

LISTEN, HEAR!

by Geoff Plant



hearLIFE

Using Matrices for Training

INTRODUCTION

I'm a "collector" of irregular verbs and plurals, as they can create special difficulties for many deaf children and teenagers. I love finding these apparent anomalies, and then try to create exercises that will assist in their acquisition. "Mouse" and "mice" is one example that I often use to illustrate the special difficulties created by these "odd men out." I can accept that it's not "mouse" and "mouses," but don't really understand why the plural form doesn't extend to words such as "house" and "spouse." It would be so much easier if the same rule applied to all items, but that's just not the way that English works! This issue is devoted to a training technique with an "irregular name." It's one matrix, but the plural is not "matrixs," but matrices (*meɪ trə siz*).

I looked up the word using the Merriam-Webster online dictionary (<http://www.m-w.com>), an invaluable resource that I would recommend to any teacher or therapist, and found that there are a number of definitions for "matrix", but the one that I was looking for is 5b below:

"5 a: a rectangular array of mathematical elements (as the coefficients of simultaneous linear equations) that can be combined to form sums and products with similar arrays having an appropriate number of rows and columns b: something resembling a mathematical matrix especially in rectangular arrangement of elements into rows and columns"

It's not all that clear, however, so I thought I should include an example. In the matrix shown below, there are three horizontal *rows* and four vertical *columns*. Column one contains three names, column

JOHN	SAW	TWO	CARS
JANE	SEES	THREE	BIKES
JAMES	WANTS	FOUR	BOOKS


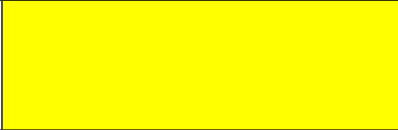




two three verbs, column three three numbers, and column four four nouns. If I choose one item from each column, and put them together in order, they form simple sentences such as, "James sees four books," "Jane wants two cars," etc. I use this technique extensively in testing and training, and find it a very useful approach. It's a "closed-set" task with the client/student presented with the alternatives. But its complexity can be altered by the number of columns and rows used.

I first saw this technique in the early 1980's when it was used in an innovative speech testing procedure developed by the Swedish researcher Björn Hagerman¹. I'm not sure if he was the first to use matrices in this way, but it was certainly my first exposure to the approach. Hagerman used a matrix consisting of five columns (names-verbs-numerals-adjectives-objects) and ten rows. The test consisted of twelve equivalent lists, each consisting of 10 five-word sentences, although the format could potentially generate thousands of different sentences. The test materials were presented in the presence of background noise, which was raised and lowered to determine the signal-to-noise ratio at which individual clients were able to identify 50% of the words in the sentences. This technique has subsequently been used by a number of other researchers and research groups, most notably in the German language Oldenburg Sentence Test.








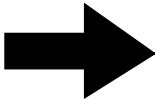


¹ Hagerman, B. 1982. "Sentences for testing speech intelligibility in noise." *Scandinavian Audiology*, 11(2), 79 – 87

USING MATRICES FOR TRAINING

My initial use of the approach, however, was as a closed-set training exercise. At first the matrices that I used were relatively restricted picture-based exercises, and were used to generate simple phrases rather than sentences. Here's a simple example, which can generate phrases such as: big yellow circle, small red triangle, etc. I always present such materials in a carrier phrase, so I would

ask the client to: "Show me a small yellow triangle," and ask her/him to repeat what was said while pointing to the appropriate cell in each column. Over time, as the client's performance improved, the size of the matrix could be increased to include more cells. In the example below, which requires some reading ability, phrases such as, "two new red arrows," and "five small blue stars" can be presented for identification.

2			
3			
4	OLD		
5	NEW		

One major advantage of the examples presented so far is that they can be used with clients (both children and adults) who have limited or no reading skills. The problem of illiteracy or limited reading skills in the adult population in the US is not well recognized, but "the 2003 National Assessment of Adult Literacy (NAAL) report, issued in 2005, estimated that 30 million adults function at the 'below basic' level of literacy skill and 11 million adults are in the 'nonliterate in English' level."² A lack of reading skills is a source of great embarrassment for many adults, and clinicians using only text-based training materials may find that clients with reading difficulties very quickly become "no shows."

I've included matrices in several of the training resources that I've developed for MED-EL. One section of "TeenTrain," for example, includes matrices of increasing levels of difficulty; some are picture-based while others are written. These are a useful resource, but teachers/clinicians should also consider developing matrices based on the needs of individual clients/students. One approach is to develop sets of topic-based cards. For example, the client/student might want to practice recognition of the names of friends and family, so each of these can be written on individual file cards. Other categories could include verbs, numbers, adjectives, and nouns. At first, the task might only involve two or three cards from each category, but, as the client's skills improve, the number can be increased.

