Pure Word Deafness: Fact Or Fiction

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Pure word deafness is a communication disorder in which ability to understand spoken language, repeat words, and write from dictation is lost, while spontaneous speaking, reading, and writing are preserved (Lichtheim, 1885). Such patients also exhibit normal hearing for pure tones or threshold configurations that would not interfere with ability to understand conversations (Wohlfart, Lindgren, and Jernelius, 1952: Albert and Bear, 1974). Although pure word deafness has been a ripe topic for neurobehavioral case studies, the clinical diagnosis of the disorder has sometimes been questioned. Pierre Marie (1906), for example, termed the problem a "simple myth" that did not exist from a clinical or anatomico-pathological point of view. Symptoms commonly associated with Wernicke's or fluent aphasia have often been reported for patients with a pure word deafness (Ziegler, 1952; Gazzaniga et al. 1973; Albert and Bear, 1974; Goldstein, 1974; Marin and Saffran, 1975) and the existence of contaminating deficits such as hearing loss, confusion, and psychological disturbance have been apparent for some reported cases (Hemphill and Stengel, 1940; Wohlfart et al. 1952; Ziegler, 1952; Goldstein, 1974).

The existence of some controversy regarding the diagnosis of pure word deafness is not surprising. Aphasiologists have long shown reluctance to recognize and accept isolable communication problems. Resolving this problem with regard to pure word deafness does not seem difficult, however, in view of the fact that such a patient should function normally on all language tasks except when performance is dependent on auditory comprehension of spoken language. Evaluation of the patient with suspected pure word deafness should consequently be geared towards establishing language competency (or lack of such) in modalities other than the auditory. Surprisingly a process by which this can be accomplished has not been described in the literature leaving a gap in clinical understanding which precludes acceptance of pure word deafness as an isolable comprehension problem. This case report attempts to partially fill this gap by describing an evaluational procedure for use with the patient with suspected pure word deafness, presenting the findings of this evaluation, and describing the techniques and results of a management program carried out with the patient.

Background Information

DM, a 53 year old, left handed, high school educated man was referred with an eleven month history of auditory comprehension impairment. His medical history revealed an open heart surgery (mitral valve replacement) for rheumatic heart disease 14 years earlier. Between this surgery and onset of his comprehension difficulties DM had suffered six cerebrovascular accidents felt to be of thrombo-embolic origin. Post stroke residuals which included combinations of upper and lower extremity weakness, facial numbness, slurred speech, and comprehensional difficulty, always cleared rapidly as did other

neurological symptoms. Although hospitalized for periods of time DM was always able to return home and to resume his job. This pattern continued until an episode (the seventh) occurring eleven months prior to referral. Three weeks before this episode DM was described as restless and illustrating increased psychomotor activity to the extent that psychiatric consultation was sought and Thorazine prescribed. Immediately following the episode he was found to be confused, disoriented, and unable to understand speech. Neurological examination found him withdrawn and unable to understand but was otherwise essentially negative. Brain scan and EEG results were negative and it was suspected DM had suffered either another stroke or a possible psychotic reaction. An otological examination, conducted to ascertain the basis of his comprehension problems, yielded negative results and a diagnosis of psychogenic deafness with a recommendation for audiological testing was made. For the audiological evaluation DM did not respond to speech testing but could be trained to respond to pure tones paired with a verbal signal. Pure tone thresholds were found to be near normal through the frequencies of 2000 Hz with mild bilateral losses for the higher frequencies. Shortly after we conducted our evaluation (see next section) DM received an EMI scan. Results revealed slight enlargement of the left lateral ventrical with focal areas of decreased density suggestive of old infarctions in the left frontal, left temporal-parietal, and right temporal-parietal areas.

Evaluational Procedures

Since task instructions for most aphasia examinations require some auditory processing ability, they are not suitable to assess the language competency of the patient with suspected pure word deafness. With such patients, it is necessary that task instructions be understood. There are two ways of doing this--presenting instructions visually (having the patient read them) or using pantomime. We chose the former and selected a nucleus of language tests and tasks commonly used by aphasiologists and printed visual instructions for each task. The patient's performance for these tasks was then compared with performance for the same tasks when instructions were given in a standard (auditory) fashion. Tests administered included the Token Test (DeRenzi and Vignolo, 1962), Peabody Picture Vocabulary Test (Dunn, 1959) and the Porch Index of Communicative Ability (PICA), (Porch, 1967). These tests were first presented in a standard fashion and then with visual instruction. Visual instructions consisted of giving the patient a card with typed instructions, and directing him to read the card and perform the required task.

