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The Bond Between a Horse and a Human

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Abstract

The bond that exists between a horse and human was examined using EEG from the horse and human simultaneously. Three volunteers ranging from novice to elite horse experience participated with an unfamiliar horse. The elite participant was also recorded with her own horse. A dose-response effect was tested using 6 conditions requiring increasing interaction between the horse and human (baseline – apart, standing together, petting, grooming, sitting, and riding). EEG was recorded from 10 locations on the horse and the human. EEG brain maps illustrated that increasing interaction between the horse and human showed more synchronous EEG. The elite horse person showed greater synchronization with her own familiar horse. Perhaps these findings illustrate the bond that exists between horses and humans.

The Bond Between a Horse and a Human

For centuries people have talked about the relationship between "a man and his horse," and the "bond that exists between a horse and a rider." Does it exist? Can we see it? Most horse lovers will verify that we can feel it, but how do we know it exists? Horses have been used in therapy since 1950s because they help people heal (DePauw, 1986). What is it about the horse that is so magical and magnificent? What ability do they have as "therapists?" They never went to counseling or psychology classes or passed any certification programs. What is their inherent ability to heal? Therapists that include horses in the equation will tell us that horses "mirror the emotions of humans." What does this mean and how is it possible? Is this the variable that facilitates healing?

Animal-assisted therapy is an important component of hospitals, nursing homes, schools, etc. A meta-analysis (Nimer & Lundahl, 2007) of animal-assisted therapy (AAT) showed moderate effect sizes for autism-spectrum symptoms (d=0.72), medical difficulties (d=0.59), behavioral problems (d=0.51), and a low to moderate effect size for emotional well-being (d=0.39). All effect sizes were significantly different from zero. Study quality did not influence these results. Dogs were the most often cited animal in the studies and results showed moderate to high effect sizes (d=.39-.57). While the population tested and number of sessions did not significantly influence the results, individual sessions compared to group therapy and AAT compared with other therapy treatments showed significant positive effects. Interestingly, individuals in the non-disabled group showed more positive and reliable results from AAT than individuals with disabilities in the well-being and behavioral groups. AAT appears to have a positive influence on many populations.

The first scientific investigations of horse therapy appeared in the 1980s, 30 years after they were being used for therapy (De Pauw, 1986). An excellent review by DePauw (1986) presents the history and classification of horse therapy. Physiological benefits of horse interaction are the basis of hippotherapy. These refer primarily to gait and rhythm. The walk of the horse can transfer to facilitate the walk of humans. Educational benefits include improved motor skills, language skills, social abilities, and enhanced self-concept.

The horse-human relationship has been addressed in articles and research (Beck & Katcher, 2003; Robinson, 1999). Robinson points out that there are various types of relationships with horses. Some ride horses, some are caretakers of horses, some use horses in their work (i.e., farm, mounted police) and others are engaged in sport (i.e., show, polo). Does riding a horse create a sense of elevated status as in the history of horses or perhaps elevated consciousness? The nature of the relationship is quite variable according to the research (males vs. females, young vs. old, etc). Perhaps it is more important to determine the type or level of “bond” that occurs in order to accurately assess the benefits of the relationship with horses. Is caring for the horse an important aspect for beneficial effect? Does it matter if one rides the horse? These answers may help clarify the research results of various populations, programs, and settings.

Researchers have attempted to look at the heart and brain states of the animal and human bond (Hama, Yogo, & Matsuyama, 1996; Keeling, Jonare, & Lanneborn, 2009; Lynch, Fregin, Mackie, & Monroe, 1974). The first study by Lynch et al., 1974, showed that the horse's heart rate increased when a human entered or left their space, and slowed when the horse was pet. Hama et al., 1996, demonstrated increased heart rate patterns in both the horse and the human with interaction. The increases were reduced with petting. Horse experience had some influence on the level of heart rate response, but not on the pattern of response for both the horse and the human. A recent study by Keeling et al., 2009, examined the correlated heart rate increase in the horse and the human when the human anticipated a startling event. There was a significant increase for both the horse and the human when the human was anticipating an umbrella opening at a certain point. They concluded that heart rate was a useful tool to investigate horse-human interactions.

