

To the Graduate Council:

I am submitting herewith a thesis written by Aric R. Gerke entitled "The Green Brain: A QEEG Investigation of the Domain-Specificity of Jealousy." I have examined the final electronic copy version of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Psychology.

Michael Olson, Major Professor

We have read this thesis and
recommend its acceptance:

Deborah Baldwin

Todd Freeberg

(Original signatures are on file with official student records.)

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the
Graduate School

THE GREEN BRAIN:
A QEEG INVESTIGATION OF THE DOMAIN-SPECIFICITY OF
JEALOUSY

A Thesis Presented for the
Master of Psychology Degree
The University of Tennessee, Knoxville

Aric R. Gerke
Dec. 2007

ABSTRACT

Previous investigators have found evidence to support the hypothesis that the genders show differential reactions to emotional and sexual jealousy.

Evolutionary psychology provides heuristic support by noting that the genders have faced divergent selection pressures in the past that jealousy could adaptively address. While these studies have given sound proof in this regard, criticism has arisen because of the dearth of support for the actual neurological process of jealousy. This study was designed to record subjects experiencing two separate conditions designed to elicit emotional and sexual jealousy. The electrophysiological results did not demonstrate evidence of domain-specificity of jealousy, and produced mixed results by showing gender differences but in directions not envisioned by a priori predictions.

TABLE OF CONTENTS

Introduction	1
Evolutionary Psychology and the Genders	1
Parental Care and Investment	2
Reproductive Hurdles	4
Jealousy as a Tool and a Liability	6
Gender Differences in Jealousy	7
Experimental Method and Hypotheses	10
Method	12
Participants	12
Informed Consent	13
Procedure	13
Data Processing	17
Results	20
Interpersonal Jealousy Scale	20
Subjective Reports	20
Condition Comparisons	22
Discussion	25
Limitations and Future Considerations	27
Conclusion	29
List of References	30
Appendix	37
Vita	50

INTRODUCTION

Evolutionary Psychology and the Genders

In describing the adaptationist program, Symons (1995, p.87) describes evolutionary psychology as being “explicitly informed by the knowledge that human psychological adaptations were shaped over vast periods of time to solve the recurrent information-processing problems that our ancestors faced.” With heuristics and knowledge garnered from the field of evolutionary biology, an adaptationist program can offer unique explanations and, perhaps more importantly, novel predictions for the content and manifestation of behavior. Borrowing from Darwin’s conceptualization of natural selection as a process of gradual assortment of particularly advantageous genotypes, evolutionary psychology can view modern humans as possessing a unique constitution and cognitive infrastructure designed to solve historical adaptive impasses.

One area heavily researched within evolutionary psychology is the similarities and differences that exist between the sexes. Because of the comparable environments that have existed for both human males and females, many similarities have been found. For example, Hyde (2005) performed a meta-analysis that probed a multitude of cross-cultural gender differences studies. Most of the findings pointed toward uniformity between the sexes, including mathematical and verbal tasks, social attributions, leadership, and a litany of other commonalities. However, exceptions were still discovered, focused largely in the realms of motor behaviors, measures of sexuality, and aggression.

These differences between the sexes have also been predicted by evolutionary psychology because of some different adaptive problems that the genders have faced. For example, in the influential research performed by Clark and Hatfield (1989), attractive male and female confederates approached naïve opposite-sex subjects on a typical American college campus and asked them one of three questions: “Would you go out with me tonight?” “Would you come over to my apartment tonight?” or “Would you go to bed with me tonight?” Responses differed significantly between genders, with males answering yes 50% of the time to a date but 75% to the sex request. Females, however, answered yes 56% of the time for a date and 0% for the sex request. In a different series of studies, males have been found to be more amenable to short-term relationships, have a higher number of desired sexual partners in a lifetime, require less time in a relationship before consenting to intercourse, and place more emphasis on physical attractiveness (Buss & Schmitt, 1993). While these findings do not exhaust the sexual differences (see Buss, 1995), they provide evidence of their existence and general composition.

Parental Care and Investment

In the realm of human sexuality, specific disparities are predicted because of the investments inherently expected from each gender. As a sexually reproducing species, humans require two individuals of opposite sexes for reproduction. Because human infants can be classified as altricial, requiring supervision for at least a few years after birth, a certain level of investment is required for successful progeny. This necessity can create tension for the parents,

especially if the combination of the couple's efforts cannot be more than twice as effective as a single parent. If fitness of offspring is not enhanced by the presence of both parents, one of the parents could achieve higher reproductive success by deserting to look for a new mate. Game theory models designed to demonstrate this interaction show that either condition, male or female desertion, could be an evolutionarily stable strategy (ESS), and would be decided by the initial conditions that led to the persisting policies. An ESS refers to "a strategy such that, if all the members of a population adopt it, then no mutant strategy could invade the population under the influence of natural selection" (Maynard Smith, 1982, page 10). Four possible strategies were identified as a possible ESS for parental investment: male and female investment, female desertion (stickleback), male desertion (duck), and male and female desertion (Maynard Smith, 1977).

While this line of reasoning may seem superfluous to some, for humans seem to largely default to monogamous mating habits, the possibility of absconding still exists for either member of a mating couple. Upon desertion, the remaining individual is forced to make a decision to also leave, or raise the offspring on his or her own. Humans find themselves in the mammalian system of internal gestation and lactation for females that automatically places them in a more obligatory investment role. This outlay is realized by time and energy diverted from personal fitness, and the disappearance of other opportunities of mating or securing additional mates. With this understanding of human mating costs and benefits, there are tangible barriers for reproductive success that differ for males and females. Where a male would be benefited by assuring that any

offspring he raises is his own genetic progeny, females benefit by focusing on the assurance of security and ample resources.

Reproductive Hurdles

The primary limiting feature for human males would be ensuring that any offspring raised was actually their own progeny. The assurance of paternity is a difficult issue because of the cryptic nature of female ovulation, and can rarely be assured without the addition of blood type matching or modern genetic techniques that can be employed to establish nonpaternity. For example, a recent study demonstrated that 50% of male participants would favor paternity testing as opposed to only 32% of female participants (Hayward & Rohwer, 2004). This marked difference in gender acceptance toward paternity illuminates the perils of cuckoldry, with the outlay of a male's time and resources being funneled unbeknownst into an offspring that shares no genetic lineage. Research on accounts of maternal and paternal resemblance in newborns found a significant elevation in allegations of paternal similarities from the new mothers compared to the fathers, which was also apparent among solicited submissions of resemblance from family members of the parents (Daly & Wilson, 1982). This could demonstrate that the fear of cuckoldry and the understanding of its implications are comprehended implicitly across the family. Another study demonstrated that fathers who noticed a high degree paternal resemblance in their offspring, or held a belief in the fidelity of their mate, gave more indications of paternal investment to those children (Apicella & Marlowe, 2004).

From an adaptation standpoint, any mechanism or ability that could protect against cuckoldry would quickly pay profound dividends in reproductive success in comparison to those males without such mechanisms. If a genetic disposition led to males' unwillingness or disregard toward the assurance of paternity certainty, this particular genetic penchant could conceivably be eliminated as a major contributor to the human gene pool. A current consensus is not available on the prevalence of human nonpaternity in the world, with estimates ranging from 1.9% to 10% (e.g., Anderson, 2006; Alfred, 2002), but its presence in all studies nonetheless demonstrates that the risk is still palpable.

Likewise, human females face their own particular hurdle to reproductive success. Unlike males, females are assured of maternity through internal gestation, aside from bizarre hospital mix-ups. However, the trade off for this certainty is the decreased ability for offspring potential, in that males only require a minimum of seconds to transfer sperm whereas females are burdened with carrying any offspring nine months in their uterus. Thus, the limiting factor for females is lining up resources and support for the impending baby. This assurance of parental investment, "any investment by the parent in an individual offspring that increases the offspring's chances of surviving (and hence reproductive success) at the cost of the parent's ability to invest in other offspring" (Trivers, 1972, p.798), is ideally accomplished by assuring that the father stays on to help rear the offspring that he helped to create.

