TRACK 6 32:29

3 speakers, only known info is Speaker 3 Sperry student 1967-1973. Sperry tribute California

Speaker 1: [INAUDIBLE 00:00:00 - 00:01:15] predicted that the [INAUDIBLE 00:01:17] and the mental activity was very much limited to [INAUDIBLE 00:01:26 - 00:01:35] the left [INAUDIBLE 00:01:36] hemisphere [INAUDIBLE 00:01:37 - 00:01:52] of language in the left hemisphere has been done and reviewed by [INAUDIBLE 00:01:58 - 00:02:10] right hemisphere was non-verbal and spatial recognition. [INAUDIBLE 00:02:16 - 00:02:22] persons demonstrated superiority over [INAUDIBLE 00:02:27]. He also observed that [INAUDIBLE 00:02:31] persons demonstrated inferiority over [INAUDIBLE 00:02:36] persons in non-verbal or visual-spatial skills. I don't have any [INAUDIBLE 00:02:45] to show the [INAUDIBLE 00:02:47] of the right hemisphere [INAUDIBLE 00:02:50] non-verbal language. In the other side of the brain [INAUDIBLE 00:02:59. [INAUDIBLE 00:03:03] suggested in India that the right hemisphere also can do conceptual processes if the material is suitable for that hemisphere — that means non...non-verbal and spatial [INAUDIBLE 00:03:19]. In the concept formation experiment, the subject learns to make a common response to a set of stimuli, that is to say a group of stimuli [INAUDIBLE 00:03:31]. The first two... The group of stimuli is assigned to single-response category. This generalization... This generalize... So, this generalizing behavior involves [INAUDIBLE 00:03:47] between [INAUDIBLE 00:03:48] and identification of relevant properties [INAUDIBLE 00:03:54]. Thus, [INAUDIBLE 00:03:59] concept formation experiment, [INAUDIBLE 00:04:03] or generalization could be negated by language. Here, the objects are meaningful. Non-verbal material would be required for non-verbal generalizations. [INAUDIBLE 00:04:18] the conceptual ability of the disconnected right and left hemisphere in an experiment using non-verbal spatial [INAUDIBLE 00:04:31]. These are the [INAUDIBLE 00:04:38] used of different shapes and sizes and [INAUDIBLE 00:04:43]. The subject was supposed to start on the second slide [INAUDIBLE 00:04:51 - 00:04:58] the other side of the [INAUDIBLE 00:05:00] different category. [INAUDIBLE 00:05:04 - 00:05:16] subject used a method of getting and sorting the blocks, and received feedback information [INAUDIBLE 00:05:22] right or wrong. The subject was wrong in the times the experimenter directed [INAUDIBLE 00:05:30] by pointing out the correct category without explaining why the new category was [INAUDIBLE 00:05:37]. Subject was asked to use the same hand for [INAUDIBLE 00:05:43 - 00:05:49]. The experiment was conducted in two stages. The first stage that they do, left hand first and right hand second, and all the [INAUDIBLE 00:05:59] on the second [INAUDIBLE 00:06:01] the knowledge of [INAUDIBLE 00:06:04]. Each hand had [INAUDIBLE 00:06:09] of the two hands were combined. In the next slide here, [INAUDIBLE 00:06:23] shown in the graph, they are very clearly shown the [INAUDIBLE 00:06:33] of the right hand...or the left hand over the right hand in the cases of four patients that we used [INAUDIBLE 00:06:43 - 00:06:57] in the case that left hand [INAUDIBLE 00:06:58] right hemisphere [INAUDIBLE 00:07:00 - 00:07:06] significantly [INAUDIBLE 00:07:07] the left and the right hand [INAUDIBLE 00:07:10] right and the left hemisphere. As I said that I used a control measure [INAUDIBLE 00:07:16 - 00:07:28]. You can see that [INAUDIBLE 00:07:29] are developed on the right-hand side. Left-hand side, you see the [INAUDIBLE 00:07:33]. On the right-hand side, you see the [INAUDIBLE 00:07:39 - 00:07:45]. In the case of [INAUDIBLE 00:07:48 - 00:07:57] as compared to the first two patients [INAUDIBLE 00:07:59 - 00:08:09]. But when you go to the next slide, [INAUDIBLE 00:08:06] of the four patients, it's very clear... We've seen that the right hemisphere [INAUDIBLE 00:08:15] much better [INAUDIBLE 00:08:17] than the left hemisphere or the left-hand side of the [INAUDIBLE 00:08:23]. On the next two... [INAUDIBLE 00:08:29] slide, I show you the correlation/causation between the [INAUDIBLE 00:08:41] of the right hand and the left hand. The only person of the patients [INAUDIBLE 00:08:50] showed some correlation/causation [INAUDIBLE 00:08:53], like 5% or 1%. All other patients did not show any. [INAUDIBLE 00:09:00 - 00:09:08]. On the next slide, we have the [INAUDIBLE 00:09:13]. That means I combined all the data of these patients. You can see that in the case of three people, the right hemisphere has much better [INAUDIBLE 00:09:27] compared to the left hemisphere [INAUDIBLE 00:09:34 - 00:09:40] significant in the case of [INAUDIBLE 00:09:42]. This slide shows how the two hands [INAUDIBLE 00:09:55] in the right hemisphere or left hemisphere. The right hemisphere uses the strategy that is shown in the left hemisphere of

