

PANTOMIME INTERPRETATION AND APHASIA

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Abstract—In this study, 27 aphasic patients and 20 normal individuals took a drawn pantomime interpretation test. The scores made by aphasic patients were significantly lower than those of control subjects. The disorders observed could not be explained by the severity of the aphasic disorder considered at a communicative level, the onset time of the brain lesion or by lexical semantic disturbances. The authors suggest that one determinant is the 'plausibility between the represented gesture and the object chosen. The plausibility factor is probably not of a linguistic nature. This interpretation is discussed in the light of earlier investigations.

INTRODUCTION

SINCE aphasia has been scientifically investigated, two theoretical points of view exist concerning the specificity of aphasic disorders. According to the first theoretical approach, aphasic disorders are the result of a general disturbance of the symbolic function [1-3]. The second considers aphasia as a specific linguistic disorder [4-7], selectively affecting the processes of linguistic behaviour without affecting the non-verbal communication behaviour. This problem has been considered in several early and recent observations from the point of view of pantomime recognition. Their results are contradictory. For instance, JACKSON [8] and HEAD [2] viewed the impairment in pantomime recognition by aphasic patients as the result of a general disturbance that equally affected verbal and non-verbal communication. However ZANGWILL [9] and ALAJOUANINE and LHERMITTE [4] reported that severely aphasic patients may show intact non-verbal communicative behaviour. According to the latter there is no consistent relationship between verbal and non-verbal communication disorders.

The experimental approach to this problem does not provide clear and consistent results either. In DUFFY *et al.*'s study [10], aphasic patients, subjects with right brain lesions, subjects with subcortical lesions and normal individuals took a pantomime recognition test. A pantomime was executed by the examiner and the subjects were asked to point out among four drawings the object whose use was pantomimed. The results showed an important deficit among the aphasic patients which was proportional to the severity of the aphasia. In a subsequent study, GAINOTTI and LEMMO [11] partly confirmed this result. They found a more important impairment in pantomime recognition among aphasic patients as compared to non-aphasic subjects with left and right brain lesions, but this defect was much stronger in patients with semantic lexical disorders. The authors suggested that in some forms of aphasia there was a disorder in some general representative activity. This disorder

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had an effect both on verbal and nonverbal activities. Moreover, recognition and production abilities were not closely related, since 50% of subjects who could correctly produce the pantomimes were unable to recognize them. Finally, in a more recent study, VARNEY [12] reconsidered the problem, insisting especially on the relationship between pantomime recognition and reading comprehension. The relationship he observed was significantly higher than those existing between pantomime recognition and oral comprehension and between pantomime recognition and oral naming. This relationship, however, was not absolute. In some cases, the deficit in reading comprehension is not associated with a deficit in pantomime recognition, and in some cases, reading was significantly more impaired than pantomime recognition. The author suggests that reading comprehension impairment may have two different causes: a supralinguistic impairment (asymbolia), which would also affect non-verbal abilities, and a specific linguistic impairment which would only affect reading comprehension. This double cause explains why reading impairment should or should not be associated with deficits in pantomime recognition. In this paper, we reconsider Varney's hypothesis in an endeavour to identify some visuoperceptive aspects of the pantomime recognition test.

METHOD

Population

The experimental group consisted of 27 right-handed aphasic subjects (20 men and 7 women), ages ranging between 30 and 68 yr, with a mean of 54.77 yr. There were 14 cases of Wernicke's aphasia, 9 of Broca's aphasia and 4 of Global aphasia. The aetiology was vascular in 25 cases, tumoral and traumatic in two others. The presence of a unilateral brain lesion was assessed by the neurological examination and by the results of radiological tests (brain scan, angiography and computer axial tomography in most cases). The control group consisted of 20 normal subjects (16 men and 4 women) who had no neurological disease, ages ranging from 27 to 67 yr with a mean of 50.35 yr.

Test

Linguistic functions. All the aphasic patients took our standard examination test for aphasia.* To appraise the degree of aphasia, we used the "Aphasia severity rating scale" of GOODGLASS and KAPLAN [7], and classed the patients as follows: those with scores of 0, 1 and 2 were rated as "light", and those with scores of 3, 4 and 5 as "serious". Two comprehension scores were established, one in the oral modality, the other in the visual modality. In each modality, the patients were given seven identical orders, simple and complex, that were presented at two different times during the examination according to the modality. One point was awarded for each correct answer. The highest possible score was seven in each modality.