Ancillary testing included assessment of tactile naming ability, environmental sound recognition, administration of the Ravens Progressive Matrices (1947), and collection of spontaneous speech and writing samples. For all these tasks, instructions were visually administered to circumvent problems related to the patient's inability to understand spoken language.

Performance On Tasks Administered With Standard And Visual Instructions

On the 62 item Token Test, DM made no correct responses on the standard presentation and had 54 correct responses on the visual presentation. For the standard condition all responses consisted of the statements "I don't know" or "I don't understand". For the visual condition all errors occurred on Part Five, where the task requires manipulation of the tokens in terms of their

prepositional relationships (Put the red circle on top of the green square). When reading Token Test stimuli, DM tended to re-read each sentence, and responses (both correct and incorrect) were usually delayed. Performance on the Peabody Picture Vocabulary Test was similar to that on the Token Test. DM identified no items for the standard presentation and 92 of 100 items for the visual presentation. Error responses on the PPVT generally consisted of misreading the word (merging instead of meringue) and then saying "I don't know" or "I don't see that one".

Performance for standard and visual administrations of the PICA is summarized in Tables I and II. Table I shows that the patient had substantially higher overall and modality mean and percentile rankings for the visual presentation. Table II provides a summary of the patient's performance on the 18 ten-item PICA subtests for each presentation mode. Although all PICA responses were assigned a score based on the 1 - 16 point scale of goodness described by Porch (1971) and used in PICA administration, Table III presents the number of items for each subtest scored as correct. (In assigning a correct or incorrect score, responses receiving a PICA score of 10 or above were regarded as correct, and those receiving a score of nine or below regarded as incorrect.)

TABLE I. Overall Mean and Percentile Rankings For Standard And Visual Administrations Of the Porch Index Of Communicative Ability (PICA), (Porch, 1967).

	Standard Administration		Visual Administration	
	Mean	%	Mean	%
Gestural Modality	9.90	20	12.49	46
Verbal Modality	7.40	36	13.72	75
Graphic Modality	10.15	75	12.85	91
Overall PICA	9.43	39	12.89	79

Table II illustrates that on visual tasks (reading and matching) DM performed identically (100% accurate) regardless of whether instructions were visual or auditory. On auditory tasks (pointing to objects named or described by function) he was unable to respond to auditory instructions (usually saying "I don't know") but was totally accurate when this information was given visually. On all verbal tasks except repetition, DM was unable to understand auditory instructions sufficiently well to produce accurate responses. On the function and sentence completion tasks he consistently replied "I don't know" or failed to answer. On the naming task, the examiner's repetition of instructions and pointing to the object to be named resulted in the naming of six of ten items (these were counted as inaccurate). On the repetition task, DM correctly repeated six of ten items, perhaps because of the visual cues gleaned (lipreading) from the examiner's face. Visual instructions for verbal tasks yielded all accurate responses for repetition, one error for sentence completion (the toothbrush was called a hairbrush), one error for naming (the knife was misnamed), and five errors on the function task (three repetitions of instructions were needed; related functions were given twice).

TABLE II. Number Of Correct Responses (By Subject) For Standard And Visual Administrations Of The Porch Index Of Communicative Ability (PICA), (Porch, 1967).

Modality	Description of Task	No. Correct Responses	
		Std. Admin.	Visual Adm.
Visual	Matching object to object	10	10
Visual	Matching picture to object	10	10
Visual	Reads name and position	10	10
Visual	Reads function and position	10	10
Auditory	Point to object by function	0	10
Auditory	Point to object by name	0	10
Verbal	Describe function	0	5
Verbal	Name object	0	9
Verbal	Sentence completion	0	9
Verbal	Repeat names	6	10
Graphic	Write function in sentences	0	1
Graphic	Write names	10	10
Graphic	Write names to dictation	5	10
Graphic	Write names spelled	0	9
Graphic	Copy names	7	9
Graphic	Copy figures	9	10
Gestural	Demonstrates function	0	0
Gestural	Demonstrates function, ordered	0	0

