

SSW Reports

Special Issue

• Fight or Romance the Limbic System

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To Fight or Romance the Limbic System

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Valentine's Day (4:30 AM):

1. Back in the 1960s I read a book, "Relief Without Drugs". It had to do with relaxation and auto-hypnosis. I was able to achieve a fantastic level of relaxation and could have painful dental procedures without Novocain. When I was at this level of relaxation I could address my most aggravating problems calmly and effectively without symptoms of stress or anxiety.

The procedure would start with a few slow deep breaths and telling myself how good it felt to be so relaxed and how healthy it is to be so comfortable. Initially, I was not so relaxed, but after suggesting it to myself I started feeling as good as I said I was (especially with just a little practice). Even now, 50 years later, it is possible to get some benefit from that old routine.

2. In 1983 I read a paper by Efron et al. (1983) and his colleagues who reported on the side effects of anterior temporal lobectomy. They indicated a surprising finding. After anterior temporal lobectomy many of their patients experienced a loss of the 'cocktail party effect'. That is, in noise they were greatly disturbed

when listening to speech in a background of noise.

After some study we found the presence of anterior signs on the SSW test in those with difficulty understanding in noise and a few years later we included this concept in the CAPD Buffalo Model (Katz & Smith, 1991).

I was invited to speak in the Turkish Republic on the SSW test (Katz & Akdas, 2002). Because they have their own SSW test I contacted a former student who developed that test. She lined up a patient for us to test who had a known brain lesion. We were going to test her blind to see if we could identify the site-of-lesion.

I asked my colleague to ask the patient if her hearing was the same as before surgery. The woman said that the ringing in her ear was awful (she had tinnitus for many years due to a hearing loss in one ear). I asked my colleague to ask again about hearing and again she complained that she could not stand the ringing. After a third attempt to get my question answered I gave up and had my colleague ask her if the ringing is any louder than it was before. The woman said, no, it was not any louder but now she can't stand it. Right away I guessed that it was an anterior temporal lobe problem.

The SSW test results showed posterior temporal signs as well as the anterior sign that we predicted. It turned out that she had a posterior temporal region tumor but in order to remove it they had to remove the anterior temporal lobe. So we were correct in identifying the anterior temporal lobe site based on her behavior (and then by testing).

3. The Buffalo Model combines speech-in-noise problems and short-term auditory memory in a single category called Tolerance-Fading Memory (TFM). While our data clearly showed the association between these two functions I was at a loss for a good theory to explain why this was so. Because the anxiety factor that was often associated with TFM one possibility was that the anterior temporal lobe contained both components (not exclusively but in their most dramatic forms). The hippocampus is universally recognized as the major memory center of the brain and sitting right above it in the anterior temporal lobe is the amygdala which is part of the limbic system.

I have associated the anxiety and stress aspect of speech-in-noise difficulty with the limbic system and have suggested that one of the early benefits of our therapy for this problem is the reduction of what I call the 'limbic effect'. This strongly points to the amygdala. Just this past year 3 articles came out indicating the strong relationship between working memory (a form of short-term auditory memory) and speech-in-noise (Brannstrom et al., 2012; Yathiraj & Maggu, 2012 and with a larger sample size, in press). A third study with those who have hearing losses also found the same connection (Rudner et al., 2012). This is powerful evidence (despite the fact that some people believe that short-term auditory memory is not part of APD and others who

suggest that speech-in-noise and memory are not connected).

4. I began to test each ear for speech-in-noise to be sure that both were contributing maximally to the binaural task. We use an alternating procedure in which 2 sublists of the WINT program are presented to one ear and then 2 to the other in a staggered fashion to minimize artifacts of which ear and in given in what order (Katz, 2009). When we find a significant difference between ears we provide therapy to that ear.

When I found a problem and called the person's attention to that ear in noise, some children responded well by improving their performance, some children did not improve and some actually got worse! When I mentioned this to my psychology colleague he pointed out that in the Neurofeedback literature they have noted that those whose brain waves that indicate tenseness, when further pressure is brought to bear they tend to get worse at the task instead of better. This concept brings me back to the amygdala and the limbic system and blocking out background noise.

