An Experiment for Soy Peptide Investigation Effect on Brain Wave Activity with EEG Signals

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Abstract: Peptide is a protein component consist of amino acids. Brain function is influenced by protein intake, the nutrients that are also composed of various types of amino acids. Protein is needed in the formation of brain cells in certain parts, including the hippocampus and brainstem or brain stem. Therefore, foods made from soy can be a good intake to improve brain performance. In this study, an experiment using an EEG system with 19 channels electrodes was carried out. In the experiment 17 people of subjects with age around 22 were chosen. Each subject were fasted at least 8 hours before recording data. In a relaxed state while closing eyes, data were recorded just before and 1 hour after consuming soy peptides, respectively. From the results of data processing, it was found that brain wave activity tends to increase due to consuming foods made from soybeans. An average increase in brain wave amplitude of about 5% was found.

1 INTRODUCTION

The benefits of soybeans to educate the brain has long been known by most people, even soybeans themselves are made into lecithin for the basic ingredients of herbal medicine for brain intelligence. Besides being able to educate the brain, soy is also very good for providing adequate nutrition to the body, because soy itself is a very high source of protein. Soybean which is a material for making tofu and tempeh, it turns out in countries like China and Japan are often used as food that is often consumed, and the results you can see, the country has a very high level of health. Soybeans are not a luxury item in Indonesia, in fact there are many soy farmers and how to grow soybeans is very easy, but unfortunately most people are not aware of the benefits of soybeans.

In soybeans, there are some nutritional content that is very good for health (Chatterjee, Gleddie, and Xiao, 2018; Valliyodan et al. 2016; Huang, Krishnan, Pham, Yu Wang, 2016; Singh, Vij, Hati, 2014; Zaheer, Humayoun, 2017; Lule, et al. 2015). In addition, soybeans can make the body become powerful. In addition to protein, soybeans also contain fat in them, so it's only natural that weight will increase when eating too much soybeans (De Angelis, Pilolli, Bavaro, Monaci, 2017; Lammi C., Zanoni C., Arnoldi, 2015; Yoshikawa, 2015; Lammi et al, 2015; Jamilian, Asemi, 2015; Oliva, Chicco, Lombardo, 2015; Cruz-Huerta et al, 2015). Although soybeans contain fat, but the fat produced by soybeans is good fats such as omega 3 fatty acids. The omega 3 fat content in soybeans is what makes the benefits of soybeans to educate your brain, because omega 3 is very good for brain tissue. Omega 3 is usually found in sea fish, but the price of sea fish that contains omega 3 is very expensive, so you can make soybeans as an alternative to sea fish as a source of omega 3. For those of you who are still school students, you should be diligent in consuming soybeans so that the brain becomes smart. You can also consume tofu and tempeh every day, because tofu and tempeh come from soybeans which are very good for brain intelligence. Working throughout the day is very draining, both physically and mentally. The fatigue caused by it can make concentration decrease, so productivity decreases. In conditions like this, the brain needs peptides. Peptide is a protein component consisting of 3-20 amino acids. Almost the same as protein, it's just the

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amount of amino acids that make it up less. A study conducted by a team of researchers from Japan and Indonesia in 1996 also revealed that peptides can increase concentration.

The Food and Drug Administration (FDA) has approved claims of the results of research conducted by (Huang et, al, 2016; Velasquez & Bhathena, 2007; Xiao, 2008; Young, 1991) which is the health of foods that link soy protein with a reduced risk of coronary heart disease. Soy is a source of high quality protein that contains all the essential amino acids found in animal protein without cholesterol and with a little saturated fat. Other studies have also proven the potential benefits of soy in reducing the risk of chronic diseases such as obesity, cardiovascular disease, insulin-resistant diabetes, and certain types of cancer (Huang et, al, 2016; Xiao, 2008; Young, 1991; Erdmann, et al, 2008; Kwon et al, 2010). Soy protein and phytochemicals, especially isoflavones, are believed to be responsible for these benefits. A total of 2 to 20 amino acid lengths are absorbed by the intestine into the blood circulation to exert a systemic orlokal physiological effect in the target tissue (Erdmann, et al, 2008; Kwon et al, 2010). Maebuchi et al. has proven that intestinal absorption of 11S peptides in humans results in a significant increase in the concentration of amino acids in venous blood globulin11S (Maebuchi, 2007). These differences (important for aromatic and branched amino acid chains) also indicate that hydrolyzed soy protein is faster and more efficiently absorbed in humans (Maebuchi, 2007).