This argument may seem tenuous given the nature of modern society and social welfare programs that provide the opportunity for a single parent to raise

offspring on their own, but the elements that helped shape modern human mental processes existed in the past. This is a storied history where the absence of a parent would have often proved fatal or severely hampering to any newborn babies, and leads to the present where modern conveniences and considerations do not always be in agreement with innate reactions. As Wright (1994, p.67) states, “for the average husband, the fact that his wife inserted a diaphragm before copulating with her tennis instructor will not be a major source of consolation.” Research on newly married couples has demonstrated that mate retention strategies for females were positively correlated with resources and status striving, whereas for males the correlation existed with youth and attractiveness (Buss & Shackelford, 1997), reaffirming what qualities each gender inherently holds in highest regard. An interesting study has even shown that females may pursue extra-pair liaisons, short-term mating outside of exclusive relationships, in order to switch to mates of a higher caliber or accrue additional resources (Greiling & Buss, 2000). Much the same as the male predicament, if a line of females consistently failed to ensure proper support for her offspring, that tendency would quickly be outperformed by a configuration of those who are able to sustain their young.

Jealousy as a Tool and a Liability

With the possibility of reproductive failure manifest across both genders, an evolutionary approach would naturally examine possible avenues of adaptive response to combat those threats. Evolutionary psychology has long earmarked jealousy as a potential adaptive rejoinder for the reproductive dilemmas

highlighted above (Daly, Wilson, & Weghorst, 1982; Symons, 1979). While jealousy is often researched due to the negative consequences of its appearance, a pioneering study demonstrated through a longitudinal study of undergraduate couples that jealousy has strong links to the preservation of romantic love (Mathes, 1986). The abhorrent aspect of jealousy cannot be forgotten though. In a study of battered women in houses of refuge, a majority of interviewees related possessiveness and sexual jealousy as the primary source of conflict that led to their assaults (Dobash & Dobash, 1984).

Given the multifaceted nature of jealousy, and the boons and drawbacks that come with it, a constrained definition is necessary. While many designations have been forwarded over the years, White (1981, p.130) was able to summarize a large collection of literature and incorporate his own research to define romantic jealousy as “a complex of thoughts, feelings, and actions which follows threats to the existence or the quality of the relationship, when those threats are generated by the perception of a real or potential attraction between one’s partner and a (perhaps imaginary) rival.” In this sense, romantic jealousy is invoked when one’s own partner is in danger of being lost to a rival, and differs from envy in which the focus is on someone else’s partner.

Gender Differences in Jealousy

Knowledge of the difference in reproductive barriers for the two genders raises the issue of whether jealousy will function equally for both sexes. Psychology had long hinted at dissimilarities in the expression of jealousy, but it was not rigorously addressed until Daly et al. (1982) broached the issue in true

empirical fashion that the sexual differences in jealousy began to be truly understood. David Buss extended this line of research with his investigations of gender differences for jealousy, culminating in a research endeavor examining mating preferences for 10,047 participants in 37 countries around the world (Buss, 1994). The basic procedure for this testing involved polling males and females on which kind of infidelity, emotional or sexual, would be more disconcerting. In emotional infidelity, a deep affective attachment is developed for someone outside of the relationship, while sexual infidelity refers to a partner engaging in sexual liaisons with another person. In this area of human behavior, a consistent divergence was established in the reactions of males and females to circumstances of emotional and sexual jealousy. Men consistently show greater aversion to their partner's sexual infidelity, while women show the opposite pattern with more distaste for their partner's emotional infidelity. This finding has been replicated through physiological procedures (Buss, Larsen, Westen, & Semmelroth, 1992), replicated in older populations that differ from the characteristic undergraduate population (Shackelford, Voracek, Schmitt, Buss, Weekes-Shackelford, & Michalski, 2004), and repeated using other cross-cultural participants (Buunk, Angleitner, Oubaid, & Buss, 1996).

This discrepancy of gender reaction corresponds to the reproductive pitfalls of the sexes. For females, when comparing sexual and emotional infidelity, a clearer threat to their offspring's well being would be the male forming an emotional attachment to a different partner and diverting resources to other channels. By focusing on emotional infidelity as a primary risk, females

could diminish their hazard of resource exclusion. Males' principal threat involves cuckoldry, and so sexual infidelity would provide a clearer direct peril to their assurance of paternity. A research project examined the processing of infidelity cues through participants reporting their jealousy feelings in response to 23 situational indicators of jealousy. This study demonstrated that females consistently have lower thresholds for the number of cues to determine emotional infidelity, while males exhibit the same tendency toward sexual infidelity (Schuetzwohl, 2003).

This is not to say that sexual infidelity will not have any effect on females, or emotional infidelity on males, but that a unambiguous divide will emerge for the genders on which category of infidelity would be more upsetting. A study highlighting the emotional impact of infidelity found that females reported significantly stronger experiences of anger, anxiety, and fear while imagining emotional infidelity compared to sexual infidelity. Men in this study reported significantly higher anger, rage, and betrayal while imagining sexual infidelity compared to emotional infidelity (Pietrzak, Laird, Stevens, & Thompson, 2002).

However, challengers of the gender differences in jealousy have offered evidence to suggest that the complete state of affairs has not yet been unveiled. A study using several psychophysiological methods (heart rate, blood pressure, and electrodermal activity) failed to reproduce the expected gender differences (Harris, 2000). Research utilizing other formats than the Buss' original forced-choice format, where participants were required to denote which infidelity would upset them more, found that the gender disparities were not significant across the

other tests. The alternate formats centered on likert-scale, agree-disagree, and checklist measures to provide alternative forms of participant response to the issue (DeSteno, Bartlett, Braverman, & Salovey, 2002). A meta-analysis of relevant articles in the homicide literature revealed no systematic sex difference in jealousy motivation in murders (Harris, 2003). Finally, another study reexamined the problems of the forced-choice testing format and found the typical sex differences. However, results demonstrated that the gender disparity was contextually dependent on experiences of past infidelity and the sexual orientation of those occurrences (Sagarin, Becker, Guadagno, Nicastle, & Millevoy, 2003). Given the weight of the evidence for the gender differences for jealousy, these conflicting studies highlight the fact that this particular behavior is a multi-faceted construct that may be insufficiently understood.

Experimental Method and Hypotheses

This study will address two main matters of interest in the literature. At the outset, the analysis will address the scarcity of neurological examinations of jealousy. While some may claim that intimate knowledge of a mechanism is not necessary to evoke confidence in its existence, mechanistic comprehension of a phenomenon is critical for a real understanding of the issue (Buss, 2000). Secondly, the research will investigate possible gender differences in the responses to sexual and emotional infidelity, and examine whether evidence of domain-specificity can be established. Domain-specificity refers to dedicated neural systems, in this case adaptively derived, as opposed to a domain-general approach that would claim that the occurrence is merely an amalgamation of

distal processes. With the advent of electrophysiological measures, another view of the phenomenon can be established to test and extend the veracity of earlier outlooks on jealousy.

The study itself will utilize quantitative electroencephalographic (QEEG) recordings while participants are engaged in imagination tasks designed to evoke cognitive states of emotional and sexual jealousy. Comparisons will be conducted to examine whether infidelity conditions cause a systematic differentiation between genders in regards to jealousy. From the evolutionary psychology perspective, findings will be predicted to show evidence of significantly higher general neurological arousal for females in the emotional infidelity conditions, and for males in the sexual infidelity conditions. From a psycho-neurological viewpoint, significant correlates of jealousy will be inspected to augment the comprehension of this emotional phenomenon.