Except for one graphic test (writing the function of objects in sentences) the patient's performance varied with the amount of visual information provided in task instructions. When asked to write the function of each object in a sentence he did not understand the standard instructions and wrote a series of sentences containing general and related words in the visual condition. He was able to write the names of the ten objects correctly for each instructional mode. Thus, it appears that handing the patient the pen and instructing him to write, elicits name writing. Writing names to dictation also afforded opportunity for visual cues from the examiner's face and five correct responses were obtained. Writing the names after they were spelled by the examiner yielded markedly different results. Here the patient could not figure out what the task was and made no correct responses. Copying tasks (names and figures) again resulted in a large number of correct responses regardless of instructional mode. Most errors were due to carelessness. On the two gestural tasks of the PICA (demonstrating the function of objects)

DM made no accurate responses in either instructional mode. He became agitated with these tasks, stated they were ridiculous, and could not be coaxed into doing them.

Additional Testing

Tactile naming was tested by having the patient close his eyes and name common objects placed in his right hand. He correctly identified 10 of 11 objects. His single error was calling a spoon a shovel. Recognition of environmental sounds was assessed by playing 12 common sounds over a tape recorder and asking DM to name them; the same sounds were presented a second time and DM was requested to select the appropriate sound from a list of four alternatives. For the first condition he identified one of 12 sounds; for the second he correctly identified seven of 12 sounds. On the 36 item Ravens Progressive Matrices he made 32 accurate responses. Finally, samples of spontaneous speech and writing were obtained by having the patient tell and write a story about the Cookie Thief picture from the Boston Diagnostic Test for Aphasia (Goodglass and Kaplan, 1972). Verbatim transcriptions of these efforts are shown in Appendices A and B respectively. These samples illustrate good functional communication but mild aphasic symptoms and some paraphasic errors.

Summary Of Findings

The most salient feature of this case was an extreme disproportionality of auditory comprehension impairment compared to other language modes, particularly the visual modality. Aphasic symptoms, which included word retrieval problems, semantic confusion, vocabulary reduction, and grammatical incompleteness were present, to a mild degree, and tended to become more pronounced with increased task difficulty. The patient illustrated some behavioral rigidity and agitation on some tasks, charactistics of bilateral cerebral involvement. This behavior tended to deleteriously influence performance regardless of mode of presentation. The patient tended to respond better on tasks which necessitated establishment of visual attention or looking at the examiner's face.

Treatment Program

A three month period of therapy three-times-per-week was initiated. This was designed and monitored by our clinic but carried out by a speech pathologist at the patient's home. This therapy is called visual facilitation because it is similar in conduct to the synthetic method of speech reading earlier proposed by Nitchie (1950). The primary goal of this program was to get DM to utilize visual cues to help him understand spoken language. Visual attending behavior was established by using written words to orient him to the topic and then requesting him to attend to the clinician's face. Contextual cues were supplied and discussion topics were selected that were of high personal interest to him. Speech rate was deliberately slowed because it was observed he understood more in this situation and previous work of Albert and Bear (1974) had shown the efficacy of this procedure.

Program effectiveness was monitored using two conventional speech reading tests, the Word by Intelligibility Picture Identification (WIPI) (Ross and Lerman, 1971) and the Barley Speech Reading Test (Barley, 1975). The WIPI

consists of six equivalent forms of 25 words each, for which the patient selects one of six pictures in response to an auditory stimulus. Scores are expressed as percentages. The Barley consists of two 22 sentence forms, containing 125 and 117 words respectively; scores are expressed in terms of the number of words correctly identified. Different forms of the tests were administered under two conditions, the auditory, for which the clinician stood behind the patient, and the auditory-visual, for which the clinician sat in front of the patient and encouraged him to watch his face. Table III shows the patient's performance on the tests at the beginning, midway and near the end of the treatment program. Greatest change in the direction of improvement for both conditions was shown in single word identification for the WIPI. Change on the Barley was much less discernible and shows a decrement in performance for the second test in the auditory-visual condition and small steady gains in the auditory condition.

TABLE III. Performance For The WIPI And Barley Speech Reading Tests At The Beginning, Midway, And End Of The Treatment Program For Auditory And Auditory-Visual Conditions.

