

Influence of the Preposition in Language Comprehension
Subtests of the Pica

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The Porch Index of Communicative Ability (PICA) continues to be one of the most widely used evaluative tools in the diagnosis and management of aphasic disorders. In addition to determining the overall severity of aphasia, the PICA was designed, in part, for comparison of the patient's performances among language modalities.

In his description of the internal consistency of the PICA, Porch (1967a) stated that the subtests of the battery were designed to be homogeneous. In explaining the uses of the PICA in localizing lesions, Porch (1978) elaborated on the advantages of holding content constant throughout all of the subtests: "it is possible to make inter-subtest and inter-modality comparisons and interpretations which aren't possible when various modalities are tested with different stimuli and different content" (p.79). More recently, Porch (1981) referred to the PICA's design as revolving around the ten objects: "This has the psychometric advantage of holding content constant across subtests and therefore making it possible to compare the patient's skill across modalities and tasks" (p.284-285).

Based on these descriptions of the PICA, one might assume that the subtests for each modality are of comparable design. For example, the reading comprehension and the auditory comprehension subtests (both included as gestural tasks) are of comparable design although they tap into different sensory systems. These subtests have the same number of items and refer to the same set of objects. One reading subtest and one auditory subtest ask for identification of objects by their function, whereas the other reading subtest and auditory subtest ask for identification of objects by name.

In order to plan appropriate treatment, we are interested in determining the primary deficits exhibited by the individual patient. We make inferences about primary deficits based upon comparison of performances among subtests of an aphasia battery.

The purpose of this study was to determine if the auditory comprehension and reading comprehension subtests of the PICA are truly comparable in terms of patient performance. Because the reading subtests contain a prepositional component that the auditory subtests do not contain, then comparisons of the patient's performances on comprehension tasks must be made with caution unless inclusion of the preposition is known to be not a significant variable.

A number of investigators have observed that, for aphasic patients, the reading modality, all else being equal, is more impaired than the auditory modality (Schuell, Jenkins, and Jimenez-Pabon, 1964; Smith, 1971). It appears that reading is naturally a more difficult task than listening.

Goodglass and Kaplan (1972) suggested that the neurological basis of reading includes the auditory comprehension system in addition to structures providing associations between auditory and visual processes. We can assume, then, that reading tasks are more difficult than auditory tasks even if they are designed to be comparable in nature and level of difficulty with regard to syntactic structure and semantic content.

The PICA normative data reported by Porch (1971) indicates considerably lower average mean scores for reading subtests than for auditory subtests. Based on 280 aphasic subjects, the average mean scores for reading were 9.77 (Subtest V) and 10.91 (VII), while auditory comprehension was over 2 points better at 12.41 (VI) and 12.77 (X). The fact that the PICA reading scores generally are lower than the auditory scores is not surprising. However, the degree of the point-spread reported by Porch may be influenced by the added factor of the prepositional component in the reading subtests.

From personal clinical experiences, we have observed a number of patients who have scored consistent "12" on the reading subtests. These responses are prompt and accurate, yet incomplete, because of the patient's failure to adhere to the prepositional direction included in the stimuli. We frequently have the feeling that the patient's responses would have been scored "15" if the prepositional component were removed or even highlighted.

According to Luria (1973) aphasic subjects have difficulty understanding grammatical structures which incorporate logical relationships, whereas they may have no difficulty understanding simpler grammatical structures. The logical-grammatical constructions referred to by Luria include prepositions, because they express relationships of space, sequence, or more complex logical concepts. Although aphasic persons may understand the meaning of individual words, they may not grasp the meaning of the construction as a whole.

Relative to the PICA, it seems likely that both the mode of presentation, auditory versus visual, and the syntactic content of the stimulus, preposition versus no preposition, may play important roles in the performance of the aphasic individual. Therefore, this study was designed to examine the scores obtained from a group of aphasic patients on the PICA reading and auditory comprehension subtests and on modified versions of these same subtests in an attempt to answer the following question: Based on the difference in mean scores between the auditory and reading comprehension subtests of the PICA, does the preposition contribute to this difference and, if so, how large is the contribution?

METHOD

The methodology utilized for this study consisted of administering eight subtests to a group of eleven aphasic individuals. Four of the subtests were the original subtests of the PICA (V, VI, VII, and X). The other four were modified versions of these subtests. These modified versions were designed to be as comparable as possible to the original four by maintaining Porch's design and procedure as closely as possible.

Subjects. The subjects participating in this study were eleven male patients at the Memphis VA Medical Center, representing mild to moderate degrees of communication involvement. The patient's ages ranged from 32 to 61 years, with the mean age being 51.75 years. Etiologies were primarily cerebrovascular accidents, although one patient had a history of surgical intervention for an aneurysm and one patient's impairment resulted from

trauma. The PICA overall mean scores for this group of subjects ranged from 7.83 to 13.51, with a group mean of 10.75. All of the subjects had to be able to read sufficiently in order to respond accurately to Subtests V and VII.