METHOD

Participants

Participants were enlisted from the University of Tennessee, Knoxville. Recruitment occurred either through the Human Participation in Research website created to easily provide undergraduate students research opportunities or through direct solicitations in psychology classes. All volunteers received extra credit in the undergraduate psychology courses for their participation. Seven participants data were excluded from the analysis. The first participant contained excessive movement artifact in the EEG recordings, rendering analysis unattainable. The second participant revealed after the recordings that she was currently taking psychopharmacological medication. Five other participants completed just a single session of recording, not showing for the second session, so their data were not included in analyses. With the elimination of the previous individuals, 28 participants completed the entire procedure, 17 females (mean age = 27.00, median age = 21) and 11 males (mean age = 21.27, median age = 21).

Exclusionary criteria for the study included any diagnosed psychological condition, physical abnormality dealing with motor control, history of brain damage, or use of psychopharmacological medication. These limitations were put into place to provide a non-clinical sample, and to minimize aberrant recordings due to extensive muscle movement that would severely limit the effectiveness of the QEEG recordings.

Furthermore, screening also ensured that subjects were at least 18 years of age, and had been involved, or were currently in, a serious relationship. This

consideration was instituted to deal with an empirical pitfall highlighted by a study exhibiting that within sex differences can be mediated by the relationship history of the participants (Murphy, Vallacher, Shackelford, Bjorklund, & Yunger, 2006).

Participants were scheduled for two separate experiment sessions. The appointments were required to have at least 48 hours gap in between, and matched to the same time of day as much as possible. The separate recording days were implemented to minimize possible carryover effects of the experimental conditions. The matched time of day was executed in an attempt to maintain consistent mental activity levels that fluctuate due to circadian rhythms or other environmental factors that could confound recording.

Informed Consent

All participants read and signed an informed consent form (Appendix A) before any data were collected. The forms outlined the basic procedure that they would experience, the risks and benefits of participating, assurances of the confidentiality of any sensitive data, explanations of compensation, guarantees that the participant could depart the study at any point without fear of reprisal, and contact information in the case of any unforeseen issues or troubles. A second copy of the informed consent was given to the participant to take with them for reference purposes.

Procedure

All of the recordings occurred in the same light controlled, sound attenuated laboratory in the Brain Research and Neuropsychology Laboratory at

the University of Tennessee. All recording sessions lasted approximately fifty minutes.

After the participants completed the informed consent, cursory information was collected. This information involved gender, handedness, age, and date of birth. All of this material is pivotal for QEEG purposes, and no other demographic or personal information was assembled.

Participants were prepared for the recordings by measuring scalp distance between the nasion and inion to determine the proper location for the electrode cap. The ear lobes were cleaned using a mild abrasive gel to remove any debris or oil that could hamper the connectivity of the electrodes. After the cap was fitted over the head using two adhesive discs on the forehead to center and stabilize placement, conductive gel was injected through holes in the cap to provide a conductive medium between the electrodes and the scalp, with the resistances ensured to be $< 10 \text{ K}\Omega$. The data were collected with a Deymed Truscan 32 system, and stored at a rate of 256 samples per second at a band pass of 0.5-64 Hz using the standard 19-leads 10-20 montage system (FP1, FP2, F7, F3, FZ, F4, F8, T3, C3, CZ, C4, T4, T5, P3, PZ, P4, T6, O1, O2).

Participants were introduced to the QEEG setup, and through cooperative demonstration shown the negative implications of any cranial movement during recording. Once all questions were covered and comfort with the project had been established, a four-minute eyes-closed baseline was recorded. The neutral baseline was taken to establish a measure of normalized activity without the interference of experimental manipulations. All recordings were conducted with

the participants' eyes closed to facilitate the imaginations, provide a less distracting testing situation, and reduce ocular and muscular movements.

Secondly, a four-minute eyes-closed active baseline was recorded.

Participants were read the following script prior to recording:

Imagine a time when you were walking to class, feeling neither good nor bad, just neutral. (adopted from Buss, Larsen, Westen, & Semmelroth, 1992).

Participants were asked to convey when they understood the request and were ready for recording. This baseline was recorded to establish an ecologically sound profile, in the anticipation that a constrained cognitive task would afford a more sound comparison for the final condition.

The third recording of each session was a four-minute eyes-closed recording of a jealousy state. This condition followed a similar format to the active baseline, in that they were read a script and conveyed when they understood the instructions and were prepared for the task. The participants were read one of the scripts:

(A) *Please think of a serious romantic relationship that you have had in the past, that you currently have, or that you would like to have. Now imagine that the person with whom you're seriously involved becomes interested in someone else. Imagine that you find out that your partner is falling in love and forming an emotional attachment to that person. Try to feel the feelings you would have if this happened to you.*

(B) *Please think of a serious romantic relationship that you have had in the past, that you currently have, or that you would like to have. Now imagine that the person with whom you're seriously involved becomes interested in someone else. Imagine that you find out that your partner is having sexual intercourse with this other person. Try to feel the feelings you would have if this happened to you.* (adopted from Buss et al, 1992).

Participants were only read one prompt, A (emotional jealousy) or B (sexual jealousy), depending on which session they were on. The order was balanced, in that half of the participants experienced the emotional condition first and half experienced the sexual condition first. On the second session, the participants repeated the entire process, neutral baseline, active baseline, and the other jealousy condition that had not been recorded yet. The balancing was especially important in a situation where emotions were expected to be profoundly elevated due to the nature of the scripted requests.

Upon completion of the three recordings, participants completed a subjective report (Appendix B). This account provided details on their experience of the jealousy condition. They were asked to report in a likert fashion, on a scale from 1 to 9 with 1 being “not at all” and 9 being “fully”, how effectively they were able to maintain the requested mental state for the entire recording. The second question dealt with the estimation of the percentage of time the participants believed they were able to sustain the mental state, from 0% to 100%.

The third question was an open-ended prompt that solicited any thoughts or feelings that occurred during the jealousy recording.

After the subjective report was completed on the second session, participants then completed the Interpersonal Jealousy Scale (IJS) (Appendix C). This scale was constructed to measure trait jealousy, and centers on 27 items that allow participants to answer on a scale from 1 to 9, 1 being “absolutely false” and 9 being “absolutely true”, how true a statement is of them. Seven items are reverse-scored to ferret out deficient input. The IJS has been found to have an internal reliability consistency of .92 for both genders (Mathes, Phillips, Skowran, & Dick, 1982).

Upon the conclusion of both sessions, the participants went through a debriefing session. This period focused on addressing any questions, concerns, or adverse effects that the jealousy imagination may have caused, specifically highlighting the point that the project was engineered to cause this gripping sentiment and that it had no viable ties to reality.

Data Processing

All recordings for the participants were vigorously artifacted to remove any traces of electro-oculogram or electromyogram contamination. This removal of extraneous cranial activity, typically associated with blinking, eyeball rolling, forehead clenching, or neck and jaw movement, represents a particular threat to EEG recording because it appears in greater strengths and at different locations than actual cerebral cognitive activity. The EureKa! program from Nova Tech EEG allows for removal of any EEG time segments with zero-crossing. All files

contained at least 45 seconds of artifactual information to ensure a viable resource for comparisons. Once artifactual, all of the files' EEG streams were analyzed to produce a low resolution electromagnetic tomography (LORETA) power map that reports current density values for all 2394 voxels (each corresponding to an area of 7x7x7 mm) of cranial white matter. The power maps split the results into five standard frequency bands: Delta (1 - 3.5 Hz), Theta (4 - 7.5 Hz), Alpha (8 - 12.5 Hz), Beta 1 (13 - 21.5 Hz), and Beta 2 (22 - 30.5 Hz).