	Beginning	Midway	End
WIPI			
Auditory	28%	52%	60%
Auditory-Visual	56%	60%	88%
Barley			
Auditory	15	18	23
Auditory-Visual	29	13	26

Although results on the speech reading tests reflect some modest comprehensional gains with and without visual cues, the effectiveness of the treatment program, and the decision to continue a structured program, must consider the patient's ability to use visual facilitating techniques in real life situations. Throughout the program, at home, and when seen for a follow-up visit, DM was reluctant to use visual cues; he tended to be overly verbal and was sometimes irritated by therapy material and requests to attend to the clinician's face. While he was sometimes able to understand words or parts of sentences he was rarely able to synthesize or "fill in" the missing parts. He rarely acknowledged or self-corrected his errors and often expressed the idea that all would be "fine" when he could hear again. We felt the patient was not making use of techniques stressed in therapy and that continuation of the program was unjustified. The patient's wife felt similarly and expressed a need for some guidance so she could pursue a home stimulation program with him.

Discussion

Several interesting clinical issues arise from the case presented today. One centers on the responsibility of the clinician evaluating the patient with suspected pure word deafness. This would seem to be that of devising a method to adequately assess the patient's language and speech competencies that is not dependent on auditory processing. This paper illustrates a simple comparison of performance on language tasks for which instructions are presented auditorially and visually, can easily accomplish this. A related issue that arises is why this has not been done before. A likely answer is that it is probably too easy to accept the obvious and that perhaps application of a label or category is too comforting to prompt a search for, and the reporting of, conflicting information. This case report would seem to painfully illustrate that very little, if anything is pure in the world of aphasiology. While DM did exhibit an extremely severe deficit in auditory comprehension relative to other language modes, contaminating factors in the form of aphasia, possible psychological disturbance, and the behavioral and anatomical concommitants of bilateral brain damage were evident. Finally we must raise the issue of whether or not the patient exhibiting symptoms of a pure word deafness can benefit from therapy. The limited information in this paper suggests the answer is no, so far as a structured approach is concerned. It also appears that patients with a severe comprehension problem, similar to the case described, do not understand some verbal material. The question is how much, when, and what factors facilitate or inhibit the comprehensional process. Our case illustrated better comprehension when watching the examiner, when oriented to a topic, or when he brought up a topic. It was speculated that increasing his reliance on visual cues would facilitate auditory comprehension, but this did not occur. DM was reluctant to use visual information, and it may be possible that any patient who receives meaningful information from incoming auditory signals, even sporadically, might behave likewise. Thus, it may be unproductive to treat such patients as one would treat the peripherally deaf. The patient's lack of adaptation to the program could also be attributed to his rigidity and failure to accept his problem. He might also be telling us that his problem is one of perceptual-discrimination and that his internal language system is intact. This might explain some of his agitation with our procedures and materials. On a brighter note, the patient's wife seems to be accomplishing more at home than we did with our treatment program. In administering the patient certain tasks, with and without visual cues, it is obvious that his system is partially open to auditory stimulation some of the time. We continue to experiment with the hope of responding to the question inherent in the title of the paper--pure word deafness, fact or fiction?

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Appendices

A. Verbatim transcription of patient's verbal description of the Cookie Thief picture from the Boston Diagnostic Test of Aphasia (Goodglass and Kaplan, 1972).

"It's just a picture full of accidents. He's going to get the cookies alright...for his sister. He's about to break his neck. Looks like the mother is pretty big because she's got the sink that's plugged off in that. There's no way to start and no way to stop on that one. There's too many accidents in this picture anyway. What a nayday. Lot of tackets in those pictures, in those pictures. More like an actual picture. More accidents in that than they should have. Wonder where they make that power picture a mess. It gives you something to talk about, the story, anyway, doesn't it. You'd be ready for an accident coming up. You bet. I's more like home than my house or anybody's home I think".

B. Verbatim transcription of patient's written description of the Cookie Thief picture from the Boston Diagnostic Test of Aphasia (Goodglass and Kaplan, 1972).

"the girl will get her cookies the boy will get his on the over end, he mine to forget his last cookie, a mother better get her eyes fixed or buy new shoes, and have the little girl will turn the water off and look for a plumbing man,"