Body Image of the Unilateral Spatial Neglect Patients with Self-portrait Drawing

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Abstract. The left side neglect tendency was examined by the ability to draw self-portraits in six unilateral spatial neglect (USN) patients with the patients’ eyes open and closed. With the eyes open, all the six patients were able to draw their self-portraits. All of those self-portraits were their own visual images, in which clear defects were observed on the left side of the body. With their eyes closed, however, three of them managed to draw their self-portraits but the other three failed to do so. The self-portraits drawn by the three patients with eyes closed had more defective parts than those drawn with eyes open. These results indicate that USN patients have difficulty not only in memorizing the visual scene but also in recalling their body image. Furthermore, it is also interesting to observe the left-right inversion in the self-portrait drawing.

Key words: Body image, Unilateral spatial neglect, Self-portrait

INTRODUCTION

Unilateral spatial neglect (USN) is a relatively common deficit which often follows unilateral brain damage1–3). Even though USN was a well-known neurological disorder4), it was only in the 1970s that the clinical relevance of this deficit and its theoretical implications on our understanding of spatial cognition began to be acknowledged.

In the 1970s, two main hypotheses of more specific interpretations of neglect were put forward. Neglect was considered as a disorder of the attentional vector pointing towards the ipsilesional side of space5–7), or failure of orientation toward the contralesional hemispace8, 9). The other interpretation was that neglect was alternatively interpreted in terms of a defective internal representation of contralesional space. The representational standpoint was definitively outlined by Bisiach and Luzzatti10), who instructed two patients with USN to image the scene of the Milan Dome Square first while facing, and then not facing the scene. Bisiach and Luzzatti observed that the left side was consistently neglected even in visual imaging. Based on this neuropsychological finding, the hypothesis of mental imaging disorder was proposed as a mechanism causing USN. An important insight into the attentional nature of visual neglect came from Bisiach and Luzzatti, who suggested that visual neglect may apply to representation rather than sensation, perception, or memory10). Therefore, neglect may affect the contralateral side of internal representation in the absence of sensory input and may be reflected in
mental imagery.

In the present study, instead of the mental imaging of exogenous scenes such as that investigated by Bisiach and Luzzatti\textsuperscript{10, 11}, the ability of six patients with USN to draw self-portraits, first with their eyes open and then closed, was investigated for the purpose of analyzing the body image, which is the internal psychic image of the self. Unlike copying a mirrored image of one’s face or body, this self-portrait drawing is characterized by the need to convert one’s own body image into visual images for drawing a self-portrait.

**METHODS**

The subjects studied were six inpatients who had suffered from cerebral apoplexy and had unilateral spatial neglect and left hemiplegia (all right-handed). Computer tomography (CT) revealed that all the patients had parietal lobe damage and motor disturbance of the left upper and lower limbs and they were using a wheelchair at the time of the self-portrait drawing. All of them could maintain the sitting position by right shifting without assistance. Symptoms of USN were observed in all subjects in Albert’s line cancellation test and the line bisection test performed as a desk examination (Table 1). In Albert’s line cancellation test, all subjects left out more than one forth of the target lines on the paper in the left side. In the line bisection test, all subjects showed displacement to the right side from the center of the line; however, neither asomatognosia nor pathologic agnosia was noted.

Each subject was seated at the desk in a room and observed by an examiner. Self-portrait drawing was performed under two conditions, first with the eyes open and then with the eyes closed. The patient held a pen with the right hand and drew his self-portrait vertically on A4-size paper. We instructed them orally to draw themselves from top to toe. The left and right sides of the completed self-portrait were orally confirmed with the patient.

**RESULTS**

Case 1: The self-portrait drawing was performed on December 10, 2001. At the time of the self-portrait drawing, the patient bisected a line (30 cm) at 11 cm to the right from the middle in the line bisection test and cancelled only one fourth of the right-hand portion of the line in the Albert line cancellation test, indicating USN. With his eyes open, the face, the right upper and lower limbs, and the right foot were drawn, but the left upper and lower limbs, the trunk, and the left foot were not depicted. When his eyes were closed, the contour of the face, the left and right upper limbs, the trunk, and the right lower limb were drawn, but the left lower limb, the left and the right foot, and the features were not drawn. The patient said that the right-hand side of the completed self-portrait was the left arm and foot. Thus, left-right inversion appeared in the drawing.