Pantomime recognition. Our material consisted in 12 drawings on white cards (16 × 20 cm) for the test and two additional drawings for the pre-test. On each card, the person represented makes a gesture involving the use of an object. There are three possibilities, and the patient must point to the correct one. The three stimuli are: the adequate object (AO), a semantic distractor object (SD), i.e. an object that has a conceptual relation with the adequate object, and a morphological distractor (MD), i.e. an object that has a morphological relation with the adequate object (but no conceptual relation). There are two types of gestures: those that have a morphological relation with the object (for example, in the gesture of drinking a bowl of soup, the hands encompass the form of the missing object), and those that do not show this relation (for example, in the gesture of holding an umbrella, the position of the hand does not refer to the form of the umbrella). The battery includes six gestures of each kind. In the category of morphological gestures, an additional distinction is established according to whether the adequate object is correctly oriented in relation to the depicted movement (three gestures) or whether its orientation is different (three gestures).

The two pre-test items are presented, and first executed by the examiner without verbal comments. The

*Our test includes some sub-tests of "L'examen de l'aphasie" by LHERMITTE and DUCARNE [13], and some other sub-tests are a French adaption of "Boston Diagnostic Aphasia Examination" (GOODGLASS and KAPLAN [7]). Our criteria for establishing a specific aphasia syndrome are the same as those of GOODGLASS and KAPLAN [7].

patient is asked to reproduce the two first items, then the test is pursued without the examiner interfering. All verbal comments made by the patient are carefully noted.

Finally, the plausibility of the distractors was measured as follows in 40 normal individuals (20 men and 20 women): every person represented in the test is presented with each distractor shown separately on a card. The test thus consists in 24 (12×2) cards. The 24 person-distractor items are presented at random. The subject is asked to look at each card and to indicate if the relation between the gesture and the object seems: either possible and usual, either possible but unlikely, or impossible. In this way, a three-point plausibility scale is obtained for all the pairs of our person-distractor test.

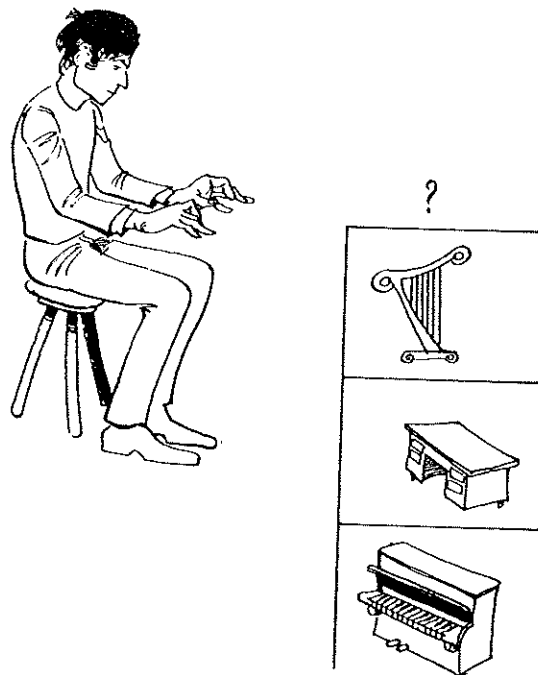


FIG. 1. The adequate object is the piano. The semantic distractor is the harp and the morphological distractor, the desk. Here, the position of the hands does not refer to the form of the piano.

RESULTS

The scores obtained with the pantomime recognition test by the control and aphasia groups are shown in Table 1.

Since only one control subject made more than one mistake during the pantomime recognition test, a score of 11 was considered as the cut-off point for discriminating "normal" from "pathological" results. Table 1 shows that 20 aphasic subjects (74%) scored below the cut-off point in this test. The difference between aphasic and normal subjects is highly significant when statistically examined (Mann-Whitney *U* Test, $z = 4.70$, $P < 0.001$).

Relationship between linguistic examination and pantomime recognition

In the aphasic group, we studied the associations between the severity of the aphasic disorders, the time of onset, the oral comprehension and written comprehension on one hand, and the pantomime recognition scores on the other hand. There appears to be no significant relationship between the severity of the aphasic disorder and the time of onset

Table 1. Distribution of the scores obtained with the pantomime recognition test by control and aphasia groups

Scores	Normal controls (<i>N</i> = 20)	Aphasic patients (<i>N</i> = 27)
12	17	5
11	2	2
10	1	3
9		4
8		4
7		3
6		2
5		1
4		2
3		1
1		
0		

(the criterion of time of onset was more or less than 2 months before test). Nor was any interaction effect observed as shown by a two-way non-orthogonal analysis of variance. The results are shown in Table 2.