Bansal and Parle, 2010 shows that consumption of foods made from soybeans not only improves memory but also can reverse memory deficits with its diverse activities. This nutritional potential is also thought to be beneficial to explore in the management of Alzheimer's disease. Dementia usually occurs due to Alzheimer's disease in the form of progressive neurodegenerative disorders. The process of dementia starts from the loss of neurons in different parts of the brain (Shineman & Fillit, 2009). In addition to drugs, dementia can also be minimized with food supplements with nutrition and soy can be one type of nutrition. (Kreijkamp-Kaspers et al, 2004; Lee & Sohn, 2005; McEwen, 2001) Shows the Effect of the soy protein of the human brain especially in the cognitive function). Soy isoflavones have an estrogenic effect, and it has been reported that soy isoflavones may improve cognitive functions by mimicking the effects of estrogen (especially through estrogen receptor β) in the brain (McEwen, 2001). Various studies have shown that estrogen can significantly enhance the basal forebrain cholinergic function by increasing the uptake of choline, and stimulating acetylcholine release (Thakur & Sharma, 2006). Acetylcholine is considered as the most important neurotransmitter involved in the regulation of cognitive functions. There is extensive evidence linking the central cholinergic system to the memory. Cognitive dysfunction has been shown to be associated with impaired cholinergic function and the facilitation of central cholinergic activity, with improved memory. Soy isoflavones are reported to increase cholinergic transmission due to indirect facilitation of acetylcholine in the brain (Sharma, 1997; Parle, 2004). An excellent source of dietary peptides, have beneficial effects on health. We investigated the effect of the soybean peptide on immune function, brain function, and neurochemistry in healthy volunteers. Near-infrared spectroscopy (NIRS) was used to analyze brain cerebral blood flow (Yimit et al, 2012). From some sources believe and some have proven that soypeptide is able to affect the functional brain in several categories. In this paper, the effect before and after consuming soypeptide on brain function activity was tested in an experiment using EEG signals. We have done a lot of research on brain activity using EEG signals (Iskandar, et al, 2019, Turnip at al, 2018, Turnip, Kusumandari, Hidayat, Hidayat, 2018, Turnip, Kusumandari, and Pamungkas, 2019). Subjects: 17 voluntary subject brain activity was measured. The findings show that an increase in brain activity after one hour consuming soy peptide was found. Figure 1 shows the original form of soybean as a basic ingredient of soy peptide and has been shown to be able to increase brain signal activity.

Figure 1: Soybean as a basic ingredient of soy peptide and its effect on brain activity.

2 METHODS

Based on previous research, that the protein content especially obtained from soybeans is closely related to body health, one of which is the human brain. PT Amerta Indah Otsuka is developing a food product made from soy ingredients known as soy peptides and it is thought that these products have a role in increasing blood flow to the brain. For testing, an experiment using 17 narcotics was designed. Subjects involved in the experiment were students with age around 20 ± 3 years and all were male. The experiment was carried out for 3 consecutive days. Each subject was asked to fast at least 8 hours before data recording was performed. Data recording was performed three times for each subject that is before, 5 after, and 1 hour after consuming soy peptides. Before recording, each subject described an experimental scenario but not for the purpose of the experiment. The reason the purpose of the experiment was not explained is to minimize the possibility of the subject becoming less concentrated in following the instructions. Recording before consuming soy peptide is to see brain activity in the initial conditions and recording after one hour aims to see changes in the amplitude of brain wave activity after food reaches the brain through the bloodstream.

An EEG system with 19 electrode channels is mounted on the head of each subject. To increase the conductivity of the electrodes with brain signals, an introductory gel is placed between the scalp and each electrode. During the experiment each subject was asked to relax while closing his eyes. Data recorded each for 5 minutes for each session. After completing the recording process, each subject was asked to fill in informed consent and was given a transport fee of Rp 100,000. The process of recording EEG data during an experiment can be seen as in Figure 2.

