

**CLINICAL STUDY:  
BAUD<sup>TM</sup> assisted Neurotherapy**

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# Clinical Study: BAUD assisted Neurotherapy

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## **Abstract**

The use of neurotherapy or the use of EEG output to help a person learn how to affect his or her brain frequencies has been documented for many years. Lubar and others (1999, 2004) (see complete list attached) have researched this method for the management of Attention Deficit Disorder (ADD) and concluded that this therapy has substantial impact for this disorder. The basic concept underlying the symptoms of ADD has been described as a heightened intensity seen in the frontal level and central regions in the wave range of theta (4-7 Hz.), which is the state of mind associated with high imagery and dream-like consciousness. This description is the identical description of how these people feel. They have a very difficult time breaking off this state when their brains are required to become more problem-solving which is related to the Beta (greater than 16 Hz.) and LoBeta (12 - 15 Hz.) frequencies. There may also be pattern of elevated delta (.5 to 4 Hz.), which is indicative of sleep states.

The primary limitation for this and other self-regulation approaches is a function of the length of time it takes for a person to learn these subtle controls, usually taking 20-50 sessions for success. There are several logistical reasons for the long delay. The client cannot take the equipment home to train every day or apply in individual circumstances, such as in school or at work. There are limitations as to the number of training sessions for such training opportunities and the costs become prohibitive. Moreover, the frustration levels, especially for those suffering from ADD, can become overwhelming for persons with limited concentration levels and memory issues.

For these and other logistical issues, the Bioacoustical Utilization Device (BAUD) was invented by G. Frank Lawlis, Ph.D. and T. Frank Lawlis, B.S. The BAUD technology is based on the principle of brain entrainment, using acoustical tones. The research of acoustical influence on brain waves has been documented with the pioneering research of Melinda Maxfield (1993) and others at the lower frequencies (4 - 7 hz.) to enhance theta frequency output from the brain and having resulting emotional senses of relaxation and pain reduction.

The engineering technology utilizes a stereophonic sound wave of either a sine or square pattern for each ear in which the interference between the two will form a third tone considered to be the frequency that drives brain patterns. This model is based on neurological output in which outputs of various sources of the brain are known to overlap and

create an integral energy pattern for multiple-level coordination of several functions.

In a simplified explanation, the application of the BAUD to neurotherapy is based on increasing the control and logistics to the client. In sessions, the client is told to increase or decrease the acoustical feedback in accordance to the desired frequency, offering feedback to his or her manipulation of the machine. For example, if the desired frequency is to increase LoBeta or SMR, as for ADD, the client can quickly observe that listening to the acoustical stimulation can influence that frequency significantly. In our experience, the client can usually learn to manage his or her brain frequencies to a noticeable difference within twenty minutes. The resultant emotional and functional experience can increase motivation and training facility. Moreover, once that experience is obtained, the client can take the BAUD to specific arenas for experimenting with specific challenges. The BAUD is approximately the size of a cell phone and light in weight. Some students have worn the device inside their shirts in school.

The purpose of this study was to investigate the efficacy of the BAUD in management of ADD symptoms, such as concentration, memory and spatial orientation. More specifically, the hypotheses were stated:

1. BAUD assisted Neurotherapy will significantly impact a person's ability to increase LoBeta and Beta frequencies and maintain that control into specific personal arenas of life.
2. BAUD assisted Neurotherapy will significantly impact a person's ability to recall details of a 20-bit story.
3. BAUD assisted Neurotherapy will significantly impact a person's ability to approach math problems and improve performance.
4. BAUD assisted Neurotherapy will significantly impact a person's ability to conduct a spatial reproduction task.
5. BAUD assisted Neurotherapy will significantly impact a person's ability to improve emotional states.

## **PROCEDURE**

### *Participants*

The 26 participants were children and adults drawn from a private practice office in Dallas, Texas in which all were initially diagnosed with Attention Deficit Disorder from a licensed psychiatrist and in counseling or psychotherapy. Many were long-term sufferers and all were on medication. Below are the demographics.

## Demographics

Ages: 14 - 65 years of age		
Race: Caucasian 100%		
Gender	15 males	
	11 females	
Medications:	Ritalin	50%
	Concerta	30%
	Strattera	10%
	Adderall	10%
	Zoloft	40%
	Celexa	40%

## *Procedure*

The participants were offered two sessions for BAUD-assisted neurotherapy and were given the explanation that we were conducting a research study involving the use of the device and signed a research-participant consent form. No one refused to participate. The environment was one of two situations, both quiet and similar to a typical clinical practitioner's surrounding.

Before the administration, the participants were given a form for emotional self-assessment of subjective units of emotional well-being. The form is below:

### Brief Assessment of Moods

On the scales below, please rate how you are feeling now on a scale of 1 (no symptoms or signs) to 10 (very high signs and symptoms).