5. When I was a graduate student we lived in low income housing where the walls were quite thin. Our next door neighbors drank lots of beer at night, played cards and laughed and joked loudly a few yards from where I was studying. My mother was visiting at that time and I must have said something unkind about the noise my neighbors were making. My mother shook her finger at me and said, "Shame on you, listen to them, they are having so much fun, how could you deny them that?"

That's all I had to hear and I was able to go back to my studies and their noise did not bother

me. Once I realized that it was not discourteous or thoughtless, they were just having fun it was okay. I thought it was magic but at that time I did not know about the amygdala.

I had another incident that showed me not to mess with the amygdala. I gave a talk in a resort area of Canada. As I took my bags to my room I heard what appeared to be piped-in music that was playing in the halls. I thought that it was the worst music I had ever heard. There was beep, beep...beep and a toot...toot, tootoot and a wam, wam. I could not imagine that anyone in the world would enjoy that kind of music. Thank goodness I got to my room and I would be out of that awful sound. When I got to my room the same awful sounds were being piped into my room! I could not believe that. I was furious not only with the invasion of my room without consulting me, but to have to hear such garbage was unpardonable! Furiously I went downstairs to the front desk and as I approached it I saw a sign that they proudly announced that the philharmonic was there. My anger turned to laughter. Suddenly I realized that the musicians were in their rooms practicing their parts. It did not bother me one bit more.

Another limbic related illustration is when I was at a basketball game with my granddaughter. At one point she turned to me sadly and tears were rolling down her cheeks. I asked what was wrong??!! She said why are they so loud?? It was a noisy crowd. I asked her, "Do you want to have fun tonight?" She said, "Yes." So I told her to do what they are doing. She asked, "what are they doing?" I said, "They are yelling and screaming and having a great time!" No sooner were those words out of my mouth, she turned around, stood up, raised her hands above her head and let out a blood curdling

scream. The tears were gone and she had a good time.

6. Years ago I noted that kids with anxiety going into the test chamber tended to be those who had major problems with TFM. I remember one child, once inside the chamber who went ballistic. He dashed to the first electrical outlet and started pulling on the plug or wire and as I was re-plugging it he dashed to the next one and did the same thing. I still don't understand what that was all about but I can't help but think that his initial anxiety turned to panic or rage. Fortunately, that was the only time there was such an explosion, but quite a few others showed what might be some form of claustrophobia.

8. I received a call from a man from another state who said that he had a smart son who was going to college and flunked out. He was very uncomfortable in class because he could not understand the professors and was very distracted because of the noise interfered with his attending. The father asked for a CAPD evaluation for his son. I indicted that I could not because that semester I was working on therapy, but if his son did come for an evaluation that I would try out my speech-in-noise therapy with him.

The young man was tall and thin. The audiologists found that he did indeed have CAPD and much difficulty in noise. The therapy program was the forerunner of WINT that begins with speech but no noise and then gradually adds multi-talker noise. At the level at which he had 0% correct (out of 10 words) we discontinued the series. What was so notable was that as the noise began to get louder the young man crossed his arms and began holding himself tighter and tighter

around his waist (only possible because he was so thin). When I turned off the noise there were massive signs of relief. I asked if he felt a lot better and he heartily agreed. Then I said that I would like him to think about how relaxed his muscles felt and comfortable he was and to take a break and get a drink of water and to see if he could hold onto this great relaxed feeling. When he returned we repeated the speech-in-noise procedure and this time he responded less severely to the procedure. We halted the series at the same SNR as before, but this time he had 30% correct. So we tried it once more. He tried to maintain the relaxed feeling but this time I suggested that he not hold himself around. Clearly he was much less bothered by the procedure and sure enough he had 70% correct. I was amazed that he could do so well and asked him if he was willing to try it one more time. So after the break he took the series but obviously in a fairly relaxed way and this time he got 100% correct. I could not believe that within one-hour he could adjust to the task and relax so much that he could get all of the 10 words.

