

Different Kinds of Intelligence are Responsible for Different Kinds of Thinking

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### Abstract

This paper explored the possibility of having more than one kind of intelligence and the variety of thinking amounts that can occur with different completion of tasks. The experiment consisted of testing an individual in three different tests that would require different parts of the brain to complete the tests. The data that was collected from the EEG gave us different wave length patterns that we compared together to validate that there are more than one kind of intelligence

### Different Kinds of Intelligence are Responsible for Different Kinds of Thinking

Not all thinking that happens in the human brain is done with one part of the brain. Many researchers over the years have spent countless hours studying the different kinds of intelligence that are seated in different parts of the brain.

Ernhart and Hebben, (1997) deals with the discussion of the knowns and unknowns of intelligence; concepts such as the psychometric approach, multiple theories and forms of intelligence, culture differences, developmental and biological approaches. The researchers discuss how they will predict the test scores and what they show. They will focus on individual differences, with IQ tests and other tests to measure the cognitive ability of the person and show that there are environmental factors, like biological and social variables.

Sternberg, Grigorenko, and Kidd (2005) discuss the question what intelligence is based on, the history of intelligence and tests to measure intelligence. They figured out some aspects that give the idea how tests show and measure intelligence. Also, the different theories have different conceptions of intelligence and test measure.

However, Sternberg (2006) also has shown the narrow range in trying to understand the different kind of intelligence, in particular creative and practical thinking. The author found that some of the intelligences get more novel than others and also enlarge the theory of “successful” intelligence, which focuses on strengths and correcting weakness. In the study, he reported how conventional kinds of tests depended on novel limited areas of intelligence. His experiment consisted of testing 80 individual with novel kinds of reasoning problems and 60 people with some kinds of inductive reasoning problems such as analogies, series completions, and classifications to know how well an individual can cope with relative novelty. The result showed that correlation of different kinds of tests depended on how novel the conventional tests were. He

also found that some components measured the creative intelligence better than did others. Also he found that some of the tests currently measure the creative aspect of intelligence than where in the past they focused more on the mathematical standpoint.

Visser, Ashton and Vernon (2008) tested Gardner's multiple intelligence theory which states that there are eight intelligences that we as humans have. 200 subjects were examined using two tests. They were told to rate themselves based on what they are good at doing. For example if they were good at music then they have more music intelligence. The results were that women seem to excel more in interpersonal intelligence while men had a grip better on mathematical intelligence.

Finally, Furnham, Wytykowska and Peyrides (2005) had participants estimate what their parents excel at based on Gardner's multiple intelligence theory. In this study the experimenters surveyed college students to find out about multiple intelligence. The results of the survey were that women tended to underestimate their intelligence, while men over estimated themselves. Also people that had high IQ's attributed it to their parents. This pertains to us in that we are testing intelligence and that the intelligence tested in this study was based on Gardner's multiple intelligence theory.

We predict that the person that is being tested will show different EEG patterns while engaged in tasks that require different intelligence.

## **Method**

### **Participant**

We studied one voluntary, male, college student between the ages of 18 and 21. English was his second language which caused some language barriers when we explained what the experiment was going to entail but it all ended up working out.

## **Materials and Apparatus**

To successfully complete our study we used a room that is quite with no distractions because the simplest distractions could have altered results. There was at least one desk and chair for the test subject to sit in. There was only six people in the room during the testing; the one being tested and then the five conducting the test. We had a table for the person who is conducting the experiment to set up the different paper tests on and we had extra supplies such as pencils, pens and tests ready just incase we needed them. We had multiple copies of the three different kinds of intellectual test we were giving. Each test tapped into a different part of the brain which helped show there are different intelligences. The first test that was given was a puzzles test which consisted of four different mazes. The second test that was given was a math test. That test consisted of three different math operations; Subtraction, Addition and Multiplication. The third test that was given was an English/language test. That test consisted of three parts; Grammar, Punctuation and Spelling. We also used the Biopac MP40 device to record the participants EEG waves during each of the different tests.