Group and condition comparisons were then conducted using the Multiple Hypothesis Testing program (MHyT3!) from Nova Tech EEG. This program was designed for the purpose of analyzing group differences in LORETA and other QEEG data sets. The test examines the differences between selected groups, and indicates the significant t-statistics (student-t) for all 2394 voxels. The family-wise error rate for type I errors was maintained at an alpha level of 5%. Any positive differences would indicate that the group mean of the first group is statistically greater than the second group's mean for that particular area. Both between-subject (independent samples) and within-subject (dependent samples) multiple t-tests are available.

The LORETA method is a procedure to estimate real time inter-cortical activity through localization estimates from surface electrodes (Pascual-Marqui, Michel, & Lehman, 1994). Through the computation of surface activity measured via a multi-channel electrode-lead array, an inverse solution is computed to estimate current density levels throughout the entire volume of the brain in accordance with the Montreal Neurological Institute's MRI average of 305 brains

(Talairach & Tournoux, 1988). While classic EEG relies on topical activity, LORETA facilitates spatial estimates of brain regions inaccessible through earlier techniques, providing the opportunity to localize neurological activity responses to complex cognitive tasks.

RESULTS

Interpersonal Jealousy Scale

A t-test was used to examine the gender scores on the IJS. An independent samples t-test suggested that female IJS scores ($M = 141.35$, $SD = 36.51$) did not differ from the male scores ($M = 139.64$, $SD = 20.71$), $t(26) = 0.141$, $p = 0.889$, shown in Figure 1. Thus, any trait-induced disparities between the genders can most likely be dismissed when considering any EEG divergences resulting from the infidelity conditions.

Subjective Reports

T-tests were also used to examine the subjective reports given by participants to describe their experiences of the infidelity conditions. Independent samples t-tests examining the means of females and males found no significant differences for the effectiveness rating, which recounted how effectively the mental states of the condition were sustained, for either the emotional infidelity, $t(26) = -0.327$, $p = 0.747$, or the sexual infidelity, $t(26) = -0.738$, $p = 0.467$ condition. There was also no significant result for the estimated percentage of time spent in the emotional infidelity, $t(26) = 0.000$, $p = 1.000$, or the sexual infidelity, $t(26) = -0.779$, $p = 0.443$, between the genders' means. Similar to the IJS outcome, the results of the subjective reports alleviate concerns that an extraneous factor of submersion in the task could have functioned as a confounding explanation in the neurological findings.

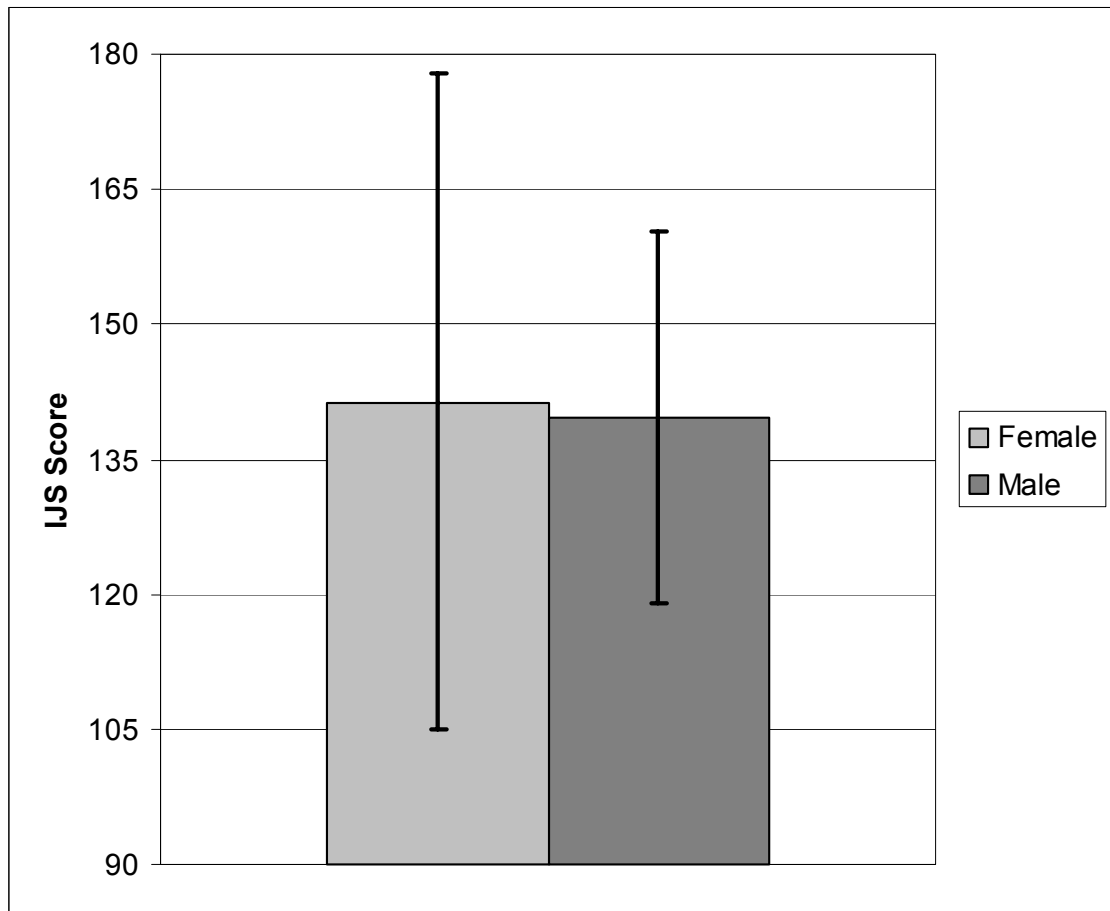


Figure 1 Interpersonal Jealousy Scores for females and males Condition

Comparisons

Six comparisons were computed: two focusing on the gender differences for emotional and sexual infidelity conditions, and four for the baseline comparisons for both genders on emotional and sexual infidelity situations. The primary comparisons examined the statistical differences between females and males on activation during the emotional and sexual infidelity tasks. Baseline comparisons were made for each gender on the two infidelity tasks in order to enable accurate description of where differences within the primary comparisons could have conceivably originated (see Appendix D for comparison dissection).

The primary comparisons involved between-group comparisons of statistical deviations, subtracting the male activation from female. Thus the results yielded from this approach provide information based on relative differences. The activation for emotional infidelity demonstrated a trend of higher male activation at lower frequencies (Delta, Theta, and partial Alpha), with females evoking higher levels at higher frequencies (partial Alpha, Beta 1, and Beta 2). Trends for the sexual infidelity comparison showed a further skewed trend, with males only showing increased activity in the lowest frequency band (Delta). However, from the prevalent evolutionary psychology position of gender differences in jealousy, the probable patterns of activation were not found. Given that females are expected to experience greater consternation for emotional infidelity and males experience more dismay at sexual infidelity, the expected configuration would be a clean split with females having greater activity levels for emotional conditions and males for sexual conditions. For the major emotional

and sexual jealousy gender comparisons, only the two lowest frequency bands, theta and alpha, showed evidence of a clear gender split. Even with these two examples though, the direction was reversed from the projected results, with males showing higher activation in the emotional conditions and females demonstrating higher activity in the sexual condition. See Appendix E for all t-max maps of the six comparisons (red regions indicate areas of statistically significant increased activity and blue regions designate decreased activation).

For the Delta frequency band (1 - 3.5 Hz), males had an increased level of activity in the superior temporal gyrus (Brodmann area 22, 38) and middle temporal gyrus (BA 21) of the right hemisphere in the emotional condition, and males also had increased levels in the postcentral gyrus (BA 3) and precentral gyrus (BA 6) of the left hemisphere for the sexual condition. In the Theta frequency band (4 - 7.5 Hz), males had increased levels in the inferior frontal gyrus (BA 47) of the right hemisphere for the emotional condition, and females had increased levels in the fusiform gyrus (BA 20) of the left hemisphere for the sexual condition. For the Alpha frequency band (8 - 12.5 Hz), males had increased activity levels in the superior parietal lobule (BA7) of the left hemisphere and females showed increased levels in the middle temporal gyrus (BA 21) of the right hemisphere for the emotional condition, and females displayed increased intensities of activation in the medial frontal gyrus (BA 10) and anterior cingulate (BA 32) of both hemispheres for the sexual condition.