Every electrode used must be connected to the WinEEG software. So that the calibration of each electrode that has been given an electrode gel can be seen in the WinEEG software. The calibration of each electrode that has been given an electrode gel will look slightly colored, if the yellow color is very good, if the red color is pretty good, and if the black color indicates the electrodes do not work. In the picture below is the impedance of each electrode point after being given an Electro-Gel at each channel point used. The tools used in the experiment is shown in Figure 3. Actually the EEG tool used has more channel capacity than used. But we only need 19 channels. If there are too many channels, the signal processing time will be longer and more difficult. (Figure 3 a). Electro-cup size to the size of the head of each subject affects the quality of the measurement. This quality can usually be observed in the form of noise contamination in data records. If the head size is smaller or we are smaller than the size of the electro-cup, then the sensor contact with the head will be smaller. This condition causes the signal conductivity to decrease (Figure 3b). A decrease in the conductivity level will be seen in FIgure 3c where the color tends to yellow to red. If the subject's head size is smaller than the electro-cup size, the installation process tends to be more difficult and sensitive to subject movement.

Figure 2: Experimen setup of soy peptida effect on brain wave activity.

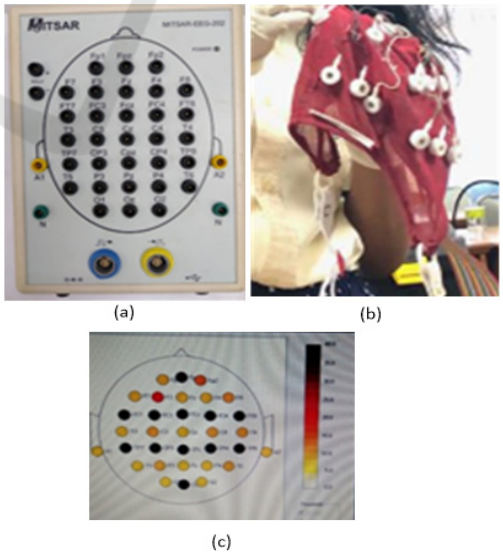

Figure 3: Experiment Tools: (a) EEG Mitsar 202 (31 Channels), (b) Electro-cup, (c) Electro-conductivity.

Overall this research method can be represented by a scheme as in Figure 4. With an experimental designed scheme, this research is expected to produce changes in brain signal activity after consuming soy peptide through an increase in amplitude and can be represented in the form of 2D brain mapping.

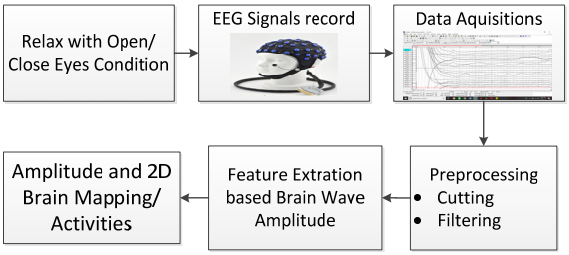

Figure 4: Experiment and Signal Processing Scheme.

3 RESULTS AND DISCUSSIONS

After processing the raw data and filtering the signal (0.5-70 Hz Cut off frequency), feature extraction is obtained where the feature is obtained from manually cutting data in accordance with the amount of data we have and the desired information. The amplitude of the results of truncation of EEG signal data can be seen as in Tables 1-4. Tables 1-3 from subject 14 show the amplitude of brain waves for each channel that is before, after 5 minutes, and after 1 hour consuming soy peptides, respectively. For all tables it is obtained that all maximum amplitudes occur in the desired frequency range except Alpha waves on the channels associated with the FP1 channel in Table 1; FP1 and FP2 on Tables 2 and 3. It is suspected that these two channels experienced interference at the time of recording. Because the recording is done on the condition of the subject relaxed and closed eyes, the results found also match where the highest amplitude is what the low frequency range is alpha waves. The high amplitude of delta waves is more likely to be thought to be due to disturbance such as based lines, eyeball movements, and body movements in the frequency range of 0 -4 Hz. Figure 5 indicates the Comparison of the brain wave amplitude: Closed & Open Eyes and Pre, Pra, & After 1 Hours. Grafik tersebut menunjukkan bahwa amplitudo pada saat closed eyes cenderung lebih tinggi terhadap closed eyes artinya subjek lebih konsentrasi pada saat closed eyes. Significant differences occur only in alpha waves when compared with other brain waves at different frequency ranges. It can be concluded that only in alpha waves occurs the most dominant brain activity. If you pay further attention to the increase in the amplitude of alpha waves before, 5 minutes after and 1 hour after consuming soy peptides, respectively, a significant increase in amplitude was found at around 40%. This increase indicates a significant effect due to consuming soy peptides on brain activity. Table 4 indicates the comparison of the brain wave amplitude for all subjects.