	No Sign		Some			Definite			Very Much	
	1	2	3	4	5	6	7	8	9	10
1. I feel depressed today.	1	2	3	4	5	6	7	8	9	10
2. I feel weak today.	1	2	3	4	5	6	7	8	9	10
3. I feel distracted today.	1	2	3	4	5	6	7	8	9	10
4. I feel angry today.	1	2	3	4	5	6	7	8	9	10
5. I feel stressed today.	1	2	3	4	5	6	7	8	9	10
6. I feel happy today.	1	2	3	4	5	6	7	8	9	10
7. I feel positive and excited today.	1	2	3	4	5	6	7	8	9	10
8. I feel strong today.	1	2	3	4	5	6	7	8	9	10
9. I feel smart today.	1	2	3	4	5	6	7	8	9	10
10. I feel energetic today.	1	2	3	4	5	6	7	8	9	10

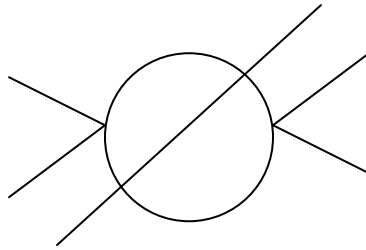
In addition to the emotional states, the participant was read the following story of 26 bits of information and asked to remember as many details as possible:

*Jerry was a very curious boy and liked to go to the movies. He usually went to them on Saturdays, but today he skipped school and went to see a movie called "Claws" on Friday. The movie was about this kid that turned into an ape and scared everyone, especially his girlfriend, Jean. He did not like the movie much, and he got into a lot of trouble because he missed school. He was grounded at home, and he had to go to detention room for a week after school. He thought a lot about his actions and decided that movies are not that good to cause this much trouble. His girlfriend was also mad at him and dumped him because he had such bad judgment. His favorite subjects in school were mathematics and biology,*

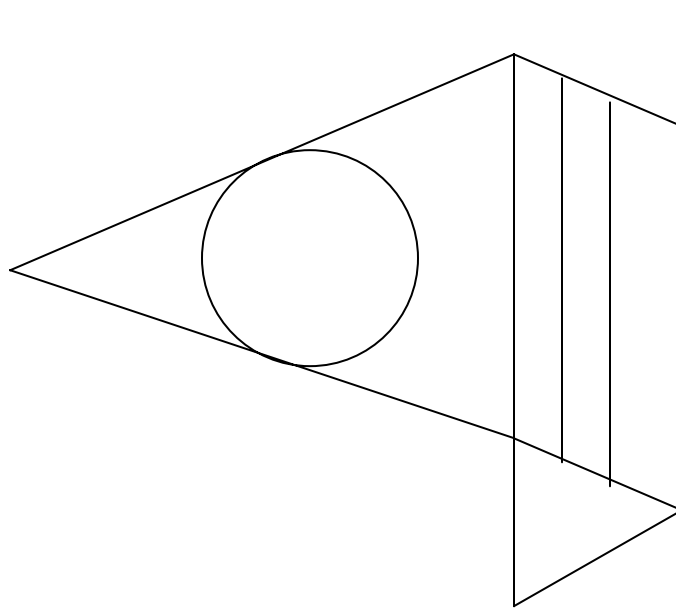
*and he hated history and English. He never skipped school again, but he got another girlfriend named Lorri.*

The participants were also asked to draw and replicate the following figures:

Drawing One



Drawing Two



The third task was to attempt as many of the arithmetic problems as possible in 4 minutes:

242	25	361	1204	23	152
199	51	983	5545	85	339
564	98	765	7823	69	342
<u>+457</u>	<u>+ 87</u>	<u>+ 129</u>	<u>+ 4578</u>	<u>+ 15</u>	<u>+ 239</u>
245	414	2504	231	13	45
<u>X34</u>	<u>X25</u>	<u>X345</u>	<u>X98</u>	<u>X9</u>	<u>X7</u>
87564	2101	7612	1412	23456	5342
<u>- 73588</u>	<u>-1998</u>	<u>- 6574</u>	<u>-1209</u>	<u>- 8765</u>	<u>- 976</u>

### *Neurotherapy procedure*

Each person was hooked to a Brainmaster EEG monitor, using one channel. Two locations were used, FZ and CZ . The rationale for using these positions was based on the literature and the expectations of optimal results from an experiential basis. Each trial was conducted in a practice session after reliability and validity readings were obtained. After a ten-minute practice session, each subject was introduced to the BAUD and when applied to the ears, was asked to see if he or she could begin to control the frequencies of LoBeta.

Based on the clinical judgment of the practitioner, the criteria for whether or not the subject has significant control was based on the “game” of crickets in which the subject would gain scores if he or she kept a cylinder full of green color, indicating increasing LoBeta signals. A success of “winning the game” with 100 points consistently was a clear measure to the researcher that the client had attained significant influence for this dimension. All 26 participants reached the criteria within 20 minutes and expressed satisfaction for this achievement.

### *Post-therapy*

The participants were asked to repeat the emotional states rating form and drawings. They were administered a parallel form of the story (shown below:)

*Judy was a very serious young girl and loved to read books about mysteries. She usually went to the library on Saturdays and read books from noon to about 3:00 o'clock, and returned home to do her normal errands. But she got involved with a story about a girl who worked with the police to solve crimes and didn't leave the library until it closed at 5:00. She got in trouble at home and had to clean the house and garage the next weekend, which caused her to miss her usual reading time. She had a*



*boyfriend but he was not interested in reading, so he did not understand why she was upset. She was upset but realized that she needed to pay more attention to her schedule and never was late again.*

A parallel form of the arithmetic test was also administered (shown below).