## **Procedure**

We first explained what we were testing and how it would go and then received verbal consent from our participant. After he agreed to participate in the experiment we hooked him up to the Biopac MP40 device using non-painful electrodes that are attached to leads. We cleaned the area that the electrodes will go on with rubbing alcohol and then stuck the electrodes closest to the skin. One electrode (red lead) was placed four to five centimeters above the right ear, the second one (white lead) was placed four to five centimeters behind the ear and the last one (black lead) was placed on the right earlobe folded under. Once the electrodes were placed we asked the participant to wear a swim cap to help keep the electrodes in place. After that step was

completed we started up the Biopac MP40 device. We had the participant get into a relaxed state of mind before we start giving the tests. Once he was relaxed we gave him the puzzles test which as stated before consisted of four different mazes to complete and he had five minutes, due to a limit amount of time, to complete as many as he could. Then he was given 15 seconds to relax. After the 15 seconds were up he was given the second test which was the math test. This test consisted of addition, subtraction and multiplication problem that progressively got harder as the test was being completed. He was given five minutes again to complete as much as he could and then another 15 seconds rest period. Then he was given the final test which was the English/language test. That test consisted of a couple paragraphs that were related but had grammar, punctuation and spelling errors that needed to be corrected. He was given five minutes to complete as much as he could again and then another 15 seconds rest period so he could return to the state he arrived in. Once the rest period had ended we stopped the Biopac MP40 and unhooked our participant. The next couple of minutes we sat and talked with our participant about how he felt the tests went and what was hard, easy or could have been done differently. After he gave us some feedback he assured us that he was feeling fine and left.

### **Results**

The data obtained from our experiment was very diverse with different brainwave patterns. Once we broke down the data into five minute sections we got a range of beta wave values. For example our participant was thinking more when he was completing the English/language part of the test then when he was completing the mazes. This data is obtained from the peak to peak values. This value measures the distance from one top of a wave to the top of another wave. The math test was another good place for us to see that brain activity was occurring through his peak to peak numbers increasing. For instance his peak to peak value in

the beginning of the math test which consisted of simple addition, subtraction and multiplication was 18.12uV by time he got to the end of the math test his peak to peak value had increased to 28.20uV which is about a 10uV jump. Since the math was getting more complicated and not having a calculator to do the work for him, he was forced to think harder on how to solve the math problem correctly. Another place where the peak to peak of the beta waves was high was during the English/language test. English being his second language, it was only expected that we would have to think harder in this section to complete. The data 100% supported that assumption. His peak to peak value was almost double what his peak to peak value was in the beginning of math. He had reached a value of 30.54uV in the beginning of this test. Clearly more intelligence was occurring at this point. Overall the data obtained help validate that there are one then one type of intelligence and that there is different amounts of thinking that occur with different tasks or tests completed.

### **Discussion**

Overall we are very pleased with our experiment and the data produced. We feel that the test did help validate that there are different kinds of intelligence that require different amounts of thinking. There are some things we would have liked to change to possibly get more accurate results. In the future if we were to repeat this experiment we would have given our participant more time to complete the test because we feel that five minutes was not that long and was almost rush feeling. Also given more time, over a longer period, we could have gotten a larger sample of both guys and girls and a larger sample of different aged individuals. With the larger samples we could see the difference even more then through just one individual. Our participant suggested that there be less people in the room when the testing is going on because he said it was a little noisy which cause a couple distractions for him. For those in the future who decided

to expand on this experiment we hope you take the above suggestions but also expand on the tests. Maybe give a variety of different test or test the participants more then one time. For example possibly do a case study on some of the participants to see if intelligence and amount of thinking grows with age.

In conclusion, we feel that our experiment tested what we were trying to validate. We also think we did the best we could and feel our experiment was a success.



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