the [INAUDIBLE 00:10:09]. Going to the [INAUDIBLE 00:10:15 - 00:10:20]. On the other hand, the left hand uses the exact same category that is the combination of size and shape. [INAUDIBLE 00:10:34] category. The right hemisphere [INAUDIBLE 00:10:37 - 00:10:48]. On the left hand, [INAUDIBLE 00:10:49 - 00:10:55] to find the answer. And therefore, the right hemisphere is better in learning spatial ability compared to the left hemisphere, which is good for language and conceptual processes [INAUDIBLE 00:11:10].

[Applause]

Speaker 2: Thank you, [INAUDIBLE 00:11:26]. Thank you for being just exactly on time. Jerre Levy, has she arrived or [INAUDIBLE 00:11:34]? [INAUDIBLE 00:11:38]. Okay. [INAUDIBLE 00:11:41] will talk about hemispheric specialization and hemisphericity versus laterality [INAUDIBLE 00:11:51 - 00:12:01].

Speaker 3 Sperry student 1967-1973:
[INAUDIBLE 00:12:02] that Jerre's not here, although the good news is it gives me more time. She's a tough act to follow in the first place. It gives me a little more time for my talk. I'm very pleased to be here. I'm glad there's a [INAUDIBLE 00:12:21 - 00:12:32]. I'm glad to be here to take part in this tribute to Roger Sperry. I was a graduate student [INAUDIBLE 00:12:38] from 1967 to 1973. And although he probably couldn't do the same tribute, that was done him by the Nobel Committee, which you all he won the prize in 1981, and honored also by the Swedish stamp. [INAUDIBLE 00:12:56] spoke today. I have... Many of us... For many of us who wondered... Ah, you've never seen the stamp before.

Speaker 4: Have you cooked this stamp up or is this the real one?

Speaker 3 Sperry student 1967-1973:
No, it's the real stamp! I got it [INAUDIBLE 00:13:17]. I saw it in Sperry's house. [INAUDIBLE 00:13:21] Sperry's house [INAUDIBLE 00:13:22]. Several of the Nobel Prize Winners are honored, by the way. [INAUDIBLE 00:13:29] happen to be on the same stamp. In any case, many of us had no doubt that he should be winning the Nobel Prize, but a lot of us wondered why he won it for this particular topic, since he made major contributions in many years prior to that. And I had the opportunity to ask Curt von Euler, who was on the committee, as to why he won the Nobel Prize for that, and his answer was because of the tremendous impact that it had on all of our society and throughout. Some of that impact, I think, has been good and some has been bad, perhaps, and perhaps I can talk a bit about that today. The first part [INAUDIBLE 00:14:09] to do with laterality is pretty much what we've been saying in this section, is that, well, the right hand doesn't know what the heck it's doing. So, this will be the laterality part, and, of course, the standard picture, as you've already seen today, the left hand [INAUDIBLE 00:14:25 - 00:14:29] left and right visual field. The left hand [INAUDIBLE 00:14:31] in left visual field and not the right, and so on. So, this is the way the lateralities start [INAUDIBLE 00:14:37]. So, we still think we can communicate with the two sides of our brain by some other kind of technique.