The association between oral and reading comprehension scores and pantomime recognition tests was analysed with a Spearman rank-order correlation test. The correlation between oral comprehension and pantomime recognition was 0.48 ($P < 0.01$) and 0.64 ($P < 0.001$) between reading comprehension and pantomime recognition.

Table 2. Relations between severity, time of onset and pantomime recognition

	Two-way non-orthogonal analysis of variance		
	Mean square	<i>F</i>	Significance level
Effect of severity	18.62	2.87	$P < 0.104$
Effect of time of onset	10.89	1.67	$P < 0.208$
Interaction effect Gravity \times time of onset	0.58	0.89	$P < 0.768$

A qualitative analysis of errors made by aphasic patients along perceptive dimensions introduced in the test showed no significant pattern of errors, as shown in Table 3 in which the results are presented in relation to the aphasic syndromes.

It seemed therefore that the visual perceptive parameters introduced in the test do not provide an explanation for the errors made (presence or absence of a good orientation of the adequate object). Comparison of the results obtained by aphasic patients who had semantic lexical disorders (on the basis of semantic paraphasia evidenced by oral naming and/or observed in the spontaneous speech of the patient) with those who had no semantic difficulties showed no difference between these two sub-groups (Mann-Whitney *U* Test, $U = 87$ n.s.).

Table 3. Qualitative analysis of mistakes made by aphasic subjects

	Distractor chosen		Morphological relation between movement and object		Object orientation	
	Semantic	Morphological	+	-	+	-
Wernicke's aphasia (<i>N</i> = 14)	22	14	19	17	11	8
Broca's aphasia (<i>N</i> = 9)	19	18	21	16	12	9
Global aphasia (<i>N</i> = 4)	12	8	10	10	6	4
	$\chi^2 = 0.802$ n.s.		$\chi^2 = 0.260$ n.s.		$\chi^2 = 0.032$ n.s.	

In a final analysis, we compared the results of normal individuals in the plausibility pre-test with the mistakes made by aphasic patients. The results are given in Table 4. They show that the degree of plausibility influences the errors made, since the more a distractor was thought to be "impossible" by normal individuals in relation to the gesture represented, the less it was chosen by the patients. On the contrary, the more it was thought to be "possible and usual" or "possible but unlikely", the more it gave rise to errors.

Table 4. Correlation between distractor's plausibility and errors made by aphasic patients

Judgment of plausibility made by the 40 normal control subjects on each distractor stimulus	Erroneous distractor stimulus selections made by aphasic patients		
	Impossible	Possible but unlikely	Possible and usual
	-0.695	0.640	0.579
	<i>t</i> = 4.53 <i>s P</i> < 0.001	<i>t</i> = 3.90 <i>s P</i> < 0.001	<i>t</i> = 3.33 <i>s P</i> < 0.01.

DISCUSSION

In agreement with earlier studies [10-12] our results show a deficit among aphasic patients confronted with a pantomime recognition test. But we were unable to establish a relationship between the deficit and the severity of the aphasic disorder, or to show a relationship between the deficit observed and the different aphasic syndromes. However, as Varney did, we found a highly significant relationship between reading comprehension and pantomime recognition, and also a significant but less marked relationship between oral comprehension and pantomime recognition. The lack of relationship between impairment in pantomime interpretation and "severity" of aphasic disorder, as rated by the scale of Goodglass and Kaplan, contrasts with the double positive relationship between the degree of impairment in pantomime interpretation and our two language tests (oral and reading comprehension tests). These facts raise the problem of choice of criteria for measuring the severity of an aphasic disorder. Goodglass and Kaplan's scale evaluates a general level of communication with a mixture of verbal and non-verbal behaviour. Our oral and reading comprehension tests measure the severity of two more specific verbal disorders with few non-verbal components. Furthermore, the specific influence of the material presenta ion