In the Beta1 frequency band (13 – 21.5 Hz), females illustrated heightened levels in the parahippocampal gyrus (BA 35) of the right hemisphere for the

emotional condition, and females also showed higher levels of activity in the hippocampus and parahippocampal gyrus (BA 30,37) of the left hemisphere for the sexual condition. For the Beta2 frequency band (22 – 30.5 Hz), females exhibited elevated intensities of activity in the medial frontal gyrus (BA 11) and superior frontal gyrus (BA 10,11) of both hemispheres for the emotional condition, and females also had higher levels in the fusiform gyrus (BA 19) and parahippocampal gyrus (BA 30) of the left hemisphere in the sexual condition.

Also, the patterns exhibited by males and females in the baseline comparisons were of particular interest. The within-subjects comparison, subtracting baseline activity from infidelity condition activity to conceivably isolate the cognitive processes involved with a jealousy experience, provided additional evidence of gender disparities. Males evoked less activity in all frequency bands for the sexual condition, and also showed increased activity only in the two higher bands, Beta1 and Beta2, for the emotional condition. Females, however, showed increased activity levels at all frequency bands for the emotional and sexual conditions.

DISCUSSION

Given the evidence compiled from the QEEG comparisons, the results lead to two principal conclusions. First, substantiation of straight domain-specificity of jealousy was not established. While many regions demonstrated activation with some consistency, no frequency band and cortical area consistently activated in a similar pattern with regards to the jealousy conditions. Second, the evolutionary psychology hypothesis of gender differences in jealousy was not supported in a straightforward sense. While gender differences were verified, these often contradicted the trends that would be predicted from the literature.

Gender differences did appear in the emotional and sexual infidelity conditions. Of interest were the trends that appeared, with males showing increased electrophysiological activity in the lower frequency ranges, with females illustrating elevated activation in the higher frequency ranges. Because the lower frequency ranges, delta and theta, are largely implicated in unconscious and non-cognitive processes, the higher bands are of more interest. Once again defying a priori forecasts, this configuration raises questions of how exactly cortical suppression in males and excitation in females could lead, from a neurological standpoint, to consistent gender differences in attitudinal catalogs of jealousy.

From an evolutionary standpoint, one possible explanation could involve the differences in coping between genders. Studies have highlighted gender differences in coping strategies for perception of pain (Keogh & Herdenfeldt,

2002), and this same difference could occur in the responses of males and females to imaginations of jealousy. It is possible that males practiced active avoidance during their jealousy imagination, which led to the significant suppression of cortical activity. This divestiture of attachment to past infidelity, or even imagined unfaithfulness, could be an inherent strategy employed by males to cope with the trauma of infidelity that can produce qualitative differences from females.

Finally, the locations of electrophysiological activation were also of particular interest. Three areas consistently appeared as significant regions of activity- the frontal gyrus, the temporal gyrus, and the limbic system. In the frontal gyrus, regions of the inferior, middle, and superior sections all demonstrated consistent patterns of activation. The inferior frontal gyrus has been implicated in language and semantic processing (Bookheimer, 2002), the middle frontal gyrus has been associated with reward processes of motivation and executive processes (Pochon, Levy, Fossati, Lehericy, Poline, Pillon, et al., 2002), and the superior frontal gyrus has been implicated in working memory and other higher cognitive functions (Boisgueheneuc, Levy, Volle, Seassau, Duffau, Kinkingnehun, et al., 2006). In the temporal gyrus, activity focused on the middle and superior divisions, which have been associated with language and semantic memory processes, visual perception, and general sensory integration (Onitsuka, Shenton, Salisbury, Dickey, Kasai, Toner, et al., 2004). Also showing activity in the temporal lobe was the fusiform gyrus, which has been implicated in facial recognition (Bokde, Lopez-Bayo, Meindl, Pechler, Born, Faltraco, et al., 2006).

Within the parietal lobe, the precuneus showed activation, and has been conjectured to have ties with episodic memory, self-oriented processes, visuo-spatial imagery, and consciousness (Cavanna & Trimble, 2006). Finally, within the limbic system, both the hippocampus and parahippocampal gyrus both demonstrated activation. The parahippocampal gyrus has a vital role in the sensory input that it provides to the hippocampus, as well as feature extraction during recall (Talamini, Meeter, Elvevag, Murre, & Goldberg, 2005). The hippocampus has been shown to have crucial contributions to memory formation and spatial processing (Eichenbaum, H., Yonelinas, A. P., Ranganath, C., 2007).

Limitations and Future Considerations

There were a few limitations and areas that could be enhanced in this study. A larger, more gender-balanced, pool of participants would have bolstered the confidence of the findings. While 17 females and 11 males provided enough cases for the statistical analysis of the EEG records, shoring up the number of participants could help to eliminate any doubts of validity.

Another pitfall in this study was the nature of the personal experience of jealousy among the infidelity conditions. While the subjective ratings demonstrated no statistical differences, a qualitative difference could have nonetheless existed. Without an emphasis on quantifying the participant's cognitive experience of jealousy in the tasks, the possibility exists that participants were actually off-theme or some gender difference existed which would serve as an extraneous alternative to basic jealousy differentiations.

Construction of a rigid reporting scale or a thematic analysis of the imagined content would be a couple of feasible methods for combating this concern.

Another possible confound is the ovulatory patterns of female participants. While the chances are remote that this factor would significantly influence jealousy to the extent the QEEG correlates would be compromised, a study determined that general sexual desire increased and higher levels of sexual desire toward extra-pair partners were likely to be experienced as ovulation approached (Pillsworth, Haselton, & Buss, 2004). While this approach does not resemble the format of the imagination tasks detailed above, the ramifications of this phase of high conception-probability on women's neurological responding for a jealousy imagination task would also be an interesting contributor to scrutinize.

Finally, the testing format itself holds problematic qualities. Asking participants to imagine jealousy through infidelity cues for four minutes allows for any number of intervening thoughts and cognitive tasks to interfere. The procedure in this study was loosely modeled on the procedure from a previous study on affective memory tasks and limbic system activation with LORETA, which successfully demonstrated limbic activity through an imagination condition (Cannon, Lubar, Thornton, Wilson, & Congedo, 2004), yet other routes to cognitive activation could assist with fleshing out the experience. While real elicitations of jealousy would be dangerous, and likely unethical, other procedures could be envisioned. One possibility lies with recording participants while administering the IJS. This presents its own methodological quandaries, but

could at least present convergent evidence to strengthen the current imagination approach.

Conclusion

This research endeavor was a pioneering attempt to examine the neurological basis of a profound affective phenomenon. While clear evidence of a dedicated neurological network was not established, interesting correlates were highlighted throughout the frontal and temporal lobes as well as in the limbic system. Departing from an either/or format of participants choosing which infidelity would be upsetting, the method focused instead on activity within each separate jealousy condition. The resulting activation provided trends demonstrating gender differences, but in patterns foreign to the experimental hypotheses.