241	24	362	1201	22	151
199	51	983	5545	85	339
564	98	765	7823	69	342
<u>+457</u>	<u>+ 87</u>	<u>+ 129</u>	<u>+ 4578</u>	<u>+ 15</u>	<u>+ 239</u>

246	413	2502	231	11	43
<u>x34</u>	<u>x25</u>	<u>x345</u>	<u>x98</u>	<u>x9</u>	<u>x7</u>
87569	2109	7615	1419	23465	5347
<u>- 73588</u>	<u>-1998</u>	<u>- 6574</u>	<u>-1209</u>	<u>- 8765</u>	<u>- 976</u>

*Control assessments*

Seven subjects were used as a waiting control group in which the pre-test and post-test with fifteen minutes separation were administration, with the post-test administered post Neurotherapy. These scores were analyzed for practice affects. The baseline was used as the comparison of control for all subjects.

## Results

### *Brain frequency changes*

Although the individual wave patterns did not meet parametric assumptions for computations, the means and standard deviations are presented below. The averages for the Cz and Fz locations are represented for the respective Delta, Theta, Alpha, LoBeta and Beta amplitudes. It should be noted that the patterns clearly are similar to the typical ADD patterns in the literature.

Location / wave	Baseline		BAUD	
	<u>Mean</u>	<u>S.D.</u>	<u>Mean</u>	<u>S.D.</u>
Cz Delta	10.67	3.32	11.21	3.44
Cz Theta	15.68	5.03	16.11	4.99
Cz Alpha	12.09	4.98	11.58	4.57
Cz LoBeta (SMR)	5.78	1.71	11.64	2.16
Cz Beta	7.48	2.48	6.67	2.84
Fz Delta	10.93	3.93	10.93	3.93
Fz Theta	16.63	5.2	15.42	3.79
Fz Alpha	10.27	4.16	10.79	2.89
Fz LoBeta (SMR)	4.92	1.68	5.30	1.73
Fz Beta	6.57	2.50	6.92	2.23

Using a non-parametric application of Chi-square using the criterion of expected ascensions of LoBeta and Beta were analyzed. The trends of the respective frequencies were rated simply as to whether their overall trends were either descending and ascending from the initial stages of the trials to the final stages. I.e. either the frequencies were getting stronger and weaker. Since the requirement for the BAUD-assisted therapy was ascension of the LoBeta (26/0), the statistical analysis was affected by this one dimension; however, as can be seen below, the clinical significance was obvious. The chart for that assessment is presented below:

Non-parametric analysis of Brain frequencies					
Cz	Delta	Theta	Alpha	LoBeta	Beta
Baseline Ascensions/ Dissensions	13/13	14/12	12/14	10/16	11/15
BAUD Ascensions/ Dissensions	3/23	6/20	13/13	26/0	22/4
Chi <sup>2</sup> = 1048, p < .0000					
Fz	Delta	Theta	Alpha	LoBeta	Beta
Baseline Ascensions/ Dissensions	14/12	15/11	15/11	12/14	11/15
BAUD Ascensions/ Dissensions	9/17	9/17	12/14	26/0	23/3
Chi <sup>2</sup> = 721, p <.0000					

In order to determine patterns common to success for ADD training the following combinations of frequencies were analyzed. It was assumed that if the Individual were attaining control of concentration abilities, the delta and beta frequencies would come closer together, making their differences less. Therefore the differences were compared to the baseline differences. Also, the differences between theta and Lobeta were also compared to the baseline and BAUD training. The results show that the Cz results were not significant; however, both the results for the Fz placement were significant.

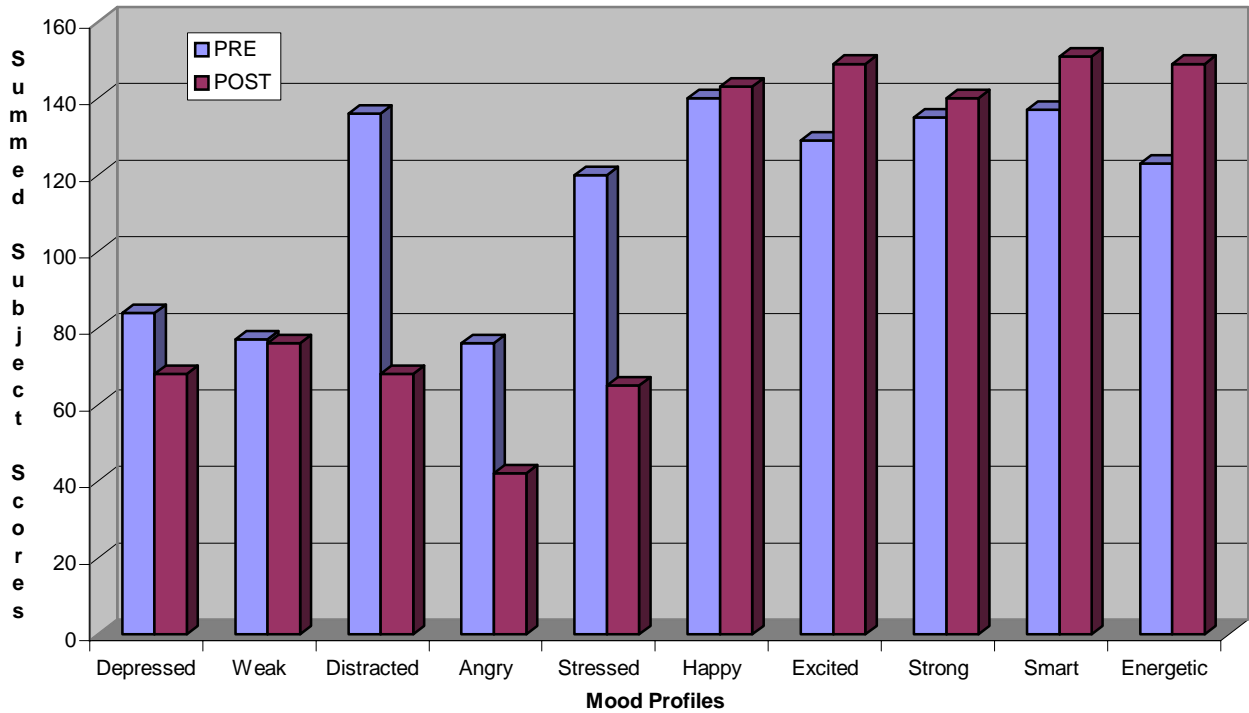
Cz comparisons				
	Means	standard deviations	T-value	significance
Delta-Beta	-1.35	7.80	-0.88	p = .19
Theta/Lobeta	-.57	6.27	-.467	p = .32
Fz comparisons				
	Means	standard deviations	T-value	significance
Delta-Beta	1.47	4.48	1.67	p = .05*
Theta/Lobeta	-1.60	4.23	-1.92	p = .03*