Anna Wise examined the brain wave activity of people as they experienced a horse. Later she studied the effect of the human TTouch approach on a two-year-old Thoroughbred filly to determine whether the beta, alpha, theta and delta waves would become similar (Tellington-Jones, 2006). Robin Bernhard attempted a similar examination of brain waves with her horse, Grace, in 2004. These unpublished case studies found positive synchronizing effects for the horse and for humans recorded on separate occasions. The experimenters suggest that perhaps brain wave activity could be a viable measure to examine the effect of touch on horses and humans.

Therefore, the purpose of this investigation was to determine if a dose response effect occurs between a horse and a human. In other words, does more interaction with the horse show more relationship in their brain signals? Secondly, does this relationship only exist for people who suggest they “bond“ with animals,” or is it present for anyone? Lastly, does this relationship differ if someone has had a long relationship with a horse compared to a new relationship?

To test this relationship the electroencephalograph (EEG) of a horse and a human were recorded simultaneously in two separate recording instruments and two separate computer systems. It was hypothesized that the more interaction a human has with a horse, the more synchronized the brain patterns would become.

Method

Participants

The human participants included two female and one male volunteer. One college-age female was fearful of horses, the college-age male had minimal horse experience (rode two or three times) and the second female was more of a “horse whisperer” named Cuz Coste (49 years of age). Cuz has been written about in several popular horse publications for her ability to “connect” with horses.

The horse participation included one 15-year-old Percheron gelding named “Magic” and all three participants were tested with Magic. None of the participants knew Magic previously. Cuz Coste was also tested a second time with her own gelding named “Diamond.” He is an 11-

year-old Missouri Fox Trotter that Cuz owned since he was 3 years old. He was a rescue horse that Cuz trained herself and claimed to connect with very well. It was of interest to determine whether there was a difference between Cuz's ability to connect with a familiar and unfamiliar horse. If a dose response effect exists, it was hypothesized that the relationship would be more synchronized with her own horse.

Measures

The Pet Bonding Scale (Angle, Blumentritt, & Swank, 1994) was used to determine the level of bonding between the human and animals in general (scale 0-32). The scale was not specific to horses.

EEG was collected from 10 sites in the brain (F3, F4, C3, C4, T3, T4, P3, T4, O2, and O1) using the International 10/20 system (Jasper, 1958; Figure 1). Electrodes were placed in the lateral canthus and the superior orbital ridge of the right eye to detect eye blinks. Linked mastoids (electrodes behind each ear) were averaged and this activity was subtracted from the 10 sites of interest. A ground electrode was placed at CZ on the human and on the nose of the horse (central). To place the electrodes the surface was shaved (if necessary), cleaned using Nuprep Gel, and Ten20 Conductive EEG Paste was applied to the Beckman 3-mm Ag-AgCl electrodes to conduct the signals from the brain. The electrodes were taped onto the surface. Impedance was below 5k ohms for the EEG electrodes and below 10k ohms for the electro-ocular electrodes. The sampling rate for all data was 1000 Hz. The high- and low-frequency filters were .01 and 100 Hz and the signals were amplified by a factor of 50,000.

Approximately 10, one second randomly selected epochs were averaged together to represent the data for each condition. A marker was manually placed in both the horse and the human recording system simultaneously, and one second epochs were analyzed prior to each mark. The data collection systems were time synchronized using this mark.

Protocol

The horse and the rider were kept in two separate locations and not allowed to interact prior to testing. The rider EEG electrodes were attached first in a mobile laboratory and a baseline measure of 10, 1s randomly marked epochs were collected and averaged together. The rider stayed in the mobile laboratory until the horse EEGs were attached outside the laboratory and 10, 1s randomly marked epochs were collected and average together. The horse was held by one assistant, the recording box was held by a second assistant, and the researcher collected the data in two laptop computers simultaneously. To reduce the interaction of the assistants and researcher, they turned away from the horse during data collection. The assistants and the researcher remained constant throughout all data collection. Only the rider interacted with the horse.

Five conditions were collected in the same order for the three participants and an additional condition was added for Cuz Coste (riding the horse). Following the Baseline condition recorded in separate locations, the rider then stood next to the horse (Condition 2), pet the horse (Condition 3), groomed the horse (Condition 4), and sat on the horse (Condition 5). Cuz rode both the familiar and unfamiliar horse (Condition 6). The Percheron horse, Magic, was used for all three riders and the first two riders were collected on the same day, so the same baseline recording was used for both riders.