LIST OF REFERENCES

LIST OF REFERENCES

- Alfred, J. (2002). Flagging non-paternity. *Nature Reviews Genetics*, 3, 161.
- Anderson, K. G. (2006). How Well Does Paternity Confidence Match Actual Paternity? *Current Anthropology*, 47 (3), 513, 520.
- Apicella, C. L., & Marlowe, F. W. (2004). Perceived mate fidelity and paternal resemblance predict men's investment in children. *Evolution and Human Behavior*, 25, 371-378.
- Boisgueheneuc, F., Levy, F., Volle, E., Seassau, M., Duffau, D., Kinkingnehun, S., et al. (2006). Functions of the left superior frontal gyrus in humans: a lesion study. *Brain*, 129, 3315-3328.
- Bokde A. L, Lopez-Bayo, P., Meindl, T., Pechler, S., Born, C., Faltraco, F., et al. (2006). Functional connectivity of the fusiform gyrus during a face-matching task in subjects with mild cognitive impairment. *Brain*, 129, 1113-1124.
- Bookheimer, S. (2002). Functional MRI of Language: New Approaches to Understanding the Cortical Organization of Semantic Processing. *Annual Review of Neuroscience*, 25, 151-188.
- Buss, D. M. (1994). The strategies of human mating: People worldwide are attracted to the same qualities of the opposite sex. *American Scientist*, 82 (3), 238-249.
- Buss, D. M. (1995). Psychological Sex Differences: Origins Through Natural Selection. *American Psychologist*, 50 (3), 164-168.

- Buss, D. M. (2000). Desires in Human Mating. In LeCroy, D., & Moller, P. (Ed). *Evolutionary perspectives on human reproductive behavior*. New York: New York Academy of Sciences, 39-49.
- Buss, D. M., Larsen, R. J., Westen, D., & Semmelroth, J. (1992). Sex Differences in Jealousy: Evolution, Physiology, and Psychology. *Psychological Science*, 3 (4), 251-255.
- Buss, D. M. & Schmitt, D. P. (1993). Sexual Strategies Theory: An Evolutionary Perspective on Human Mating. *Psychological Review*, 100 (2), 204-232.
- Buss, D. M., & Shackelford, T. K. (1997). From Vigilance to Violence: Mate Retention Tactics in Married Couples. *Journal of Personality and Social Psychology*, 72 (2), 346-361.
- Buunk, B. P., Angleitner, A., Oubaid, V., & Buss, D. M. (1996). Sex Differences in Jealousy in Evolutionary and Cultural Perspective: Tests from the Netherlands, Germany, and the United States. *Psychological Science*, 7 (6), 359-363.
- Cannon, R., Lubar, J., Thornton, K., Wilson, S., & Congedo, M. (2004). Limbic Beta Activation and LORETA: Can Hippocampal and Related Limbic Activity Be Recorded and Changes Visualized Using LORETA in an Affective Memory Condition? *Journal of Neurotherapy*, 8 (4), 5-24
- Cavanna, A E., & Trimble, M. R. (2006). The precuneus: a review of its functional anatomy and behavioural correlates. *Brain*, 129, 564-583.
- Clark, R. D., & Hatfield, E. (1989). Gender Differences in Receptivity to Sexual Offers. *Journal of Psychology & Human Sexuality*, 2 (1), 39-55.

- Daly, M., & Wilson, M. I. (1982). Whom Are Newborn Babies Said to Resemble? *Ethology and Sociobiology*, 3, 69-78.
- Daly, M., Wilson, M., & Weghorst, S. J. (1982). Male Sexual Jealousy. *Ethology and Sociobiology*, 3, 11-27.
- DeSteno, D., Bartlett, M. Y., Braverman, J., & Salovey, P. (2002). Sex Differences in Jealousy: Evolutionary Mechanism of Artifact of Measurement? *Journal of Personality and Social Psychology*, 83 (5), 1103, 1116.
- Dobash, R. E., & Dobash, R. P. (1984). The nature and antecedents of violent events. *British Journal of Criminology*, 24 (3), 269-288.
- Eichenbaum, H., Yonelinas, A. P., & Ranganath, C. (2007). The Medial Temporal Lobe and Recognition Memory. *Annual Review of Neuroscience*, 30, 123-152.
- Greiling, H., & Buss, D. M. (2000). Women's sexual strategies: the hidden dimension of extra-pair mating. *Personality and Individual Differences*, 28, 929-963.
- Harris, C. R. (2000). Psychophysiological Responses to Imagined Infidelity: The Specific Innate Modular View of Jealousy Reconsidered. *Journal of Personality and Social Psychology*, 78 (6), 1082, 1091.
- Harris, C. R. (2003). A Review of Sex Differences in Sexual Jealousy, Including Self-Report Data, Psychophysiological Responses, Interpersonal Violence, and Morbid Jealousy. *Personality and Social Psychology Review*, 7 (2), 102-128.

- Hayward, L. S., & Rowher, S. (2004). Sex differences in attitudes toward paternity testing. *Evolution and Human Behavior*, 25, 242-348.
- Hyde, J. S. (2005). The Gender Similarities Hypothesis. *American Psychologist*, 60 (6), 581-592.
- Keogh, E., & Herdenfeldt, M. (2002). Gender, coping and the perception of pain. *Pain*, 97, 195-201.
- Mathes, E. W. (1986). Jealousy and romantic love: a longitudinal study. *Psychological Reports*, 58, 885-886.
- Mathes, E. W., Phillips, J. T., Skowran, J., & Dick, W. E. (1982). Behavioral correlates of the Interpersonal Jealousy Scale. *Educational and Psychological Measurement*, 42, 1227-1230.
- Maynard Smith, J. (1977). Parental Investment: A Prospective Analysis. *Animal Behaviour*. 25, 1-9.
- Maynard Smith, J. (1982). *Evolution and the Theory of Games*. London: Cambridge University Press.
- Murphy, S. M., Vallacher, R. R., Shackelford, T. K., Bjorklund, D. F., & Yunger, J. L. (2006). Relationship Experience as a predictor of romantic jealousy. *Personality and Individual Differences*, 40, 761-769.
- Onitsuka, T., Shenton, M. E., Salisbury, D. F., Dickey, C. C., Kasai, K., Toner, S. K., et al. (2004). Middle and Inferior Temporal Gyrus Gray Matter Volume Abnormalities in Chronic Schizophrenia: An MRI Study. *American Journal of Psychiatry*, 161, 1603-1611

- Pascual-Marqui, R. D., Michel, C. M., & Lehman D. (1994). Low resolution electromagnetic tomography: a new method for localizing electrical activity in the brain. *International Journal of Psychophysiology*, 18, 49-65.
- Pietrzak, R. H., Laird, J. D., Stevens, D. A., & Thompson, N. S. (2002). Sex differences in human jealousy: A coordinated study of forced-choice, continuous rating-scale, and physiological responses on the same subjects. *Evolution and Human Behavior*, 23, 83-94.
- Pillsworth, E. G., Haselton, M. G., & Buss, D. M. (2004). Ovulatory Shifts in Female Sexual Desire. *The Journal of Sex Research*, 41 (1), 55-65.
- Pochon, J. B., Levy, R., Fossait, P., Lehericy, S., Poline, J. B., Pillon, B., Le Bihan, D., Dubois, B. (2002). The neural system that bridges reward and cognition in humans: An fMRI study. *PNAS*, 99, 5669-5674.
- Sagarin, B. J., Becker, D. V., Guadagno, R. E., Nicastle, L. D., & Millevoi, A. (2003). Sex differences (and similarities) in jealousy: The moderating influence of infidelity experience and sexual orientation of the infidelity. *Evolution and Human Behavior*, 24, 17-23.
- Schuetzwohl, A. (2003). Sex differences in jealousy: the processing of cues to infidelity. *Evolution and Human Behavior*, 26, 288-299.
- Shackelford, T. K., Voracek, M., Schmitt, D. P., Buss, D. M., Weekes-Shackelford, V. A., & Michalski, R. L. (2004). Romantic jealousy in early adulthood and in later life. *Human Nature*, 15 (3), 283-300.
- Symons, D. (1979). *The Evolution of Human Sexuality*. New York: Oxford University Press.