### *Emotional states*

Each of the ten emotional ratings was compared pre and post the BAUD assisted neurotherapy experience. The statistical findings are presented below and as seen in the graph, there was a ceiling affect for the positive emotions, making statistical significance implausible. As can be seen, even considering the error rate of ten comparisons, the primary changes were distraction and stress, the two ingredients in ADD.

Comparison of pre-post emotional ratings						
	Pre-mean	Pre-S.D.	Post mean	Post S.D.	t	p
Depressed	3.23	2.26	2.8	2.11	1.21	.12
Weakness	2.96	2.00	2.69	1.69	.65	.26
Distracted	5.23	2.74	2.65	1.38	4.4	.000
Anger	2.92	2.39	1.80	1.05	2.49	.01
Stress	4.61	2.48	2.69	1.62	4.08	.000
Happy	5.38	2.33	5.55	2.49	.26	.40
Excited	4.95	2.73	5.73	2.50	-.1.57	.13
Strong	5.19	2.32	5.46	2.37	-.61	.55
Smart	5.27	2.27	5.88	2.42	-1.30	.20
Energy	4.69	2.36	5.65	2.31	-1.64	.11

Mood Assessment Bar Graph



The wait-control group was also compared as a no-treatment group and the differences were compared. As can be seen, there were no significant changes based on the experience of attention or expectations. The results are shown below:

	Pre-mean	Pre-S.D.	Wait mean	Post S.D.	t	p
Depressed	3.23	2.26	2.00	2.11	.54	.61
Weakness	2.96	2.00	4.00	2.00	.59	.58
Distracted	5.23	2.74	5.00	3.02	.77	.47
Anger	2.92	2.39	2.00	2.70	.00	1.00
Stress	4.61	2.48	3.85	2.26	.30	.71
Happy	5.38	2.33	4.57	2.37	1.94	.11
Excited	4.95	2.73	4.72	3.14	.25	.80
Strong	5.19	2.32	4.28	2.43	.41	.70
Smart	5.27	2.27	4.57	2.22	.34	.74
Energy	4.69	2.36	3.42	1.81	.74	.49

### *Auditory memory*

Each of the participants was read a short story in order to determine the memory increase with the use of the BAUD assisted neurotherapy. The number of bits of information remembered was recorded for pre and post neurotherapy, with 7 individuals being given the test twice as a wait-control. As can be seen from the data analyses, the post experience was significant, with the wait control score being almost identical to the pre-test.

	Mean	S.D.	t	p
Pre-therapy score	8.11	2.81		
Wait group score	8.00	4.32	.73	.545
Post score	13.19	4.03	6.80	.000

### *Spatial organization*

Spatial organization was assessed through the drawings. These were scored in five dimensions, as described below. It is significant that all the improvements were fairly dramatic although the performances were not that abnormal. The number of distortions might be excluded since there was obviously a practice affect.