An old standard one used is the dichotic listening technique that I used and many other graduate theses have been built on [INAUDIBLE 00:14:58] and so on. This particular technique is relatively simple and straightforward. You have two verbal words, in this case the numbers, seven and nine [INAUDIBLE 00:15:11] and so on, and that subject will say as many of those words as they possibly can. You can do this with other kinds of stimuli, in this case [INAUDIBLE 00:15:21 - 00:15:31] one ear exactly the same time [INAUDIBLE 00:15:29] the other ear. [INAUDIBLE 00:15:30] multiple guess. And if you had an ear preference, you then concluded that there was some kind of hemispheric preference on the other side through this standard laterality [INAUDIBLE 00:15:41] since language was... at least speech certainly was in the left hemisphere, perception of language was somehow assumed to be also in the left hemisphere. By the way, in the past we've given individuals and groups of individuals... In this case, we put some rather makeshift earphones [INAUDIBLE 00:16:01], but in any case you can give this task to a whole group of people at one time. It doesn't really make much

difference. [INAUDIBLE 00:16:09]. Here's some typical data just to show you what it would be like. Here, the measure is left minus right, so if your right ear is better, it's a negative. The graph is pointing down [INAUDIBLE 00:16:23] three groups of subjects [INAUDIBLE 00:16:26] had very strong right-ear dominance. [INAUDIBLE 00:16:31] left-ear dominance [INAUDIBLE 00:16:33] focusing on [INAUDIBLE 00:16:35] positive. But typically, you see the data like this. Here's a study I did with [INAUDIBLE 00:16:42] second language [INAUDIBLE 00:16:46]. So, dichotic listening was given first in one language and then in another language. In this case, it was in Hebrew. And as you there's a strong... This is a laterality effect [INAUDIBLE 00:16:57] laterality [INAUDIBLE 00:16:58]. We had to control for overall performance, [INAUDIBLE 00:17:03] to more right ear [INAUDIBLE 00:17:06] left hemisphere [INAUDIBLE 00:17:08], and it really didn't make too much difference whether you heard the second language at birth, as a child, or an adult, or had been speaking it for a long period of time or a short period of time. The whole point was that you had... It was a fairly robust, strong effect of right-ear dominance [INAUDIBLE 00:17:24] and that was the typical laterality.

People then went on to kind of use these kinds of tests on normal individuals to show what kind of specialization occurred in the right hemisphere, what kind of specialization occurred in the left hemisphere. This was known as the [INAUDIBLE 00:17:39] laterality. But the trouble was that people started making up what it was that they were, if they were right-brained thinkers and left-brained thinkers. [INAUDIBLE 00:17:51] had his shot at it. "I think I'm a left-brained person. [INAUDIBLE 00:17:55] and numbers." "And I guess I'm a right-brained person. I'm good at jigsaw puzzles, like music, and I think I have a pretty good imagination." So, the idea is that people... It's sort of introspective to say, well, I'm a right-brained person because of this and I'm a left-brained person because of that. So, one should at least test out how good one was. That's what the idea was, is that you're trying to test out how good you are at these kind of so-called right-brain tasks, or how good you are at these so-called left-brain tasks. And laterality tests like lateralizing it to one side really doesn't do it. What you want to know is are you better at sequencing; are you better at verbal skills; are you better at spatial skills; and so on. So, I can start with a test [INAUDIBLE 00:18:44] to test precisely that. And the test [INAUDIBLE 00:18:46] can be given on an individual [INAUDIBLE 00:18:49] audio tape so it's automated and gives instructions, and the subject would sit there in front. Or, once again, you can give it to a whole classroom [INAUDIBLE 00:18:58]. Lots of data, very fast. Good for a PhD thesis. Here, the subjects have their hands in the air because this is a sequence task and they're not supposed to write until the [INAUDIBLE 00:19:09] sequence. So, the first task is...we call the serial sounds. They would hear well-known sounds. It wasn't the idea of recognizing sounds, but knowing which one was first, which one was second, and so on. So, they'd do three sounds in a series and have to write them down in the correct sequential order. Or we'd do the same thing with numbers. They'd hear a bunch of numbers in order and have to write them down in the same sequence. We would score them on not whether they're right or wrong, but how many they got correct in a sequence. If there were six in the sequence and they got four right, they'd get a higher score. And then a word fluency or a word production task. How many words [INAUDIBLE 00:19:42] number of letters [INAUDIBLE 00:19:45]. Four categories. So, that was our kind of verbal-sequential that would be associated with left brain.