Case 2: The self-portrait drawing was performed on December 10, 2001. At the time of the self-portrait drawing, the patient bisected a line (30 cm) at 2 cm to the right from the middle in the line bisection test and cancelled only three fourths of the right-hand portion of the line in the Albert line cancellation test, indicating USN. With her eyes open, the face, the right upper and lower limbs, and the right foot were drawn, but the left upper and lower limbs, the trunk, and the left foot were not depicted. When her eyes were closed, the contour of the face, the left and right upper limbs, the trunk, and the right lower limb were drawn, but the left lower limb, the left and the right foot, and the features were not drawn. The patient said that the right-hand side of the completed self-portrait was the left arm and foot. Thus, left-right inversion appeared in the drawing.

**Table 1.** Results of a desk examination of subjects for unilateral spatial neglect

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>Type of crisis</th>
<th>Crisis day</th>
<th>Test day</th>
<th>Line bisection test</th>
<th>Albert’s line cancellation test</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>male</td>
<td>Cerebral infarction</td>
<td>June 21, 2001</td>
<td>December 10, 2001</td>
<td>11 cm right from the middle</td>
<td>the deletion of right side 1/4</td>
</tr>
<tr>
<td>71</td>
<td>female</td>
<td>Cerebral infarction</td>
<td>April 27, 2001</td>
<td>December 10, 2001</td>
<td>2 cm right from the middle</td>
<td>the deletion of right side 3/4</td>
</tr>
<tr>
<td>71</td>
<td>male</td>
<td>Cerebral infarction</td>
<td>January 12, 2001</td>
<td>December 10, 2001</td>
<td>6 cm right from the middle</td>
<td>the deletion of right side 1/4</td>
</tr>
<tr>
<td>77</td>
<td>male</td>
<td>Cerebral infarction</td>
<td>April 28, 2001</td>
<td>December 10, 2001</td>
<td>1 cm right from the middle</td>
<td>the deletion of right side 1/4</td>
</tr>
<tr>
<td>80</td>
<td>female</td>
<td>Cerebral infarction</td>
<td>April 9, 1999</td>
<td>March 20, 2001</td>
<td>11 cm right from the middle</td>
<td>the deletion of right side 1/4</td>
</tr>
<tr>
<td>54</td>
<td>male</td>
<td>Cerebral infarction</td>
<td>October 24, 1998</td>
<td>March 20, 2001</td>
<td>9 cm right from the middle</td>
<td>the deletion of right side 1/4</td>
</tr>
</tbody>
</table>

The test day was the execution day of the line segment bisection test, Albert’s line cancellation test and self-portrait drawing.
the completed self-portrait was the left arm and foot. Thus, left-right inversion appeared in the drawing.

Case 3: The self-portrait drawing was performed on December 10, 2001. At the time of the self-portrait drawing, the patient bisected a line (30 cm) at 6 cm to the right from the middle in the line bisection test and cancelled only one fourth of the right-hand portion of the line in the Albert line cancellation test, indicating USN. With his eyes open, the face and the right upper and lower limbs were drawn, but the left upper and lower limbs, the face, the trunk, and the left eye and foot were not depicted. When his eyes were closed, only the outline of the face was drawn. The patient said that the right-hand side of completed self-portrait was the left arm and foot. Thus, left-right inversion appeared in the drawing.

Case 4: The self-portrait drawing was performed on December 10, 2001. At the time of the self-portrait drawing, the patient bisected a line (30 cm) at 1 cm to the right from the middle in the line bisection test and cancelled only one fourth of the right-hand portion of the line in the Albert line cancellation test, indicating USN. With his eyes open, the face, the left and right upper and lower limbs, and the trunk were drawn, but the left eye and the feet were not depicted. The patient said that the right-hand side of completed self-portrait was the left arm and foot. Thus, left-right inversion appeared in the drawing. When his eyes were closed, the patient was not able to draw the self-portrait.