Analysis

The Pet Bonding Scale was totaled for each rider. EEG data were visually inspected for eye blinks and artifact and these were removed from the data collection. The data was filtered at 30 Hz with a 6db roll off for each 1s epoch preceding the manual markers (approximately 10/condition). Power spectrum analysis was conducted and frequencies were categorized into theta (5-7Hz), alpha (8-12Hz), beta (13-20Hz) and beta2 (21-30Hz). Brain maps were generated from the power spectrum analyses.

Results

The Pet Bonding Scale scores were 25 for the female novice rider, 31 for the male rider, and 32 for Cuz Coste. The scale ranges from 0 to 32 so these scores were mid-high values and reflect bonding with animals.

The EEG brain maps presenting absolute values from the power spectrum analysis are illustrated in Figure 2 for the female novice rider and Figure 3 for the male intermediate rider for each condition. All data are presented on the same scale (y axis = 0-5 microvolts). Figure 4 illustrates three conditions for Cuz Coste with Magic (the unfamiliar horse). Only three conditions are displayed due to a loss of data for the horse in the other three conditions. Figure 5 demonstrates six conditions for Cuz Coste with Diamond (the familiar horse).

An examination of the change in brain maps from baseline to either sitting or riding demonstrates increased synchronization of the horse with the rider. Horse grooming and horse sitting/riding create the most synchronized state between the horse and the rider. Cuz appeared to show greater synchronization with the familiar horse compared to the unfamiliar horse.

Discussion

It was of interest to determine if a dose response effect occurs as the interaction between the horse and the human increases. It was hypothesized that the brain maps would become more synchronized with increased interaction. A comparison of baseline to stand, to pet, to groom, and to sit on the horse shows EEG synchronization increases between the horse and the rider. In addition, Cuz Coste’s brain maps indicate greater synchronization with her own familiar horse than with the unfamiliar horse. This finding supports the synchronization that occurs as the “bond” increases.

The second question of interest was to determine whether interaction with the horse is influenced by the Pet Bonding history as indicated by the Pet Bonding Scale. It appears that past experience is not an influencing factor. However, the lowest score (25) is in the top 25^{th} percentile of the scale (0-32). Thus additional research is needed to determine if a subjective assessment of bonding with animals is an indicator of EEG synchronization, or the bond between a horse and a human.

The synchronization that exists is similar to the data reported by Anna Wise (Tellington-Jones, 2006). Her data included beta, alpha, theta, and delta and showed similar synchronization in the horse with human touch and had previously shown the same response in humans to interaction with a horse. However, previous data examined either the horse or the human separately, but not simultaneously. In the present study increased interaction created increased, synchronized activation. Both the horse and the human changed from their baseline condition. So the question as to whether a horse "mirrors" the emotions of a human may be more accurately described as "synchronizes" with the state of the human. This may partly explain why horses become therapy animals. They may have the ability to synchronize the brain state of humans; an ideal state for health and performance.

To summarize, it appears that a dose response effect occurs between a horse and human. Increased interaction leads to increased EEG synchronization. Activation states of both the human and the horse tend to increase and synchronize. "Animal bonded" people tend to benefit from this interaction. It is grooming the horse that shows the most synchronized activity, with riding being valuable as well. This is an important finding for special populations whose internal state may not be operating in a synchronized manner. It is possible that the horse, as an outside influence can influence EEG patterns and the state of the human. Insurance companies that support AAT are to be commended for their belief in this form of therapy. It is suggested that adding a horse to any type of therapy may augment the results. Further research is necessary to verify and understand this relationship and to compare this therapy with other common techniques, and to determine if this bond has the ability to heal all populations.

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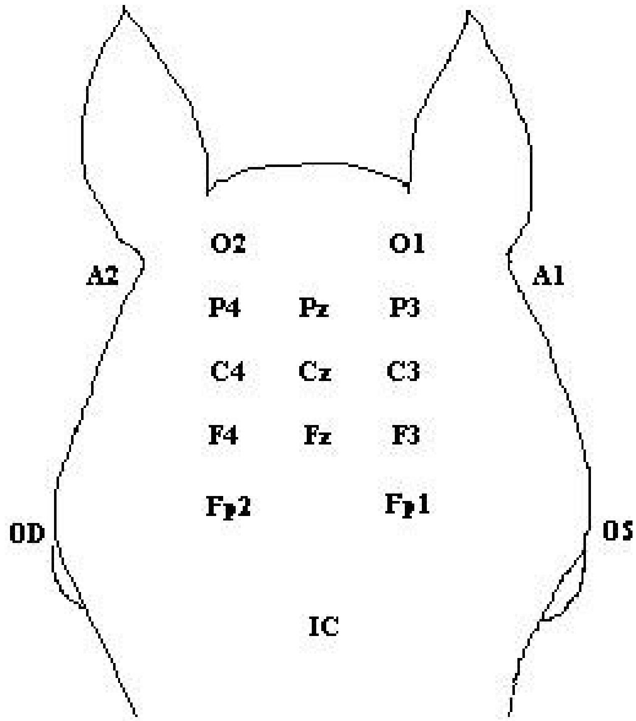
Figure 1. Horse and human electrode placement.