For the right brain, visual-spatial tasks taken directly out on unilateral legion patients. This is from... This is a task where you see a big frame on a white background with a fixation point or [INAUDIBLE 00:20:05] shown in a whole classroom at one time. There would then be this "x" someplace on it, and on their answer sheet they'd have a similar kind of frame and they'd have to put the "x" in the right place [INAUDIBLE 00:20:17]. There's a mental rotation task. This is an easier one for [INAUDIBLE 00:20:23] or younger individuals — in this case, children. [INAUDIBLE 00:20:27] which two of those are the same [INAUDIBLE 00:20:30]. This is a bit more difficult for older folks and more functional folks [INAUDIBLE 00:20:40] Shepard-Metzler figures [INAUDIBLE 00:20:43] more difficult. A similar kind of a mental imagination task [INAUDIBLE 00:20:52]. So, take the numbered block number one. The task was is how many blocks are touching it. In this case, you can easily see that two of the blocks are touching it. If you take block number three, however, it's a little easier to see...it's a little

harder to see that there's four blocks touching that. The top one is [INAUDIBLE 00:21:07] next to it and one underneath it is easy to tell. [INAUDIBLE 00:21:11] on the other side [INAUDIBLE 00:21:12] all the blocks are the same size. And that would require some kind of imagination. And, finally, a standard [INAUDIBLE 00:21:19] test. You have to recognize what those objects are.

So, we gave this to a group of folks. And again, these weren't lateralized tasks, but the idea was that if you did better on the visual-spatial task, you're presumably doing it better with the right hemisphere, and the same thing with the left tasks. And so the test has been standardized on adults and children and males and females that are slightly different, and you get standard scores. And you get a right hemisphere measure [INAUDIBLE 00:21:47] for historical purposes, or you get a left hemisphere score, and it's basically a sum of all the tests. [INAUDIBLE 00:21:56] on all the tests, and you get some kind of measure of laterality. In this case, [INAUDIBLE 00:22:02] laterality [INAUDIBLE 00:22:04]. Let's just take a look at the difference between the two. Since it's standardized, by definition a normal person would get zero on this test. But if you get something better on the visual-spatial skill, then it would be a positive measure. If you get something better on the verbal-sequential measure, it'll be a negative. That's just the way the measure was done. Perhaps that's a more modern version of what you would be calling it. And then you can do all kinds of things like that. But the first thing you want to ask: Is there any relationship to laterality? That is, the more verbal-sequential you are, is that related to how lateralized you are in terms of dichotic listening tasks, for example? The answer is: no way. [INAUDIBLE 00:22:47] and why should it be, for that matter? Everybody knows that [INAUDIBLE 00:22:51] dominant and for verbal skills in most individuals, just because it's the other way doesn't mean that you're going to do better on those kinds of tests. There's really no difference. And that was L versus V, which is L, laterality, versus verbal-sequential, and here's laterality versus the visual-spatial [INAUDIBLE 00:23:08]. So, that didn't pan out, nor did [INAUDIBLE 00:23:13]. The idea is, however, in using those kinds of tasks is that we get the idea that people think differently. They just think in different ways. This is an early comic...cartoon that appeared in the 1970s, actually. [INAUDIBLE 00:23:31] the left side of my brain [INAUDIBLE 00:23:33] the right side of my brain [INAUDIBLE 00:23:34] to run a business properly. Again, the problem comes in the popularization of this, that the [INAUDIBLE 00:23:42] are we talking deliberate response [INAUDIBLE 00:23:44] left-brain [INAUDIBLE 00:23:45] or are we talking [INAUDIBLE 00:23:46] right-brain [INAUDIBLE 00:23:49]. And the good... It's funny, but the sad part about that is people then got the idea that they can say here's what a right-brain person thinks and does, and they would come up with questionnaires as to what they were, and you'd find these kinds of questions on a questionnaire and people would be able to say, "Well, I'm a right-brained person because of this and that."