I've been using this technique with one of my long-term clients, a young adult with a prelingual

² http://www.proliteracy.org/media_room/literacy_facts.asp Accessed January 16, 2008. Note that 30 million adults represent around 10% of the population of the United States.

hearing loss, who was fitted with a cochlear implant around twelve years ago. Unfortunately, he received little initial training with the implant, and, when I started to see him around 18 months ago, his performance level precluded the use of open-set materials. Closed set matrices, however, represented a good way to introduce auditory-only perception of phrase and sentence materials. We started with very simple matrices consisting of only three columns and two rows, but, over time, they have become progressively more and more complex. The set of words that we are currently using is shown below. Each sentence is eight to nine words long, which places considerable strain on his auditory short-term-memory. This was a great concern for the client at the beginning of the training program, as

					ONE	
					TWO	
			MONDAY		THREE	
			TUESDAY		FOUR	
I'LL	SEE		WEDNESDAY	AT	FIVE	O'CLOCK
		you on	THURSDAY		SIX	FIFTEEN
SHE'LL	MEET		FRIDAY	AROUND	SEVEN	THIRTY
			SATURDAY		EIGHT	FORTY-FIVE
			SUNDAY		NINE	
					TEN	
					ELEVEN	
					TWELVE	

he felt he had difficulty retaining even two or three word sequences presented via audition alone. Over the course of the training, his ability has improved a great deal, and he is now able to cope with much longer sequences. The difficulty of the task varies considerably; three columns involve only two alternatives, but others require the client to differentiate between four, seven, or twelve possible words. I usually present each new sentence twice, allowing the client to check his initial answer before responding. This doesn't correspond to the realities of everyday conversation, but my aim here is to encourage the client to make a tentative "guess," and then verify it before having to say what he thought I had said. Over time, I'll ask that he repeats what he heard after only one presentation, but that task would be a little too intimidating for the client at this time.

I will make the sentences presented a little longer as the client's auditory skills improve. Here's a matrix that might be suitable. It not only generates longer and more complex sentences, but it also provides practice in listening for important "date and time" information.

			January	first	1	o'clock
			February	second	2	05
		Monday	March	third	3	10
My		Tuesday	April	fourth	4	15
Your	appointment	Wednesday	May	fifth	at	5
Our next	visit	Thursday	June	sixth		6
Her	meeting	Friday	July	seventh	around	7
His		Saturday	August	eighth		8
		Sunday	September	ninth		9
			October	tenth		10
			November	eleventh		11
			December	twelve		12
						55

I have used similar matrices to provide telephone training for clients. Many adult clients approach telephone use with some trepidation. This technique, with its closed-set format, is a good way of establishing confidence in their ability to use this important means of everyday communication.

INCREASING TASK DIFFICULTY

NOISE

There are a number of ways that matrices can be made more difficult and challenging for individual clients. One of the most obvious is to introduce some background noise – I prefer multi-talker babble – and see what, if any, effect this has on the client's performance. I usually try to have the noise at a level that results in the client being able to identify around half of the words – 50% correct. If s/he scores higher than 50%, I increase the noise level a little; if the score is less than 50%, I lower the noise level. It takes a little bit of "tweaking" up and down to locate the approximate 50% point, but it's certainly worth the effort. I then provide training with the noise held constant at that level, and usually find that clients' scores improve over time. If it seems to be appropriate, the noise level can then be raised again to find the new point at which the client scores around 50%. Many CI users report difficulties in understanding speech in noise, and such exercises can help improve not only the client's performance but, perhaps just as important, her/his confidence.

If the client experiences great difficulty with the matrices in noise, consider presenting at least some of the sentences auditory-visually to allow access to lipreading cues.

RATE

I'm sure that many, or even most therapists who work with adults have had CI users comment that, "if everyone spoke like you, I wouldn't have any problems!" In some ways it's a compliment, but it also highlights that teachers/clinicians have learned to speak in ways that do not mirror "normal" conversational styles, and that may not always be helpful for the client. The speaking style used by many teachers/clinicians is usually called Clear Speech and this involves more careful articulation of the vowels and consonants, a slight pause between words, and, perhaps consequently, a rate of speech that is a little slower than normal.

If I ask CI users to tell me what sort of speakers create difficulties for them, they usually say that people with accents are very difficult to understand. I find this amusing in some ways, as I still retain an Australian accent despite having lived in the US for 15 years! The other group of speakers who seem to create problems are those who "speak very quickly." They're not talking about some of the "motor-mouths," who are used in some advertisements on radio or television, who are pretty much impossible for most people. Rather they are talking about people who speak a *little faster than normal*. Even at this slightly elevated rate, there are significant changes in the person's speech; the vowels become less peripheral, consonants, especially final consonants, are often omitted, and syllables tend to "run into each other" (run into each other). The result is that people with hearing loss, even those with well-developed listening skills, often experience difficulties in understanding this more rapid speech. It's more difficult to increase speaking rate until the 50% point speech recognition point is attained, and then maintain this speaking rate for training, but it's certainly worth attempting. Training can then be conducted at this higher rate, and a record kept of the client's performance over time. Again, if the task is too difficult via audition only, consider presenting at least some of the materials auditory-visually.

CONCLUSION

Matrices are a useful technique to be incorporated into training with both children and adults. If you have suggestions for their use, please let me know, and I'll pass them on in a future newsletter. The best contact is via email at hearf@aol.com. I look forward to hearing from you.