For a number of years I had referred to the *primary* and *secondary effects* of noise. This was the clearest indication that I had seen. When he adjusted to the task and began to relax more and more the secondary effects freed him in some amazing way to handle the primary challenge of pulling out speech from the background of noise. I would not have believed that this rapid change was possible. But just as in the case of my granddaughter at the basketball game, this was not going to be a cure. If he was to receive WINT-type therapy it would take a shorter time to marginalize the secondary effect and then to continue to improve the primary effect to reduce the chances of the problem recurring. Figure 1

shows the WINT results for 74 children who received AP therapy. The secondary ‘limbic’ effect is associated with the initial phase.

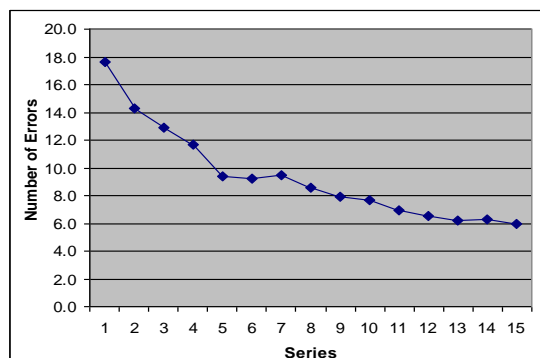


Figure 1. Words-in-Noise Training-1 (WINT-1) program N=74. Improvements in the first 5 series are associated, at least in part, with the improvement in the ‘limbic effect’. The more gradual improvement over the next 10 series is likely due primarily to the primary effect.

9. This brings me to misophonia. Misophonia, we are told, means hatred of sounds. Those who suffer from this are tortured by such noises, as a glass when it makes contact with the table, nasal speech, the ticking of a clock, etc. etc. It reminds me of someone who is tactile defensive. When someone gives them a gentle touch to their arm or back it is as if they were punched in the face. It is for this reason that I include this question on my questionnaire to be sure I don’t trigger this negative reaction. Sure enough Misophonia is associated with the amygdala and the limbic system.

Conclusions

Based on these experiences and information it is folly to fight the limbic system because it will not only fight back; but it will double-down. So how can you beat its ill effects? Well, if romance is not your approach to life then at least befriend the limbic system (it is really a nice system and important to our well being and safety). Only when it gets too upset does it

cause us problems. So we must teach it to relax and not sweat the small stuff.

1. Remember it's your friend (if it hasn't been your friend with regard to background sounds or noise now is the time to make friends - both of you will really enjoy it).
2. Take a couple deep breaths and relax (both of you will benefit from that too).
3. Then tell the limbic system how you feel (good, great, relaxed) even if you are not (feeling good, great or relaxed just yet).
4. Tell the limbic system (I *lovingly* call it *Limbi*) that you are thinking that we are fortunate to be able to hear because there is so much learning and pleasure that we can derive from hearing.
5. Explain to Limbi that when people make noises they are not trying to annoy you. They don't even realize they are doing it. They just may be eating, crying, setting the table or enjoying lively conversations with others. These are everyday activities for most people and not meant to annoy or upset anyone. They are so busy living their lives or doing their things that probably have no comprehension, that this is bothering another person. In fact, sometimes the people who have the most trouble dealing with noises are quite noisy themselves!
6. The simplest thing to do is to romance or at least befriend the noise. What I did with my tinnitus (constant ringing in my ears) is to make it my friend. So wherever I go in the world I always have my friend from back home with me. Consequently, it is not important so I usually forget about it. I believe without medication or counseling you

can improve your situation by loving you current enemy for the betterment of society and your own happiness.

Practice relaxing and when everything is quiet then make a conscious effort to relax with the noise/sounds that annoy your Limbi. With practice you will see as we see in WINT training that noise is not so bad especially when it's your friend.

7. The limbic system is there to save our lives from danger. See what you can do to reduce your negative reaction to noises, even if you have to befriend them.

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