Here are two of these tests, one with [INAUDIBLE 00:24:11], which is called [INAUDIBLE 00:24:12]—I can't remember what the acronym is—the other one by McCarthy, which is the 4MAT system, and they have this right-brain measure and a left-brain measure, and even an integrated measure [INAUDIBLE 00:24:22]. And as you see, these are two different tasks given to the same group of individuals, and they are pretty well correlated; that is, the right brain is correlated with the right brain and the left brain is correlated with the left brain, and so on. So, they're at least consistent within themselves and they may even measure something. The question is: How is it related, let's say, to the visual-spatial, verbal-sequential skills that I just showed you [INAUDIBLE 00:24:44]? And, in fact, [INAUDIBLE 00:24:46]. What's interesting, actually, if you look at those two red numbers on the right, it shows that the verbal-sequential test is positively correlated to what they call a right-brain person and negatively correlated to what they call a left-brain person. So, if there's any significant [INAUDIBLE 00:24:59] wrong direction. Now, that doesn't mean these tasks don't show something and couldn't be used, but in terms of having been related to any brain function, I certainly couldn't find anything. So much for that idea. And this shouldn't make it any more brilliant an idea than [INAUDIBLE 00:25:17] from the right side of your brain.

So, what good is it all? Well, everybody's got their theories, and I guess that was very popular because the proponents of those kinds of theories were better salespersons than I am. I [INAUDIBLE 00:25:32] of what it is that is useful in terms of hemisphericity — that is, how well one...if one uses those kinds of functions—visual-spatial, verbal-sequential—in their everyday life. And I think that contrary to many folks...to many of my neuropsychological colleagues who are looking for the anatomical location of these things using CAT scan/CT scan [INAUDIBLE 00:25:56]. The right research should be looking at the relationship between neurotransmitter systems and [INAUDIBLE 00:26:03]. And I'm going to present to you three...well, two experiments [INAUDIBLE 00:26:09], which I hope will demonstrate that what should be...what is important here are neurotransmitter issues rather than anatomical location.

One way to do that is show [INAUDIBLE 00:26:22] changes during sleep cycles. The study was, well... The study was 12 male subjects. This was replicated later on 12 female subjects—where half were tested on waking from REM sleep, and then were tested later on waking from non-REM sleep. With the other half, they woke up first from non-REM, and were tested later in REM. So, the point is is every subject was tested twice [INAUDIBLE 00:26:42], woken once from REM sleep, once from non-REM sleep...[INAUDIBLE 00:26:48]...woken once from non-REM sleep, woken once up from REM sleep, compared to themselves and how they did on those tasks that I just showed you [INAUDIBLE 00:26:57] counterbalance which test you gave first. And the results show here... The way to read this slide is that the visual-spatial tests in the REM sleep...or, I'm sorry...the visual-spatial tests in the non-REM sleep subtract from the visual-spatial in the REM sleep. So, of all the different individual subjects [INAUDIBLE 00:27:16], if the bar is pointed upward, that means they did better in the REM on the visual-spatial test, and almost everybody did, as you can see. Compare that to the verbal-sequential situation, where everything's pointed down, which means they did better in the verbal-sequential test during the non-REM period. So, there was this very significant interaction where they did better on [INAUDIBLE 00:27:37] compared to themselves. And you put it all together and the idea is not that everybody switched over—that is, not that they did better on the spatial task in the REM period and better on the verbal task in the non-REM period—but that it was all relative. So, if they did this well on the visual... [INAUDIBLE 00:27:55] difference in the visual-spatial tasks, where this is visual-spatial, then they got [INAUDIBLE 00:28:00] different in the non-REM period. That's what this shows, and 11 out of the 12 subjects showed that, and the replication was the same kind of thing. Now, for things to fluctuate like that in REM and non-REM period, you can't be talking about anatomical location; you have to be talking about something [INAUDIBLE 00:28:17]. And to answer your question: No, I don't know what it is. By the way, if you look at total performance, it didn't matter. Some were better in the REM period; some were better in the non-REM period, so it had nothing to do with whether you're tired or not during one of the periods.