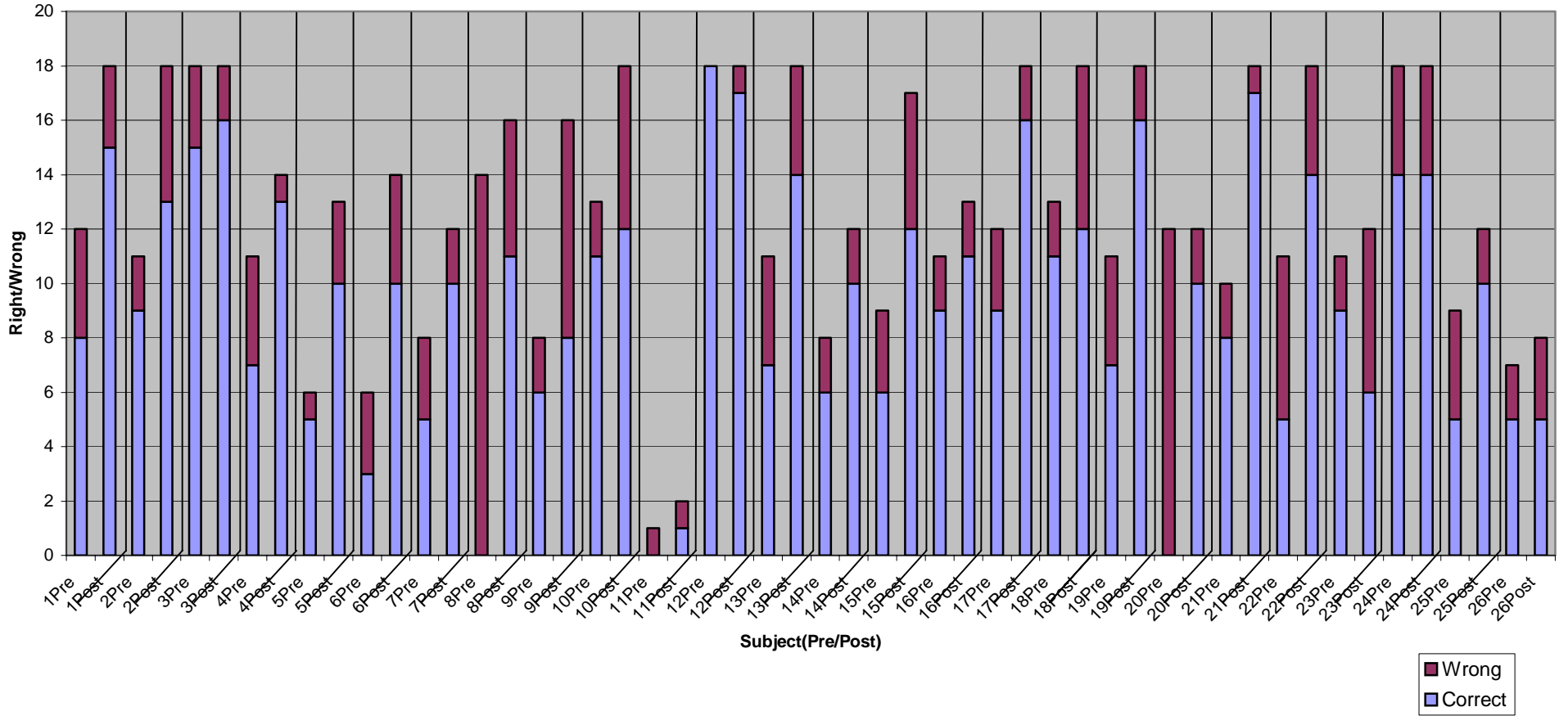
1. Disconnections – the number of time the lines were not connected or misplaced.
2. Distortions – number of distortions.
3. Omissions – number of omissions in the drawings
4. Number of errors
5. Scale – graded on a scale form 0 to 2, 0 = in correct scale, 1 = some minor change, 2 = a major distortion.

Spatial Organization results				
Scale	Mean	S.D.	t	p
Pre disconnections	3.11	1.75		
Wait group	2.57	1.81	.001	.999
Post	1.88	1.27	2.96	.003
Pre distortions	2.30	1.37		
Wait group	1.71	1.25	3.16	.025
Post	1.00	.75	5.44	.000
Pre omissions	.35	.68		
Wait group	.00	.00	1.58	.175
Post	.11	.32	1.54	.065
Pre Number of errors	3.89	2.03		
Wait group	3.14	2.19	1.00	.363
Post	1.78	.99	6.34	.000
Pre Scale	1.42	.577		
Wait group	1.28	.755	1.00	.363
Post	.42	.58	8.06	.000

### *Number functions*

The ability to perform arithmetic tasks is especially difficult for children with ADD primarily because of the demand for tedious detail. Many simply will not attempt such a task because of the discomfort facing them and the strong demand for accuracy. As can be seen, one individual did not attempt but one problem for the pre-test and two for the post test (see graph of arithmetic assessment).

### Arithmetic Assessment





Statistical assessment on Arithmetic Test				
	Mean	S.D.	t	p
Pre-Number attempted	10.73	3.83		
Wait group	10.67	2.73	.17	.866
Post	14.96	3.93	7.40	.000
Pre-Number correct	7.23	4.33		
Wait group	6.83	3.48	.382	.718
Control	11.82	3.78	5.89	.000

On the basis of these statistics, it appears obvious that the participants had a significant advantage to using the BAUD. The responses to the demand of arithmetic problems represented a different qualitative challenge in the number of attempted problems, and the accuracy was increased.

## **Discussion**

The immediate results of the BAUD assisted trial were obvious. There was quicker learning and control with the assistance of the device. The brain waves based on the FZ placement were predictable for the LoBeta; the more remarkable responses were in the other brain frequencies as they moved toward a state of normalcy and harmony.

The emotional results were interesting in that the primary significant variables were the areas of most concern to those attributed to ADD challenges – distractions and stress. Emotions are by definition not reliable of long-term psychological measures of temperament, but it was clear that the individuals did have a positive experience in the training process.

The results of the functional tests were especially gratifying. Improvements in auditory memory, spatial organization, and arithmetic performances were significant, even when taken into account of the error rate for testing these variables.

## **Follow up**

Although this study was based on a brief administration, each individual was asked for a life goal that could be assessed within three weeks, such as making better grades or being successful in a task. Each participant took the BAUD device home and practiced on a daily basis as documented. 33 percent terminated the use of medication for their ADD

symptoms, and the remaining reduced medication significantly, as reported to their physician.