Figure 2. EEG dose response effect from novice rider.

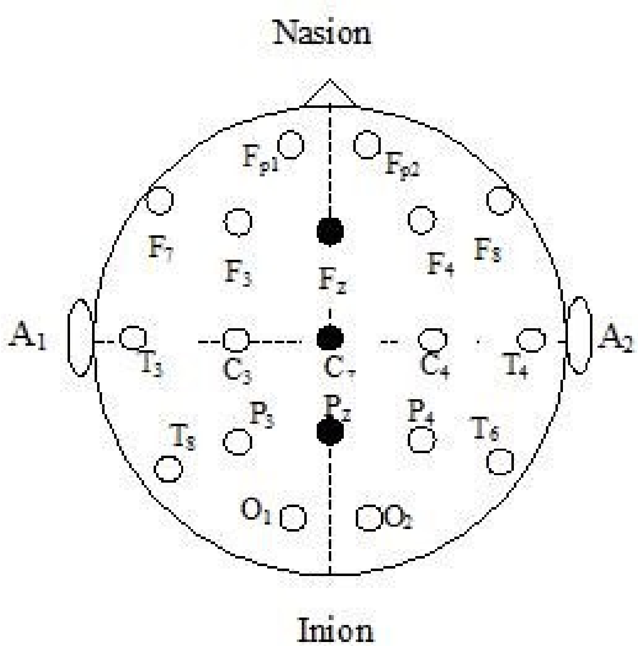
Figure 3. EEG dose response effect from intermediate rider.

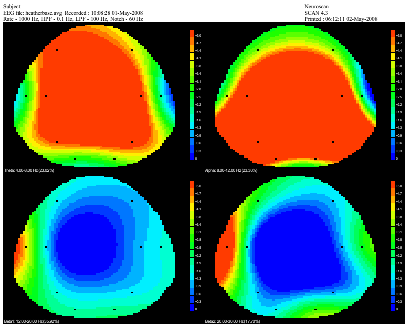
Figure 4. EEG dose response effect from an elite rider with new horse.

Figure 5. EEG dose response effect from an elite rider with own horse.



UCD-VMTH Equine EEG electrode map





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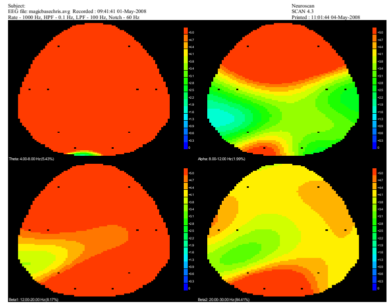

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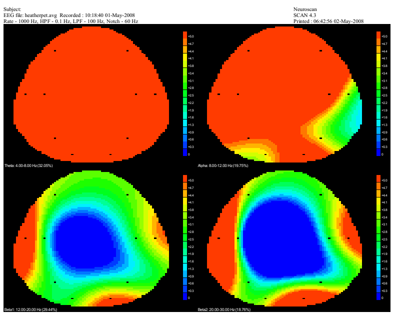

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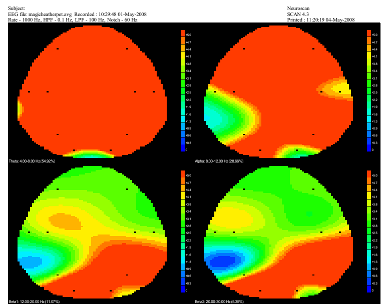