Table 1: Pre: Amplitude of each channels of each brain wave.

Channels	Delta		Theta		Alpha		Beta1		Beta2		Gamma	
	%	Hz	%	Hz	%	Hz	%	Hz	%	Hz	%	Hz
Fp2-F8	36,54	1,46	10,12	4,15	8,77	7,57	2,43	16,36	3,77	24,17	2,93	30,27
F8-T4	24,46	1,46	8,36	3,91	17,02	10,99	4,6	17,82	7,79	22,95	6,49	30,52
T4-T6	16,12	1,71	6,25	4,39	40,84	10,99	4,15	17,58	6,32	22,95	3,81	32,23
T6-O2	15,83	1,46	9,5	4,15	47,2	10,99	3,57	13,92	4,78	21,73	2,23	30,76
Fp1-F7	30	1,46	9,64	4,15	10,13	7,32	2,66	14,16	3,19	20,02	2,09	30,03
F7-T3	22,32	1,46	7,4	4,15	17,86	10,99	3,66	19,29	5,94	23,68	4,48	29,79
T3-T5	10,39	1,46	4,71	4,15	44,21	10,99	4,66	19,78	9,63	22,46	6,95	38,09
T5-O1	13,41	1,71	7,89	4,15	54,39	10,99	3,61	13,92	5,74	29,79	2,86	29,79
Fp2-F4	42,27	1,46	9,5	4,15	7,59	7,57	2,19	17,58	2,72	20,02	1,6	30,03
F4-C4	28,07	1,46	12,78	3,91	22,26	10,99	3,72	13,92	4,29	21,73	1,98	30,27
C4-P4	19,16	1,46	7,69	3,91	43,78	10,99	3,31	13,92	3,89	22,22	1,34	30,03
P4-O2	21,02	1,46	9,27	4,15	38,79	10,99	3,54	14,4	5,43	21,73	1,77	30,76
Fp1-F3	36,22	2,2	10,51	3,91	9,32	12,45	2,67	14,16	3,24	20,02	1,83	29,79
F3-C3	26,17	1,46	11,09	3,91	29,29	12,45	3,45	13,92	4,51	21,24	1,62	30,03
C3-P3	15,47	1,46	6,98	3,91	53,94	10,99	3,13	13,92	5,01	21,73	1,4	29,79
P3-O1	14,06	1,46	7,83	5,13	54,51	10,99	3,77	13,92	6,1	21,73	1,77	29,79
Fz-Cz	24,71	1,46	12,42	5,62	28,5	12,45	3,81	13,92	4,41	23,44	1,9	30,27
Cz-Pz	24,61	1,46	9,5	3,91	31,75	10,99	3,19	13,92	3,41	21,24	1,32	31,01
Average	23,38	1,53	8,97	4,21	31,12	10,65	3,45	15,36	5,01	22,38	2,69	30,74

Table 2: Pra: Amplitude of each channels of each brain wave.