Experimental Subtests. As previously stated, four of the subtests administered were the auditory and reading comprehension subtests of the PICA in their original form (V, VI, VII, X). Modified versions of these tests were created, so that the modality difference and syntax difference could be separated. A preposition was added to the PICA auditory subtests, and it was subtracted from the PICA reading subtests. Examples of the PICA and experimental stimuli are shown in Table 1. Four conditions were created: (1) auditory without the preposition (as in the PICA), (2) auditory with a preposition (the experimental version), (3) reading without a preposition (the experimental version), and (4) reading with a preposition (as in the PICA).

Table 1. Examples of stimuli in PICA subtests and experimental subtests.

AUDITORY SUBTESTS

<u>PICA</u> VI	Point to the one used for cleaning teeth.
X	Point to the toothbrush.
<u>EXP</u> VI'	Put this card to the right of the one used for cleaning teeth. (a blank card)
X'	Put this card to the right of the toothbrush. (a blank card)

READING SUBTESTS

<u>EXP</u> V'	Point to the one used for cleaning teeth. (examiner holds the card)
VII'	Point to the toothbrush. (examiner holds the card)
<u>PICA</u> V	Put this card to the right of the one used for cleaning teeth.
VII	Put this card to the right of the toothbrush.

Every effort was made to make administration and scoring of the experimental tasks as similar as possible to procedures with the PICA. This effort had to be balanced with the effort to match tasks so that they differed only with respect to modality or presence of a preposition. The only problem in using the PICA's multidimensional scoring system was in defining an incomplete or 12 for the experimental tasks. Criteria from the PICA's auditory subtests were applied to the experimental reading subtests, and criteria from the PICA's reading subtests were applied to the experimental auditory subtests.

Procedure. The order of administration of subtests dictated by Porch (1967b) was maintained (V, VI, VII, X) with the modified versions of the subtests interspersed with the original subtests. However, counterbalancing which of the subtests came first, the PICA version or the experimental version, was done to control for the possibility of an order effect in the final data. Therefore, two test booklets designating test format were developed for each subtest sequence. Instructions for the examiner regarding

the experimental subtests were typed in the same format as the administrative booklet for the PICA. Administration of each subtest followed PICA procedure.

RESULTS

A randomized block factorial ANOVA (2x2) was used to analyze the data. Modality and presence of the preposition showed significant main effects. No significant interaction was found (see Table 2).

Table 2. ANOVA results for randomized-block design analysis of modality and preposition.

Source of Variation	SS	df	MS	F	p
Blocks	50.7323	10	5.073	8.639	<.01
Treatments	31.8656	3			
A (Modality)	3.3551	1	3.3551	5.714	<.05
B (preposition)	28.2401	1	28.2401	48.093	<.01
AB (interaction)	.2704	1	.2704	.4605	ns
Residual	17.615	30	.5872		
Total	100.2129	43			

An additional analysis was done in order to determine how much of the difference between the auditory and reading subtests is actually due to the presence of the preposition. First, we averaged the two subtest means for each of the four conditions. Then, the reading means were subtracted from the auditory means. The average of these differences yielded a .56 difference attributable to modality (Table 3.). Then, the conditions without a

Table 3. An estimate of the contribution made by modality and the preposition to the difference between auditory and reading subtests on the PICA (Porch, 1971).

Subtests	1971 Norms	Study Means	Study Diff
Auditory VI, X	12.59	14.20	
Reading V, VII	10.34	12.04	

preposition were subtracted from the conditions with a preposition. The average of these differences yielded a 1.60 difference attributable to presence of the preposition. These numbers equalled the difference between the PICA subtests (Table 3).

DISCUSSION

The findings of this study have clinical significance with respect to our interpretation of PICA data or any test data. We must be cautious in using PICA scores to compare a patient's performance across modalities when there are differences in content between these tasks. Our data supports what might be a common clinical inference that lower reading scores may be due to a deficit in comprehending prepositions rather than to a pronounced deficit in reading per se. Because one of our main concerns is to determine primary deficits within the aphasic disorder, we may be ignoring an important syntactic impairment in many of our patients simply because we are viewing decreased performance on Subtests V and VII as resulting from impaired reading skills. Reading may be more difficult for the patient, all else being equal, but treatment should be addressed to the primary deficit, which may apply to auditory input as well as to visual language input. Treatment to improve reading skills may have little or no effect in improving the patient's reading performance without treating a syntactic deficit in both modalities.

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