [9], top-down neural mechanisms control the amount of visual information by adjusting bottom-up neural mechanisms in order to manage performance appropriate activities using limited mental resources. Patients with stroke possess only limited mental resources because of decreased cerebral metabolism. Consequently, patients with stroke seem to be able to achieve better attention intentionally by reducing the amount of visual information.

The purpose of this study was to investigate the response to visual attention tests among different hemi-field eye patching conditions through a case with left spatial neglect.

Case Report

The case was an 86 year old right-handed woman. She had severe left hemiparesis and hemihypoesthesia with stroke. Additionally, she also had left spatial neglect without hemianopia. Measurements involved in this study were obtained 5 months after stroke onset.

Hemi-field eye patching glasses were made by attaching paper to standard glasses containing non-corrective clear lenses. Measurements were performed in the following 3 conditions: right-field eye patching, left-field eye patching, and no patching. Visual attention tests used were the line-bisection test, the line-crossing test, the star-cancellation test, and the letter-cancellation test including the behavioural inattention test.

Results

The primary results in this study were as follows (Table 1).

	NP		RP		LP	
	Left	Right	Left	Right	Left	Right
Number of omission errors	10	7	6	5	7	1

Table 1: Number of omission errors in the letter cancellation test (NP=No patching condition; RP=Right-field eye patching condition; LP=Left-field eye patching condition; Left=left half of the sheet of paper; Right=Right half of the sheet of paper).

- In the crossing test, there were no omission errors in all conditions.
- In the letter-cancellation test, the number of omission errors in two hemi-field eye patching conditions was lower than in the no patching condition.
- In the right half of the sheet of the letter-cancellation test, the number of omission errors in the left-field eye patching condition was markedly lower than in the right-field eye patching condition.

Discussion

The letter-cancellation test is a more difficult task than the line crossing test because it is composed of a dense array of letters and many kinds of obstructive letters. Therefore, the letter-cancellation test requires many mental resources to perform. That is, many omission errors in the no patching condition would appear because it is too much visual information to pay attention to intentionally.

In comparison of the two hemi-field eye patching conditions, the left-field eye patching markedly reduced omission errors in the right half of the sheet, although there was no difference between the two hemi-field eye patching conditions in the left half of the sheet. Since left spatial neglect is based on the rightward bias of spatial attention, patients with left spatial neglect are likely to attend to rightward objects and space. Moreover, the visible eye field in the left-field eye patching condition should be in the rightward space. Therefore, omission errors in the left-field eye patching condition would have decreased in the right half of the sheet.

Smania et al. [10] suggested the Sprague effect theory, the inter-hemispheric balance theory, and the visual exploration constraint theory as a mechanism of the eye patching effect for hemispatial neglect. However, this research was focused on spatial inattention. Robertson et al. [11] reported that patients with left spatial neglect were influenced by spatial and non-spatial attention. Other researchers [12-15] have reported that training for non-spatial attention had improved not only non-spatial inattention but also spatial inattention in left spatial neglect. In short, the case in this study seems to have involved primarily non-spatial inattention.

Further research should incorporate many patients with left spatial neglect to clarify the effect of left-field eye patching for left spatial neglect, including the relationship between lesion and spatial neglect.

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