The remainder of this report will contain each individual's follow-up report; however, it is safe to say that the majority of them had personal successful experiences as a result of the BAUD training. These reports will be added to this report.

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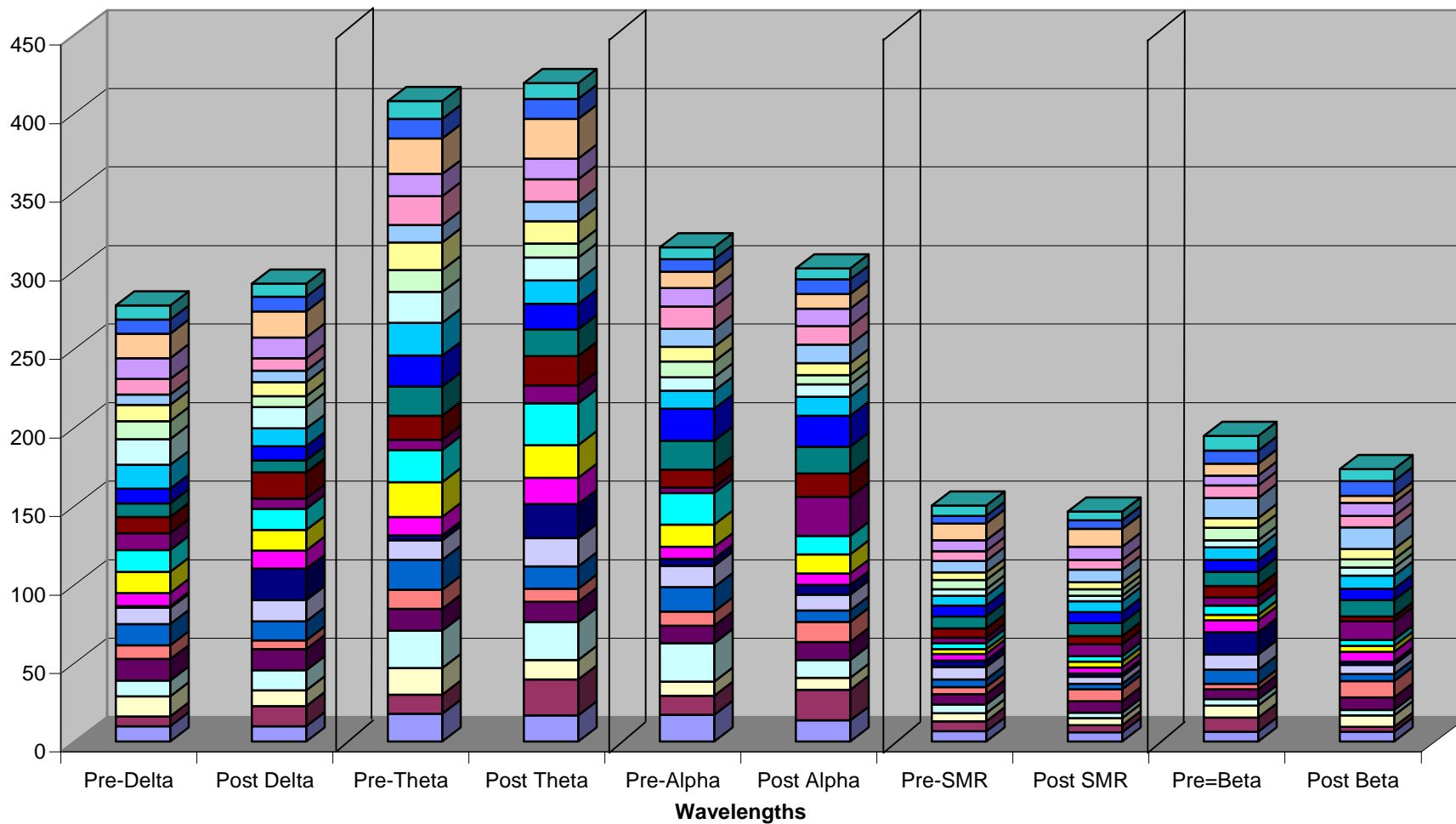
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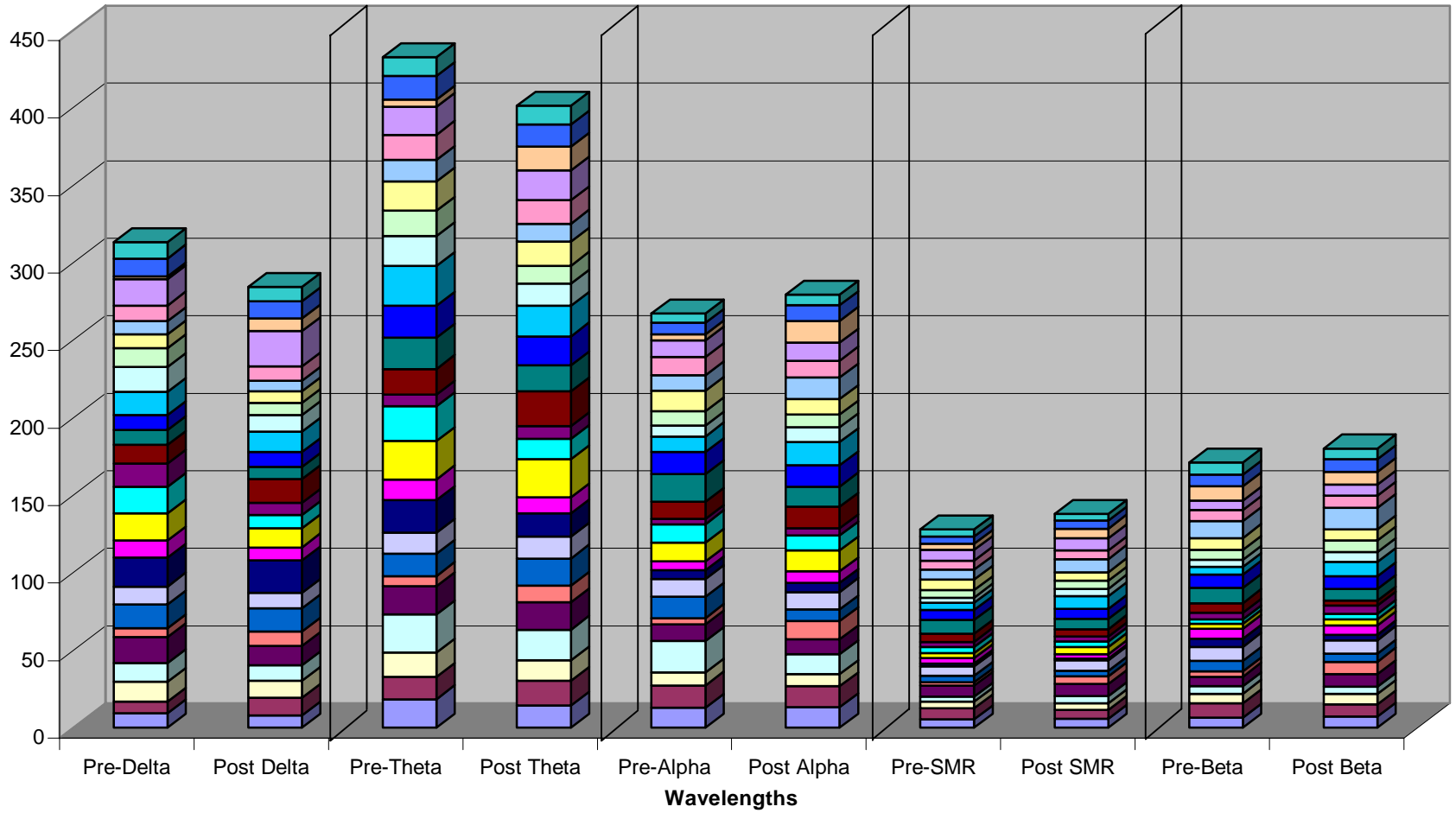
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# APPENDIX: Charts