- Symons, D. (1995). Beauty is in the adaptations of the beholder: The evolutionary psychology of human female sexual attractiveness. In Abramson, P. R., & Pinkerton, S. D. (Ed), *Sexual nature, sexual culture*, Chicago: University of Chicago Press, 80-118.
- Talairach, J., & Tournoux, P. (1988). *Co-planar Stereotaxic Atlas of the Human Brain*. New York: Theme Medical Publishers.
- Talamini, L. M., Meeter, M., Elvevag, B., Murre, J. M., Goldberg, T. E. (2005). Reduced Parahippocampal Connectivity Produces Schizophrenia-like Memory Deficits in Simulated Neural Circuits With Reduced Parahippocampal Connectivity. *Archives of General Psychiatry*, 62, 485-493
- Trivers, R. L. (1972). Parental investment and sexual selection. (1996). In Drickamer, L. C., & Houck, L. D. (Ed), *Foundations of animal behavior: Classic papers with commentaries*. Chicago: University of Chicago Press, 795-838.
- White, G. L. (1981). Some correlates of romantic jealousy. *Journal of Personality*, 49 (2), 129-147.
- Wright, R. (1994). *The moral animal: the new science of evolutionary psychology*. New York: Vintage.

APPENDIX

Appendix A- Informed Consent

INFORMED CONSENT STATEMENT

The Green Brain: A QEEG Investigation of the Cortical-Specificity of Jealousy

INTRODUCTION

You are invited to participate in a study that will investigate the neuropsychological underpinnings of jealousy.

INFORMATION ABOUT PARTICIPANTS' INVOLVEMENT IN THE STUDY

The project will involve Quantitative Electroencephalography (QEEG) recordings on two occasions. Both occasions will record a baseline recording, seeking to measure neural activity at a resting level. Next, a recording will be taken while you follow a script to imagine a neutral occurrence, attempting to provide a controlled measurement for later comparisons. For the third recording, you will follow a script to imagine a jealousy-inducing situation, seeking to provoke a state of jealousy.

The QEEG recording process itself is safe, simply placing an electrode cap on your head that simply measures electrical activity from the brain. The capping process uses conductive gel that can be easily washed out at the conclusion of the experiment. Each session will take approximately one hour. Two sessions will be sought, at least 48 hours apart, and times of day between the two sessions will be matched as closely as possible to ensure consistent neural activity. At the conclusion of the second session you will also complete the Interpersonal Jealousy Scale, a 27-question survey constructed to measure trait jealousy

RISKS

QEEG recording is a safe method of obtaining neurological information, and has been used without incident at the University of Tennessee's Brain Research and Neuropsychological Laboratory for a number of years. Evoking a potent emotion, such as jealousy, will be undertaken with particular caution. This study will utilize the hindsight afforded by previous investigations, and will use hypothetical imaginations of jealousy to more safely tap into this emotional reservoir. Debriefing at the end of the study will ensure that any issues are covered.

BENEFITS

While jealousy is a powerful emotion that can have many negative as well as positive effects on human behavior, it is feebly understood at the neurological level. To date, no research has been conducted to probe the neural substrate while the brain is processing jealous content. Furthermore, the findings could provide details on differences or similarities between genders' processing of jealousy. This study offers an opportunity to fill a gap in research knowledge on an influential passion.

CONFIDENTIALITY

All recordings and information from the study will be kept confidential. Data will be stored securely and will be made available only to persons conducting the study unless you specifically give permission in writing to do otherwise. No reference will be made in oral or written reports that could link you to the study.

COMPENSATION

Compensation will involve extra credit or fulfillment of a course requirement; depending on which class you are recruited. You may withdraw from the study at any point without repercussion, and will receive full-credit for that session.

EMERGENCY MEDICAL TREATMENT

The University of Tennessee does not "automatically" reimburse participants for medical claims or other compensation. If physical injury is suffered in the course of research, or for more information, please notify investigator in charge (Aric Gerke: 865-974-3222).

CONTACT INFORMATION

If there are questions at any time about the study or the procedures, (or you experience adverse effects as a result of participating in this study,) you may contact the researcher, Aric Gerke, at WLS A305, and 865-974-3222. If you have any questions about your rights as a participant, contact the Office of Research Compliance Officer at 865-974-3466.

PARTICIPATION

Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at anytime without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed your data will be returned to you or destroyed.

CONSENT

I have read the above information. I have received a copy of this form. I agree to participate in this study.

Participant's signature _____ Date _____

Investigator's signature _____ Date _____

Appendix B- Subjective Report

Subjective Report

1. Rate how effective you were at attaining the desired mental state throughout the recording, using the following scale:

	<i>1-not at all</i>				<i>5-moderately</i>				<i>9-fully</i>	
<1	2	3	4	5	6	7	8	9	>	

2. Estimate the percent of time that you were able to maintain the desired mental state throughout the recording:

0	10	20	30	40	50	60	70	80	90	100
---	----	----	----	----	----	----	----	----	----	-----

3. Provide a brief description of the thoughts or situations that came to mind during the recording:

Appendix C- Interpersonal Jealousy Scale

Use the following scale to indicate how true or untrue each statement is of you.

1 = Absolutely False 5 = Neither True nor False 9 = Absolutely True

1. If my romantic partner were to see an old friend of the opposite sex and respond with a great deal of happiness, I would be annoyed. []
2. If my romantic partner went out with same-sex friends, I would feel compelled to know what he/she did. []
3. If my romantic partner admired someone of the opposite sex, I would feel irritated. []
4. If my romantic partner were to help someone of the opposite sex with his/her homework, I would feel suspicious. []
5. When my romantic partner likes one of my friends, I am pleased. []
6. If my romantic partner were to go away for the weekend without me, my only concern would be with whether he/she had a good time. []
7. If my romantic partner were helpful to someone of the opposite sex, I would feel jealous. []
8. When my romantic partner talks of happy experiences of his/her past, I feel sad that I wasn't part of them. []
9. If my romantic partner were to become displeased about the time I spend with others, I would be flattered. []
10. If my romantic partner and I went to a party and I lost sight of him/her, I would become uncomfortable. []
11. I want my romantic partner to remain good friends with the people he/she used to date. []
12. If my romantic partner were to date others, I would feel unhappy. []
13. If I noted that my romantic partner and a person of the opposite sex have something in common, I would become envious. []
14. If my romantic partner were to become very close to someone of the opposite sex, I would feel very unhappy and/or angry. []

Use the following scale to indicate how true or untrue each statement is of you.

1 = Absolutely False 5 = Neither True nor False 9 = Absolutely True

15. I would like my romantic partner to be faithful to me. []
16. I don't think it would bother me if my romantic partner flirted with someone of the opposite sex. []
17. If someone of the opposite sex were to compliment my romantic partner, I would feel that the person was trying to take my romantic partner away from me. []
18. I feel good when my romantic partner makes a new friend. []
19. If my romantic partner were to spend the night comforting a friend of the opposite sex who had just had a tragic experience, my romantic partner's compassion would please me. []
20. If someone of the opposite sex were to pay attention to my romantic partner, I would become possessive of him/her. []
21. If my romantic partner were to become exuberant and hug someone of the opposite sex, it would make me feel good that he/she was expressing his/her feelings openly. []
22. The thought of my romantic partner kissing someone else drives me up the wall. []
23. If someone of the opposite sex lit up at the sight of my romantic partner, I would become uneasy. []
24. I like to find fault with my romantic partner's old dates. []
25. I feel possessive toward my romantic partner. []
26. If I saw a picture of my romantic partner and an old date I would feel unhappy. []
27. If my romantic partner were to accidentally call me by the wrong name, I would become furious. []