Channels	Delta		Theta		Alpha		Beta1		Beta2		Gamma	
	%	Hz	%	Hz	%	Hz	%	Hz	%	Hz	%	Hz
Fp2-F8	34,01	1,46	7,19	4,39	6,05	8,79	2,32	18,07	3,86	21	4	33,2
F8-T4	19,39	1,46	6,03	3,91	9,21	10,99	3,81	18,07	9,38	22,46	12,05	31,25
T4-T6	22,11	1,46	4,45	3,91	16,85	10,99	2,24	13,92	5,56	27,59	6,89	31,25
T6-O2	23,27	1,46	9,08	3,91	32,37	10,99	3,75	14,16	4,64	21,48	2,81	31,25
Fp1-F7	34,11	1,46	6,64	3,91	5,94	10,99	2,14	13,92	3,46	23,44	3,76	37,35
F7-T3	22,3	1,46	4,53	3,91	8,2	10,99	3,36	19,29	9,07	24,41	7,55	29,79
T3-T5	19,42	1,46	3,73	3,91	15,43	10,99	4,09	19,04	8,32	24,41	9,3	31,98
T5-O1	12,82	1,46	5,57	4,64	43,81	10,99	3,79	13,92	5,74	21,48	4,95	30,03
Fp2-F4	51,06	1,46	9,57	3,91	6,87	7,32	1,99	13,92	3,02	22,46	2,18	33,69
F4-C4	26,58	1,46	12,67	3,91	23,57	10,99	4,29	13,92	5,31	20,02	3,22	32,23
C4-P4	19,68	1,46	7,61	3,91	39,9	10,99	3,66	13,92	4,54	21,48	2,4	33,94
P4-O2	23,65	1,46	8,98	3,91	36,25	10,99	3,63	14,4	5,3	21,97	2,37	31,01
Fp1-F3	44,22	1,46	10,29	3,91	8,51	7,32	2,71	14,16	4,01	24,41	2,78	37,11
F3-C3	25,52	1,46	11,18	3,91	26,81	12,7	4,3	13,92	5,64	21,97	3,07	32,96
C3-P3	17,29	1,46	7,39	3,91	46,66	10,99	3,64	14,16	5,28	21	2,59	29,79
P3-O1	13,47	1,46	6,11	4,15	52,96	10,99	3,7	13,92	6,07	21,48	2,59	29,79
Fz-Cz	28,69	1,46	11,84	3,91	26,58	9,77	3,89	13,92	4,52	19,78	2,01	32,96
Cz-Pz	24	1,46	10,85	3,91	34,98	10,99	4,22	13,92	4,3	21	1,93	30,27
Average	25,64	1,46	7,98	3,99	24,50	10,49	3,42	15,03	5,45	22,32	4,25	32,21

The same thing is also seen in Table 4 where the highest amlitude is found in alpha waves for all subjects. Strangeness is found in subjects 5, 14, and 16 where the average amplitude is very low compared to other subjects, namely in experiments before and 5 minutes after consuming soy peptides. This difference is thought to be temporary due to errors in processing data. The strangeness of this data will be a special study in the following

experiments and data processing. But overall on the processing of data all subjects found an average increase in alpha wave amplitude of about 20% due to consuming soy peptides. An increase in the average amplitude of each brain wave can be seen in Figures 6-11. Of each wave, the most significant increase was found in alpha waves, of course, this is consistent with the results found in processing individual data. However, other waves also experienced an increase: waves: Tetha by 5.5%, Betha 1 by 26%, Betha 2 by 33%, and Gamma by 44%, respectively. This increase does not illustrate the dominance of increased brain activity, because the basic amplitude is not as big as alpha waves which is 31.2 micro volts while the base amplitude of other waves is only less than 7 micro volts.

After processing raw data and filtering signals, we obtain data from EEG spectra which produces a formula resulting from the addition of brain waves based on frequency. Figure 10 is a 2D comparison of brain mapping based on the average power spectrum between the before and after (5 minute and 1 hour) comsumming soy peptide. The results show alpha wave frequency activity is more dominant than other wave frequencies. Alpha waves increased from the condition of the pre-eye closure to the pre-eye closure by 10 subjects, in subjects 10 / (S10) experienced a significant increase from 18.46 - 67.69 uV ^ 2, from the state of fasting for ± 3 hours until after the subject consume soybean. In the condition of the pre-blindfold to close the eye after 1 hour after consuming soybean decreased by 5 subjects. Subject 2 / (S2) experienced a significant decrease from 51.00 - 5.63 uV ^ 2.

Table 3: After 1 hours: Amplitude of each channels of each brain wave.