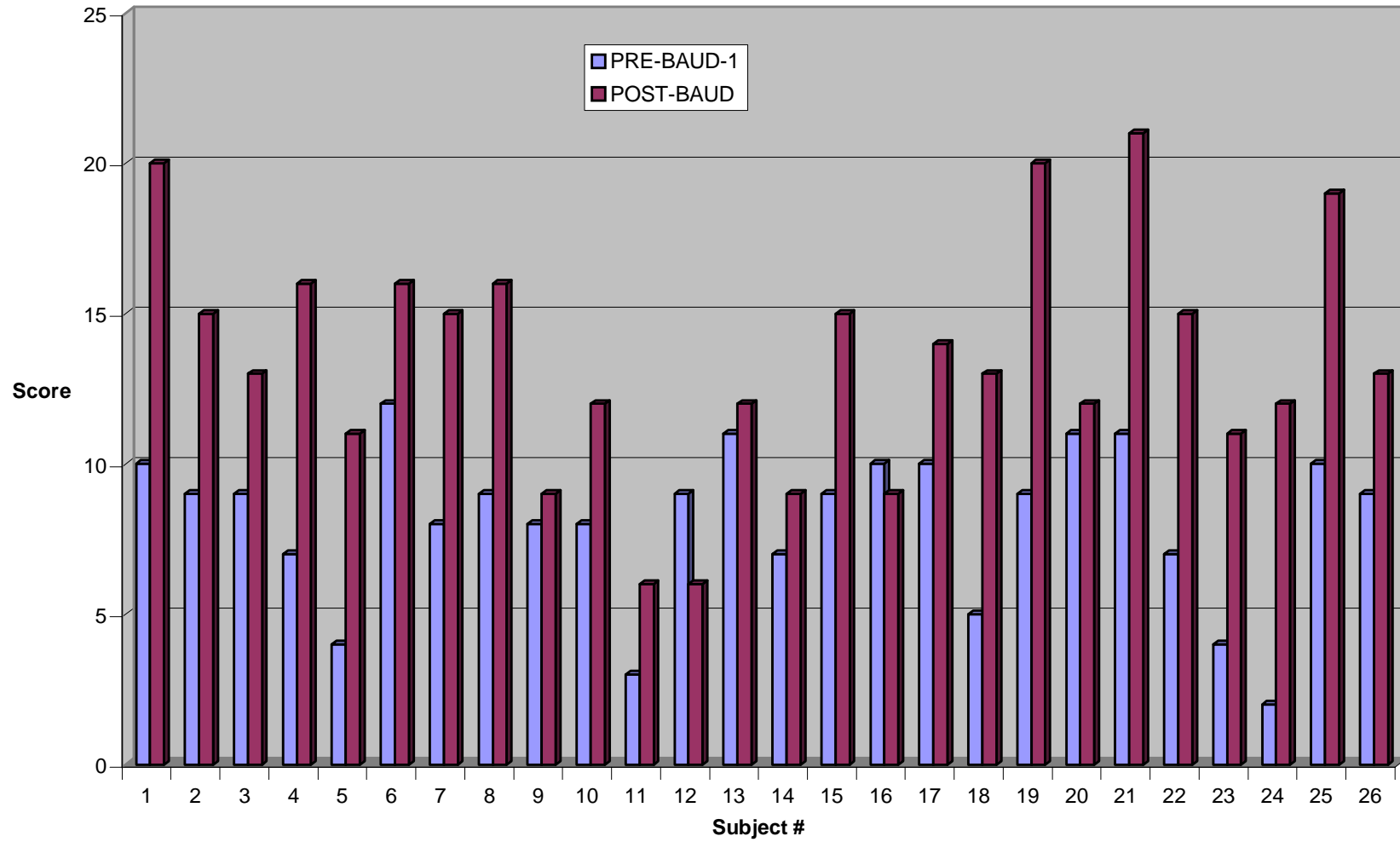
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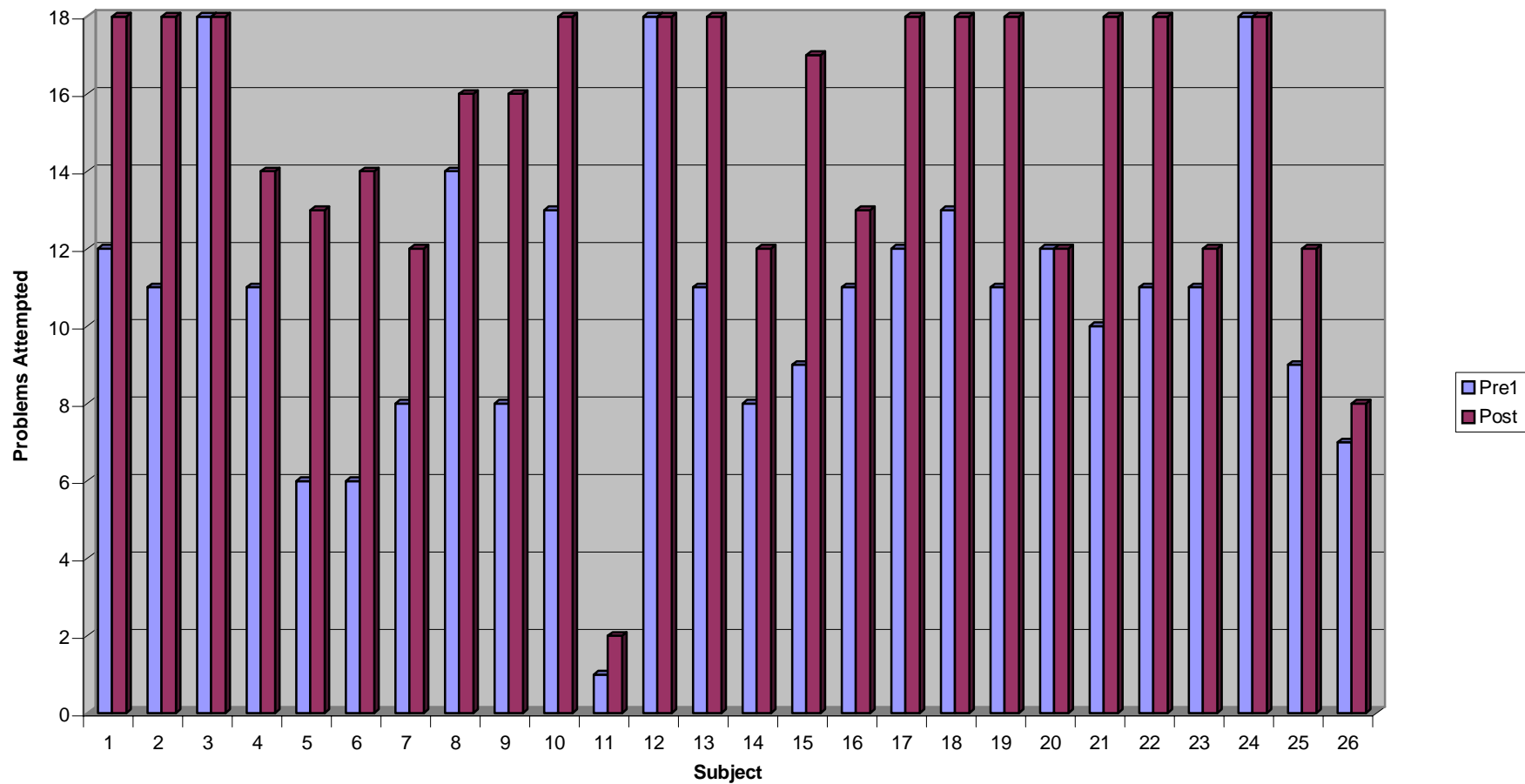
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### Story Recall



### Arithmetic Attempts



### Arithmetic Score Comparisons