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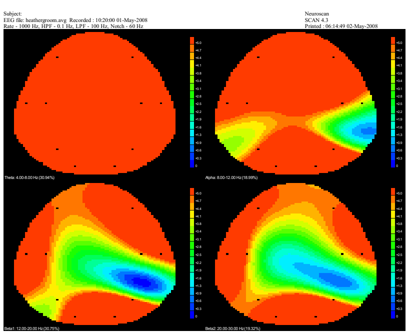
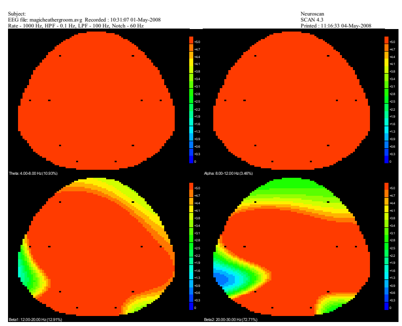


Rider Groom



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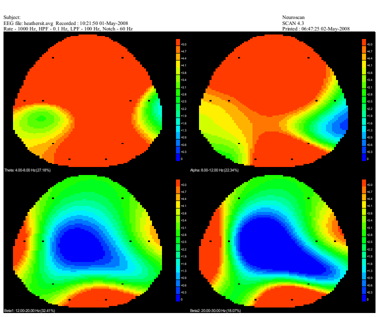
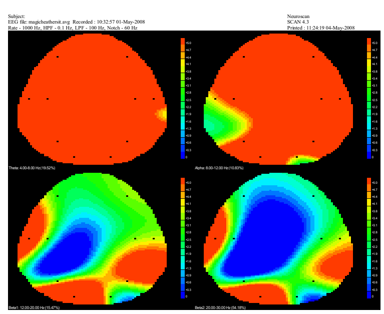


Rider Sit



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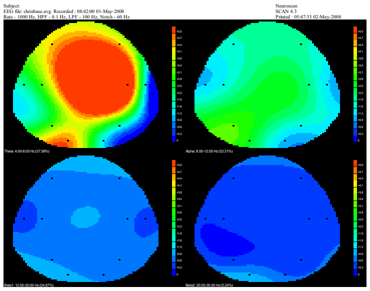

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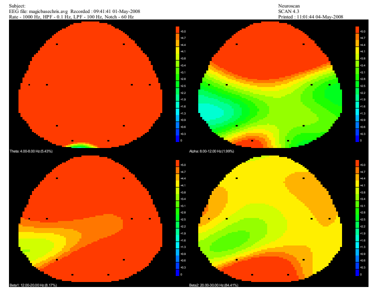

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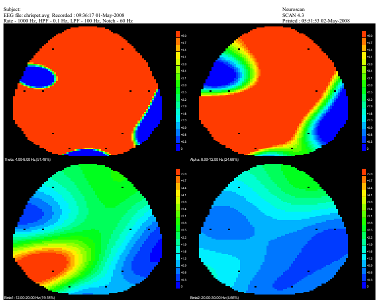

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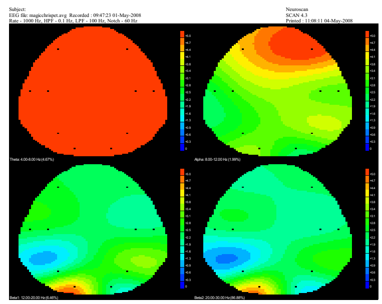

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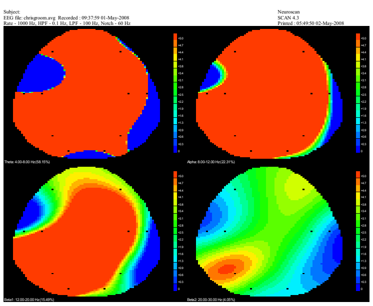
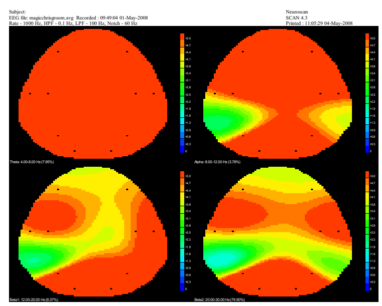


Rider Groom



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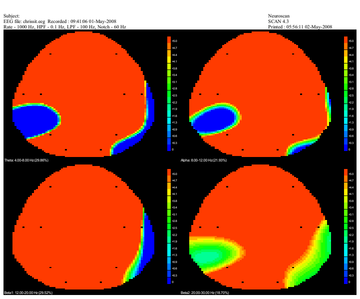

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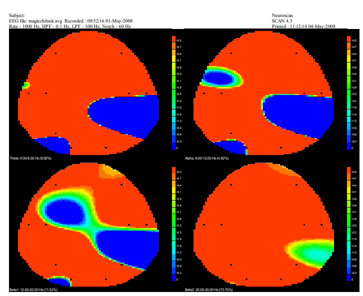

