CABE Webinar Dr. Steven Strauss on fMRI Technology
Extracts from Transcript

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Dr. Flores

Yes, question 2, Dr. Strauss. What are some of the problems using the MRI?
And other brain imaging techniques to study reading. What has been your research and experience? Okay, that's a very good question. Because MRIs are used today as one of the most important. Tools to study language according to the principles advocated by the so-called science of reading. I could say based on the previous slide that one of the big problems is you cannot put 3 people in the MRI machine.

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Dr. Strauss

But, we can, we can do lots of studies with one person. The MRI machine is very limited. When we use machines that investigate real time processes. There are what we always look for are what we call temporal resolution and spatial resolution. Spatial resolution means if we have 2 different events, somebody saying a sentence. That is, just an affirmative type of sentence or somebody asking a question.

Can we see in the brain? The separation of the areas of the brain where those 2 things are taking place. That is called spatial. Resolution. Sometimes 2 different events cannot be spatially resolved and they look like they're taking place in the same part of the brain. What SOR researchers try to do is experiments to see if they can separate. 2 different linguistic events to 2 different parts of the brain. Temporal resolution is not very good with MRI machines. So what does this mean? It means that because the spatial resolution is very, very good. But that is because the temporal resolution is not good and the events that are studied have to take place very quickly.

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The MRI machines are really limited to taking pictures of subjects reading very short pieces of language. Syllables single words, maybe a nonsense word. But it cannot study text. It cannot study what children and adults actually read. And therefore, the principles and discoveries they make.
Which they call studies of reading. Are inherently limited by the F the MRI machine. And it raises the question of whether and whether the SOR, the science of reading advocates. Are constrained to study. The identification of individual words because that's all the MRI machines allow them to study. We need different kinds of methods to study the reading of natural language materials. Real books, real poetry, real recipes. Things of that nature. Those cannot be studied on an MRI machine. Because the temporal resolution is not good enough.

Those are very short events and the shorter the event the better. So again, excuse me for my voice, I apologize. So identifying a letter or a syllable. Or word, those can be studied, because

they're very quick. The SOR advocates. Are trying to study the quickest events that they can., because that's those are the events that are most readily analyzable by these MRI machines.

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I hope that answers your question.

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Dr. Strauss

Alright, so, another limitation, and I'll be brief on this. Is that if you the way the MRI works. in the study of reading. Is that the reader is given a task to do. For example, you're given a word to look at and you have to sound out the word or read it out loud. And then the blood. Flows to that area of the brain where the event is taking place? So the researchers look for where the blood is going? And what they would like to say is, well, that's where this event occurred, except they can't do that because the blood is also going to other parts of the brain that have nothing to do with reading. For example, it goes to parts of the brain that keep you awake. It goes to parts of the brain that allow you to sit up in your chair while you're reading and not topple over. So they have to figure out a way to get rid of that stuff. And how they can see only the part of the brain that sounded out the word. In order to do this, they have to have another task. Which is very similar to the first task.

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Dr. Flores

Have neuroscientists ever studied real reading and continuous texts. Number one. Number 2, our MRI machines capable of studying authentic reading of continuous, texts?

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Dr. Strauss

Right, well of course that's a very good question. At the beginning of this talk. I pointed out that the temporal resolution of MRI machines is not very good.
And what that means is that as different parts of the event take place through time, one earlier than another, one later than another. It becomes more and more difficult. To see the effect in the. MRI machine. They seem to be occurring at the same time. We can't separate them. The MRI machines are not good at that. So in that sense, the MRI machine would have to be improved in order to be able to get greater temporal resolution. there are some studies which have attempted to look at how readers read longer text. What's done is not the subtraction methodology that I mentioned to you earlier, but a different method. For example, a reader. Reads a longer piece of text. Several times.

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In order to maximize the signal that you get on the MRI machine. And then the patient does nothing or the subject, I mean, does nothing. So that we get signals of just the resting state. Of

the brain. Those two things are compared and some insight into how the brain reads a whole text can be obtained. However, neuroscientists themselves have pointed out that the longer you test someone for example on a real piece of text a whole page for example, the more likely it is that their attention span is going to change. It could increase or it could decrease that the attention span of somebody else reading it could increase or decrease. Based, for example, on your interest, I mean, people know that if you're reading a nail biter of a mystery. Your attention span is your attention to the task and increase That. So attention changes. That means the blood flow changes. It goes to more parts of the brain that will control your attendance band. And now who knows? What you're looking at, you're looking at an MRI picture of the total blood flow. Some of the attention is going to reading the text, but a lot of it is not. And we just don't know how to separate the one from the other.

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So to answer your question simply, no. MRI and neuroscience has not been able to study. reading of text. I can give you an example of where it's possible. Using EEGs, electroencephalography, which is used to study people with seizures. We put wires on their head just like we put wires on your chest if we're getting an EKG for your heart.

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Now, EEGs for the brain also show the electrical patterns in the brain. And they are very, very sensitive. So if you're reading a text, we might see. Lots of variations as the needle is moving up and down. On the page. We see all kinds of wave forms and so on. And we see them separated in time. So with one word came seconds and seconds before another, we will see them separated into different time locations on the EEG recording. But we have no idea. What the spatial resolution is, in other words, where and how far apart they are. And we really don't even know what aspect of reading those wave forms correspond to. Basically we can show that the temporal resolution is good but that's about it.