Case 5: The self-portrait drawing was performed on March 20, 2001. At the time of the self-portrait drawing, the patient bisected a line (30 cm) at 11 cm to the right from the middle in the line bisection test and cancelled only one fourth of the right-hand portion of the line in the Albert line cancellation test, indicating USN. With her eyes open, the face, the right upper and lower limbs, and the right side of the trunk were drawn, but the left upper and lower limbs, the left eye, the left half of the trunk and feet were not depicted. The patient said that the right-hand side of completed self-portrait was the left arm and foot. Thus, left-right inversion appeared in the drawing. When her eyes were closed, the patient was not able to draw the self-portrait.

Case 6: The self-portrait drawing was performed on March 20, 2001. At the time of the self-portrait drawing, the patient bisected a line (30 cm) at 9 cm to the right from the middle in the line bisection test and cancelled only one fourth of the right-hand portion of the line in the Albert line cancellation test, indicating USN. With his eyes open, the outline of the face, the right upper and lower limbs, and the right half of the trunk were drawn, but the left upper and lower limbs, the left side of the trunk, the feet, and the face were not depicted. The patient said that the right-hand side of the completed self-portrait was the left arm and foot. Thus, left-right inversion appeared in the drawing. When his eyes were closed, the patient was not able to draw the self-portrait.

**DISCUSSION**

Although all the subjects were able to depict their own portraits under the open eyes condition, they neglected various body parts on the left side. With their eyes closed, only three patients were able to draw their own portraits, but the depictions were obviously insufficient and many defects were noted when they were compared with those drawn with the eyes open. These results show that patients with USN find it very difficult to convert their own body images to visual images. The patients who showed strong left neglect in general desk examinations were not necessarily unable to make self-portraits, which indicates that drawing an object present before them and drawing visual images are mediated by different cerebral mechanisms. In particular, the reason for the difficulty in making a self-portrait with the eyes closed is thought to be that the contour of the body can be confirmed step by step during the depiction with the eyes open, whereas retention and sustainment of the visual images are continually required when the eyes are closed. To retain and sustain the visual images with the eyes closed, it is necessary to memorize the body contour under depiction, for a short time, using somatic sensation. It is possible that the patients are unable to pay attention to somatic sensation.

As mentioned above, Bisiach and Luzzatti reported that left spatial neglect was observed even in visual imaging in mental imagery of the scene of the Milan Dome Square. Reconciling the different possible reference frames of neglect is possible using the notion of representational neglect. Moreover, the bias to report fewer landmarks from the left side was apparent both when the patients...
imagined themselves standing with their backs turned on the cathedral, and when they were facing the cathedral from the opposite end of the square. This impairment was ascribed to brain damage on the side opposite to the mentally neglected hemispace. This paper had a huge impact, and research on neglect syndrome subsequently exploded as it became clear that the syndrome was highly relevant to theories of attention and space processing.

The results of the present study show that left spatial neglect appears when patients with USN convert not only visual landscapes but also their own body schemas to visual images. In addition, the visual image of the body is not egocentric but is allocentric, because all six patients depicted their own paralyzed side (left hand and foot) on the right-hand side of the space. Case 2 in particular, whose left elbow joint had a flexion contracture caused by hypertonia due to spasticity, depicted his left elbow in a flexed position very well (Fig. 1). This depiction of the left limbs on the right-hand side is a phenomenon of great interest, and such left-right inversion does not occur in the case of drawing a mirrored self-portrait.

In desk examinations of USN, an object is present in front of the eyes, whereas a target to pay visual attention to was not present in the self-portrait drawing in the present study. Therefore, patients had to convert their own body images to visual images for depiction. The results of the present study show that patients with USN have difficulty in visually imaging their own body images. The introduction of self-portrait drawing into clinical examinations is useful for easy confirmation of a patient’s visual image of his/her own body and can be used as an index for recovery from spatial neglect. In the treatment of USN, it is thought to be necessary to activate the psychic manipulation of visual images and moving images with eyes closed.

REFERENCES