The second test [INAUDIBLE 00:28:33]; that is, what about the fluctuations throughout the day? So, what we did is we took 24 male subjects and tested them every—a representative test that I'll show you in a minute—[INAUDIBLE 00:28:44] every 20 minutes for eight hours. They also put [INAUDIBLE 00:28:47] catheter because they thought something might be related to hormone function, and [INAUDIBLE 00:28:52] by just checking at each of the cycles whether there were significant peaks. We did a similar word production task, that we used two letters because you had to do it every 20 minutes, so you needed a lot more letters. The same localization task and a single-digit modalities task, which in our hands [INAUDIBLE 00:29:13] on both of those other factors, so it was kind of a neutral task. And what we found was... Now, these are periods, so four and eight is the whole day. It was an all-day period. There's a lot of all-day cycles; that is, they got better and worse over the [INAUDIBLE 00:29:28] earlier peaks. But as you see, at 96 minutes there was a peak; that is, some subjects have better and worse alternated [INAUDIBLE 00:29:36] localization task every 96 minutes. So, something was fluctuating. What's also interesting, if you look at the word production, there's a peak in a different place — at 80 minutes, in particular, and also one at 160, which means that's the harmonic effect. So, you get different peaks, then, depending on what the task was if you know the tasks were given exactly the same time. [INAUDIBLE

00:29:58] you've got oscillators that are going on that you're getting better and worse with the same subject at the same time throughout the day. And whatever that oscillator might be, [INAUDIBLE 00:30:07]. And so [INAUDIBLE 00:30:11] once in a while my right brain throws in something. Well, right brain functions [INAUDIBLE 00:30:16]. She wants to say something, so I won't tell you about this experiment. And maybe I wasn't [INAUDIBLE 00:30:26] salesman, but [INAUDIBLE 00:30:28]. Thank you very much.

[Applause]

Speaker 2 [Unknown, Spent 10 years at Sperry's lab]:

Thank you very much. I'd like to know [INAUDIBLE 00:30:39]. Is Jerry here yet? Last call. Well, in her absence, I'm going to go ahead and give my talk, and that should allow [INAUDIBLE 00:30:54] for everybody, okay? My talk is entitled "Listening to Sperry: Implications for Neuropsychological Evaluation in the Psychiatric Population". It's a pleasure to be here and be a part of this symposium honoring Roger Sperry. I'm very excited by the things we've seen here this morning, and since I have been actively involved in neuropsychological evaluations for the last approximately ten to fourteen years, when I hear these things, I immediately think in terms of patients and possible implications in the things that I do. My background in psychobiology at Sperry Lab [INAUDIBLE 00:31:54], where I spent about ten years [INAUDIBLE 00:31:56] UCLA. It left some distinct and lasting effects on the work that I now do in neuropsychological assessment on the psychiatric population. I think there are two major sort of conceptual tasks. One is [INAUDIBLE 00:32:18] familiar function, such as [INAUDIBLE 00:32:23] conceptualization, visual-spatial reception, executive function—