Channels	Delta		Theta		Alpha		Beta1		Beta2		Gamma	
	%	Hz	%	Hz	%	Hz	%	Hz	%	Hz	%	Hz
Fp2-F8	32,81	1,46	8,61	3,91	7,02	7,32	2,1	13,92	3,39	24,41	2,67	32,47
F8-T4	24,32	1,46	9,77	3,91	17,8	11,47	4,36	13,92	6,88	22,46	5,52	30,76
T4-T6	18,97	1,46	6,79	3,91	39,08	11,47	3,06	14,16	4,39	22,22	2,2	31,25
T6-O2	20,03	1,46	8,73	4,88	40,05	11,47	3,53	13,92	4,18	22,46	1,87	31,01
Fp1-F7	32,2	1,46	10,27	3,91	10,94	7,32	3,28	13,92	3,76	21,48	2,38	31,49
F7-T3	24,91	1,46	10,69	3,91	19,23	11,47	4,5	19,78	7,14	19,78	4,66	30,03
T3-T5	10,16	1,46	5,16	4,15	51,81	11,47	4,48	18,31	8,21	22,46	4,7	39,06
T5-O1	9,97	1,46	7,2	3,91	61,16	11,47	3,58	13,92	5,08	22,71	2,51	30,27
Fp2-F4	36,7	1,46	11,4	3,91	9,52	7,32	3	15,63	4,06	20,51	2,65	32,47
F4-C4	25,79	1,46	14,18	5,37	27,74	11,47	5,25	13,92	5,76	20,51	2,62	29,79
C4-P4	17,35	1,46	9,05	3,91	48,72	11,47	4,12	13,92	4,75	22,46	1,76	31,01
P4-O2	15,46	1,46	9,48	3,91	49,42	11,47	4,23	13,92	6	22,46	2,09	31,01
Fp1-F3	36,8	1,46	11,27	3,91	9,35	7,32	3,11	14,65	3,73	21	2,08	29,79
F3-C3	23,41	1,46	13,34	6,1	31,57	11,96	4,61	13,92	5,73	20,51	2,42	30,27
C3-P3	14,76	1,46	7,18	3,91	54,28	11,47	3,74	13,92	5,36	23,19	1,66	30,27
P3-O1	10,81	1,46	7,41	6,35	60,02	11,47	3,76	14,16	5,29	21,73	1,73	30,27
Fz-Cz	22,97	1,46	13,16	6,1	24,38	11,96	4,06	13,92	4,84	19,78	2,68	30,03
Cz-Pz	15,24	1,46	9,54	5,62	52	11,47	4,44	13,92	5,13	20,51	1,97	31,49
Average	**21,81**	**1,46**	**9,62**	**4,53**	**34,12**	**10,60**	**3,85**	**14,65**	**5,20**	**21,70**	**2,68**	**31,26**

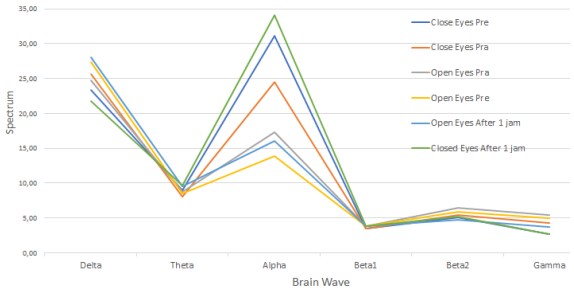

Figure 5: Amplitude Average Comparison of Brain Wave: Closed & Open Eyes and Pre, Pra, & After 1 Hours.

Table 4. An Average of the Brain Wave Amplitude for All Subjcts in each Session (Pre, Pra, and After 1 Hours).