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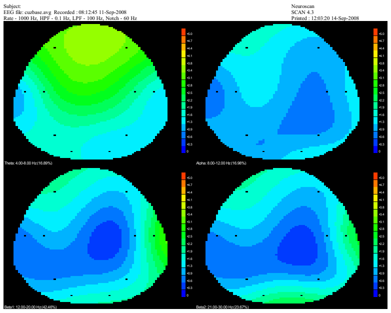

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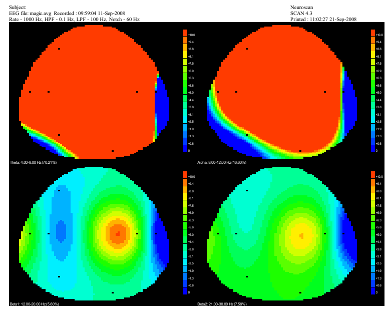

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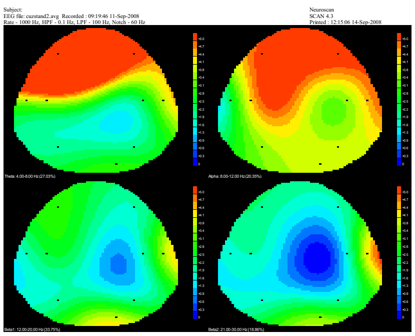

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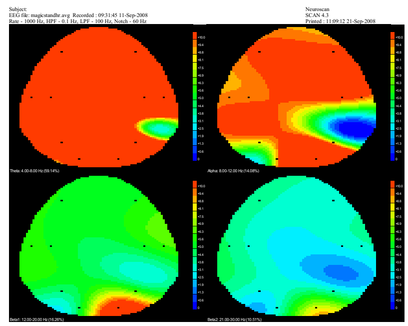

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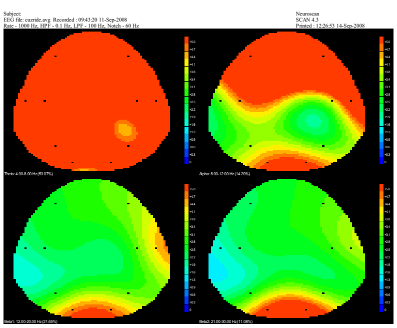

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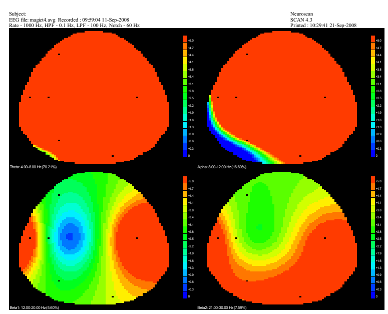

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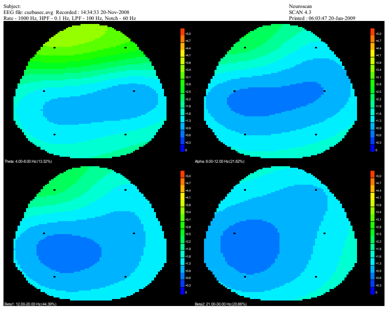

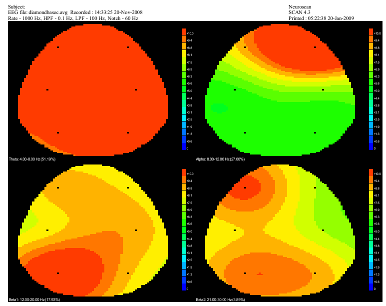

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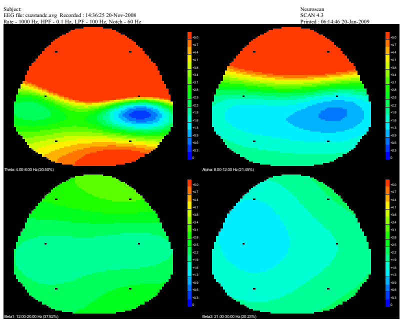