through a visual channel is hard to determine. The qualitative analysis does not seem to emphasize the visual parameter of the pantomime test: there are no more morphological than semantic errors, and the presence or absence of morphological relation between the object and the pantomime does not allow a distinction to be made among the responses. In the same way, the orientation of the object does not play a discriminant role in the explanation of the errors. Apparently the explanation lies elsewhere: the plausibility of the distractor would play the main part. If we examine the two most difficult items, i.e. a subject eating an apple with a balloon to be blown up (10 mistakes) and a banana (6 mistakes) as morphological and semantic distractor respectively, and a subject greeting with his hat with an umbrella (10 mistakes) and a cup of coffee (5 mistakes) as semantic and morphologic distractor respectively, it was not the morphological aspect of the stimulus *per se* nor the semantic category to which it belonged that explained the errors made, but a wrong interpretation of the relation presumably existing between the movement and the object chosen.

For example, with regard to the first above-mentioned item, the balloon to blow up was chosen by an aphasic patient who said: "he blows up the balloon", and as for the second item, another patient chose the cup of coffee and said: "he calls the waiter" (for representation of greeting with a hat). It seems then that an inappropriate choice (morphological or semantic) was made more frequently if the proposed distractor and the movement were not absolutely incompatible (see Table 4). This explains why in our material, for one of the items, a trumpet was never chosen instead of a guitar, but that in another item, a harp was sometimes chosen instead of a piano. From a lexical semantic viewpoint, all four objects are music instruments, but each of them allows different gestures, more or less closely related. These gestural relations are not strongly expressed at a semantic lexical level. From this point of view, for example, we may say that the semantic relation between a trumpet and a piano is stronger than that between a trumpet and a banana, but that these last two objects have much more in common with respect to possible movements (for instance, both are related to the mouth, they can both be carried by a single individual, etc.).

Thus the most frequent confusions occur in relation to the plausibility of movement/proposed distractor relation. The plausibility probably obeys a logical pattern of movement/object relations, which are probably not strictly superposable to lexical semantic relations. Hence, if we wish to understand the parameters that influence the symbolic recognition of pantomime, we must first understand the mechanisms involved in this particular symbolic activity of pantomime recognition.

It is not surprising that the impairment in lexical semantics are not correlated with the wrong interpretation of the gestures. We think there is a clear-cut distinction between linguistic disorders and the pantomime recognition. This temporary conclusion is consistent with the theory of HATFIELD *et al.* [14] who, in another context, suggest that a distinction should be made between semantic knowledge and non-verbal knowledge. Our conclusion is also in agreement with the remarks of HÉCAEN [15] who, in the context of an analysis of gesture behaviour considered from the efferent side, proposed that various more or less conventional gestures codes may be disturbed without a parallel disorder in the linguistic code.

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RESUME

Dans cette étude, on administre à 27 patients aphasiques et à 20 sujets normaux un test d'interprétation de pantomimes dessinées. Les résultats des sujets aphasiques sont significativement inférieurs à ceux obtenus par les sujets contrôles. Les désordres observés ne s'expliquent ni par la sévérité de l'aphasie envisagée sous l'angle de la communication, ni par la durée du trouble aphasique, ni par les désordres de la sémantique lexicale. L'influence de plusieurs paramètres^{variables} de l'épreuve est examinée, mais il n'en résulte aucune interprétation des déficits. Les auteurs suggèrent que le déterminant principal des troubles est la plausibilité existant entre le geste représenté et le distracteur choisi. Ce facteur de plausibilité n'est probablement pas d'une nature linguistique. Cette interprétation est discutée en regard des recherches antérieures.

Deutschsprachige Zusammenfassung

In dieser Studie unterzogen sich 27 aphasische Patienten und 20 gesunde Probanden einem Test, bei dem gezeichnete pantomimische Darstellungen zu interpretieren waren. Die Leistungen der Aphasiker waren signifikant schlechter als die der Kontrollpersonen. Die beobachteten Ausfälle konnten nicht durch die Schwere aphasischer Beeinträchtigung auf Kommunikationsebene, den Zeitpunkt des Erwerbs der Hirnlaesion oder durch lexikalisch-semantiche Störungen erklärt werden. Die Autoren nehmen an, daß eine Determinante in der inneren Beziehung zwischen repräsentierender Geste und zugrundeliegender Intention zu suchen ist. Der Plausibilitätsfaktor ist wahrscheinlich nicht linguistischer Natur. Diese Interpretation wird im Lichte früherer Untersuchungen diskutiert.