	Pre						Pra						After 1 Hour					
S	δ	θ	α	β1	β2	γ	δ	θ	α	β1	β2	γ	δ	θ	α	β1	β2	γ
S1	21,9	7,9	26,8	8,5	6,6	4,1	16,2	7,4	31,0	9,9	8,2	6,0	21,2	8,9	20,3	8,0	6,2	2,8
S2	23,5	8,1	14,7	3,3	4,4	2,4	16,4	7,1	19,9	5,5	9,9	9,4	17,8	4,9	11,8	2,7	4,2	2,8
S3	21,2	7,1	33,7	3,7	4,4	1,8	20,3	6,0	27,0	2,8	3,2	0,6	17,1	8,3	32,8	4,7	5,5	2,7
S4	17,5	12,9	47,1	4,7	3,8	2,1	17,8	11,4	48,1	4,1	3,1	1,6	16,5	12,0	45,0	3,7	2,4	1,3
S5	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	14,4	5,7	11,7	7,1	7,4	7,8
S6	17,4	5,9	46,3	4,2	5,5	2,2	12,3	4,4	42,3	3,2	4,7	1,9	10,2	5,6	54,8	5,6	8,5	4,0
S7	19,5	7,0	29,1	3,8	5,0	3,2	17,3	6,4	35,4	4,2	5,8	3,9	14,4	5,6	36,5	4,3	5,7	3,3
S8	13,5	7,7	44,6	7,0	6,8	3,9	15,1	7,6	39,2	7,2	7,6	4,9	13,6	8,3	45,3	6,6	6,3	3,4
S9	10,6	7,2	63,8	4,4	3,6	1,9	10,7	7,4	62,1	3,7	3,1	1,7	10,2	5,5	57,3	3,8	3,3	2,0
S10	14,7	13,7	55,8	3,3	2,5	1,4	15,5	13,6	51,6	3,4	3,2	2,0	13,6	14,4	57,2	3,3	2,4	1,2
S11	25,6	8,0	24,5	3,4	5,4	4,2	23,4	9,0	31,1	3,5	5,0	2,7	21,8	9,6	34,1	3,8	5,2	2,7
S12	16,1	6,0	42,6	5,6	5,7	3,0	16,4	7,2	42,6	6,2	6,3	3,8	15,6	5,2	29,1	4,5	4,7	2,9
S13	14,6	9,1	35,7	4,4	7,8	3,7	12,0	6,4	24,0	3,3	5,7	2,9	13,7	7,7	28,8	3,8	6,6	1,7
S14	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	15,7	5,9	36,0	7,1	9,3	6,1
S15	18,2	13,6	34,0	4,7	6,2	4,3	17,3	12,2	38,3	4,7	6,1	4,4	14,0	9,8	39,9	5,3	6,8	5,6
S16	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	8,8	4,8	45,9	4,3	8,5	7,3
S17	21,7	9,2	31,9	3,6	3,8	3,6	20,6	7,4	25,1	2,3	2,1	2,0	18,3	9,1	36,6	3,5	3,1	3,3
Av.	**15,1**	**7,3**	**31,2**	**3,8**	**4,2**	**2,5**	**13,6**	**6,7**	**30,5**	**3,8**	**4,3**	**2,8**	**15,1**	**7,7**	**36,7**	**4,8**	**5,6**	**3,6**