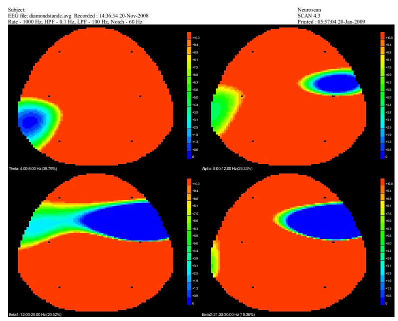

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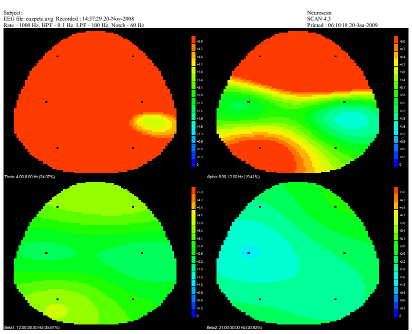

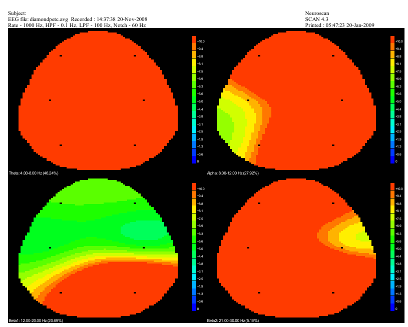

Rider Pet

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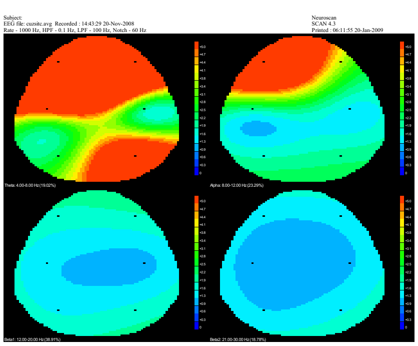

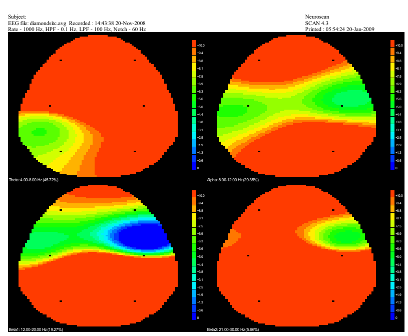

Rider Sit

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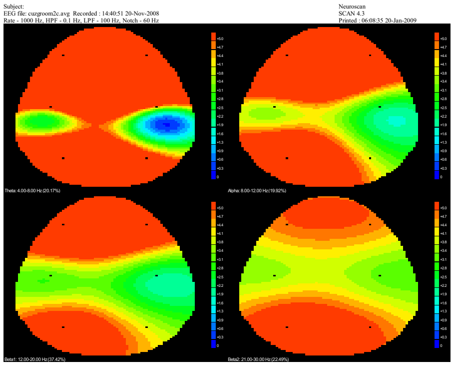

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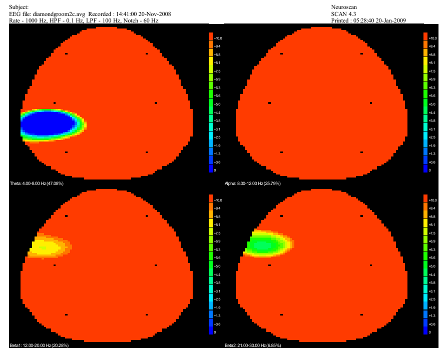

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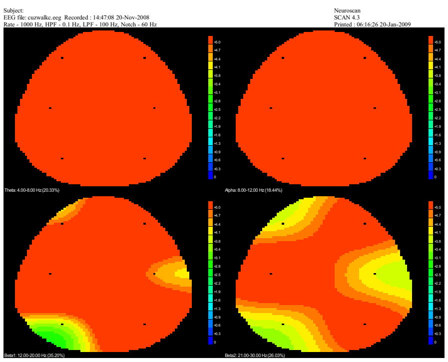

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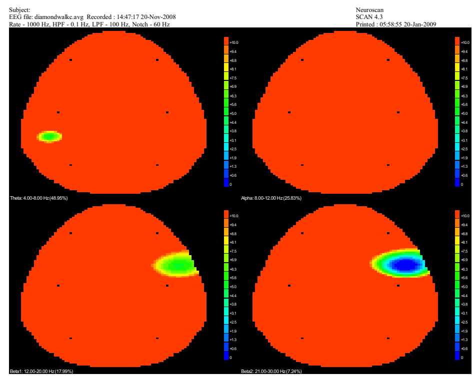

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