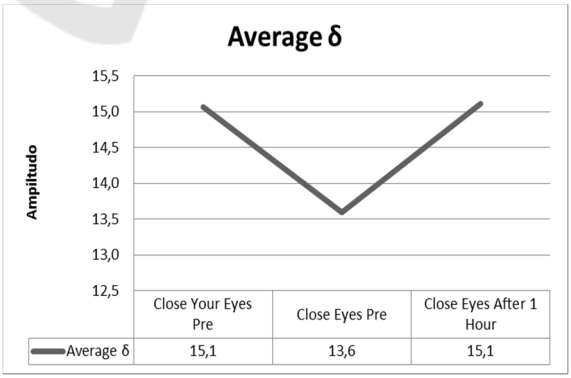

Figure 6: An Average of the Delta Apmlitude

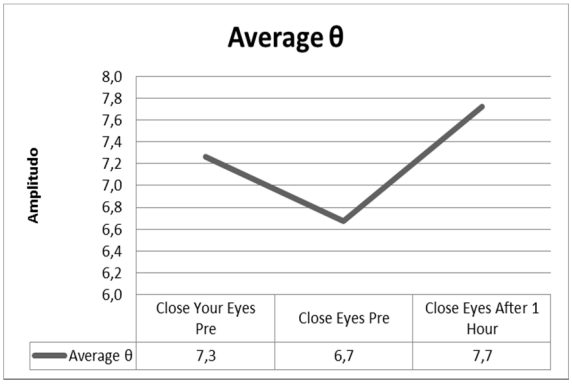

Figure 7: An Average of the Theta Apmlitude

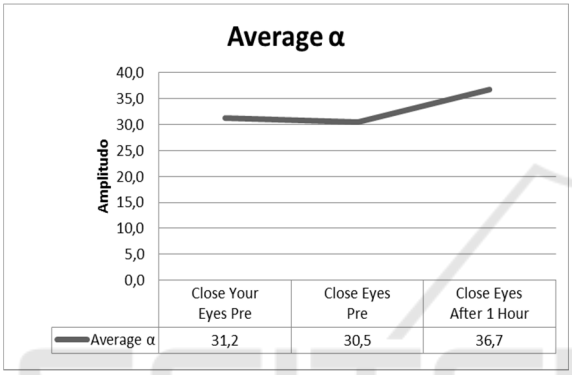

Figure 8: An Average of the Alpha Apmlitude

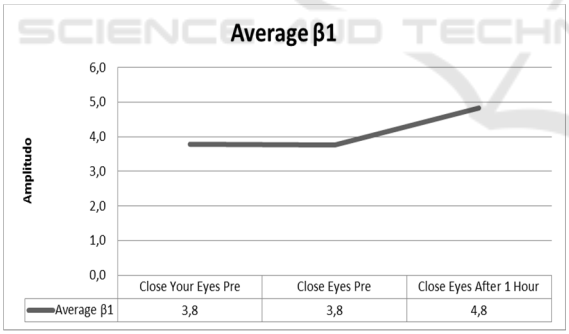

Figure 9: An Average of the Beta1 Apmlitude

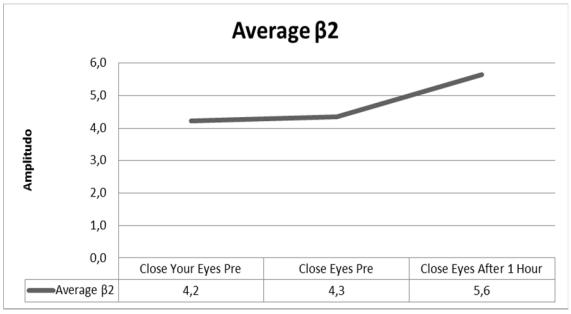

Figure 10: An Average of the Beta2 Apmlitude

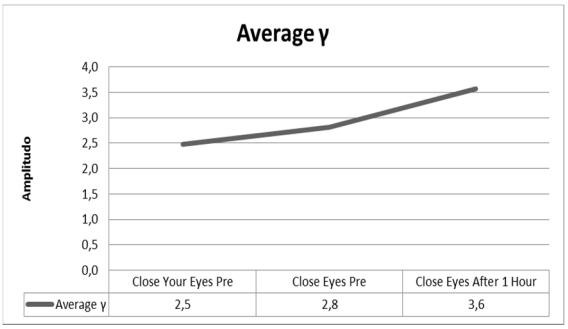

Figure 11: An Average of the Gamma Apmlitude.

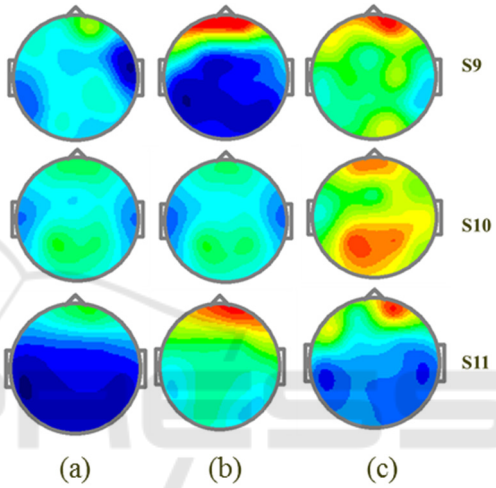

Figure 12: 2D Brain Bapping before and after consumig soy peptide: (a) Before (b) after 5 minute, (c) after 1 hour.

4 CONCLUSIONS

Experiments on 17 subjects with the condition of relaxing closed eyes to test the effect of consuming soy peptide food on the brain have been successfully carried out. The dominant brain activity is found in alpha waves. An increase in alpha wave amplitude for individuals and groups of 40% and 20%, respectively, was obtained. Overall, it can be concluded that consuming soy peptide food has been shown to increase brain wave activity.

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