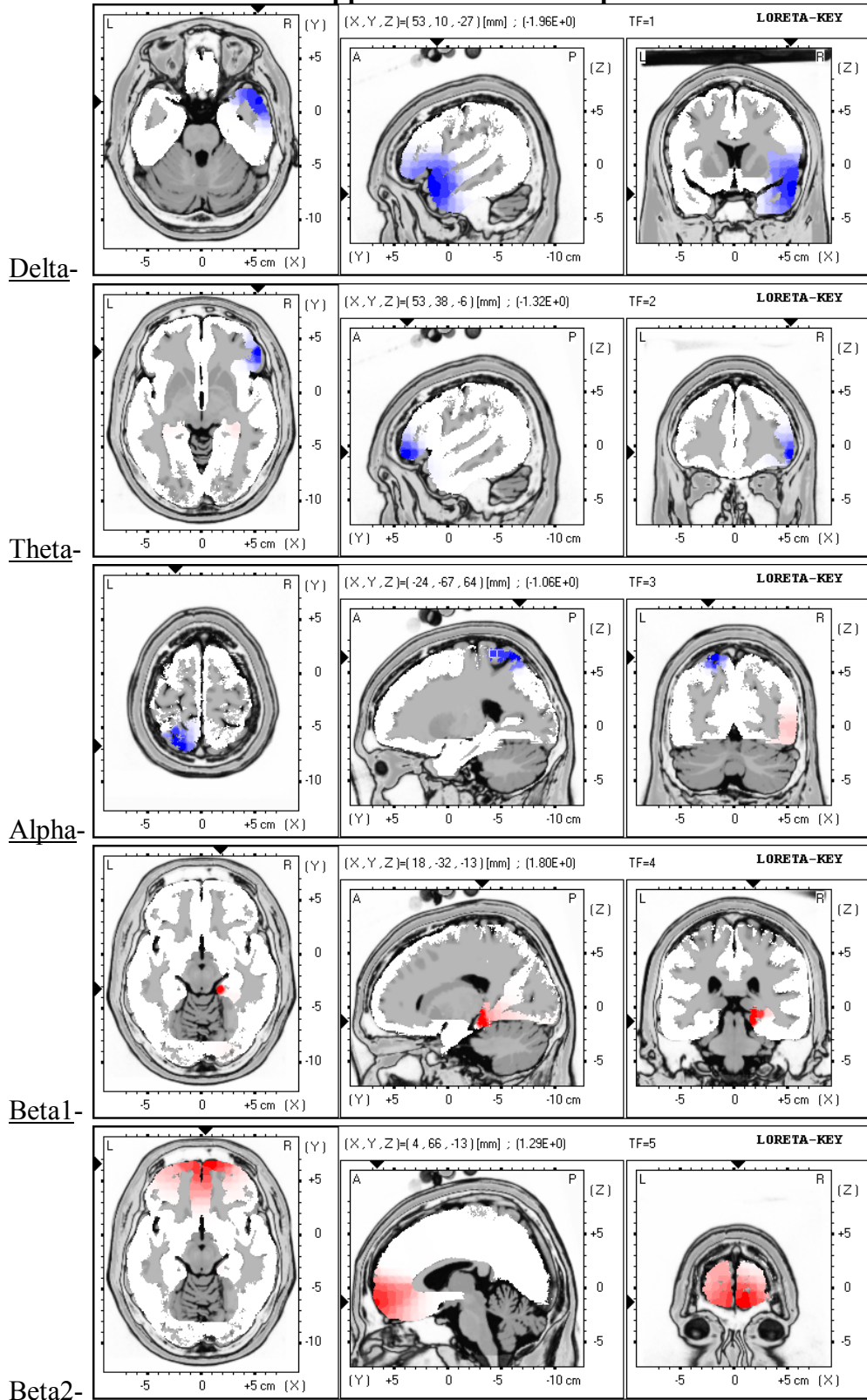
Appendix D- Condition Comparisons

	Active Baseline	Emotional Infidelity	Sexual Infidelity
Female	A	C	E
Male	B	D	F

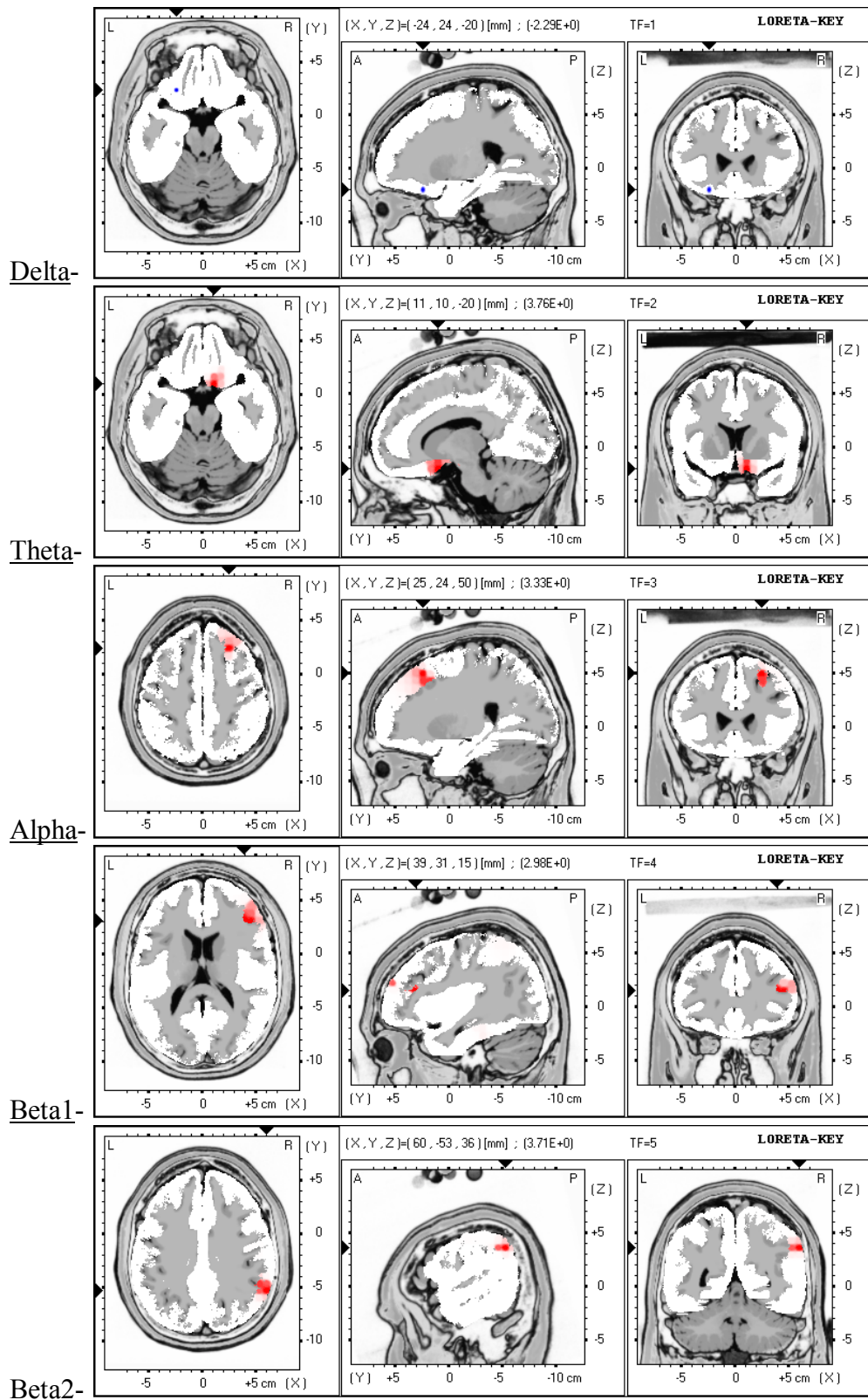
Primary comparisons: C - D
E - F

Secondary comparisons: C - A
E - A
D - B
F - B

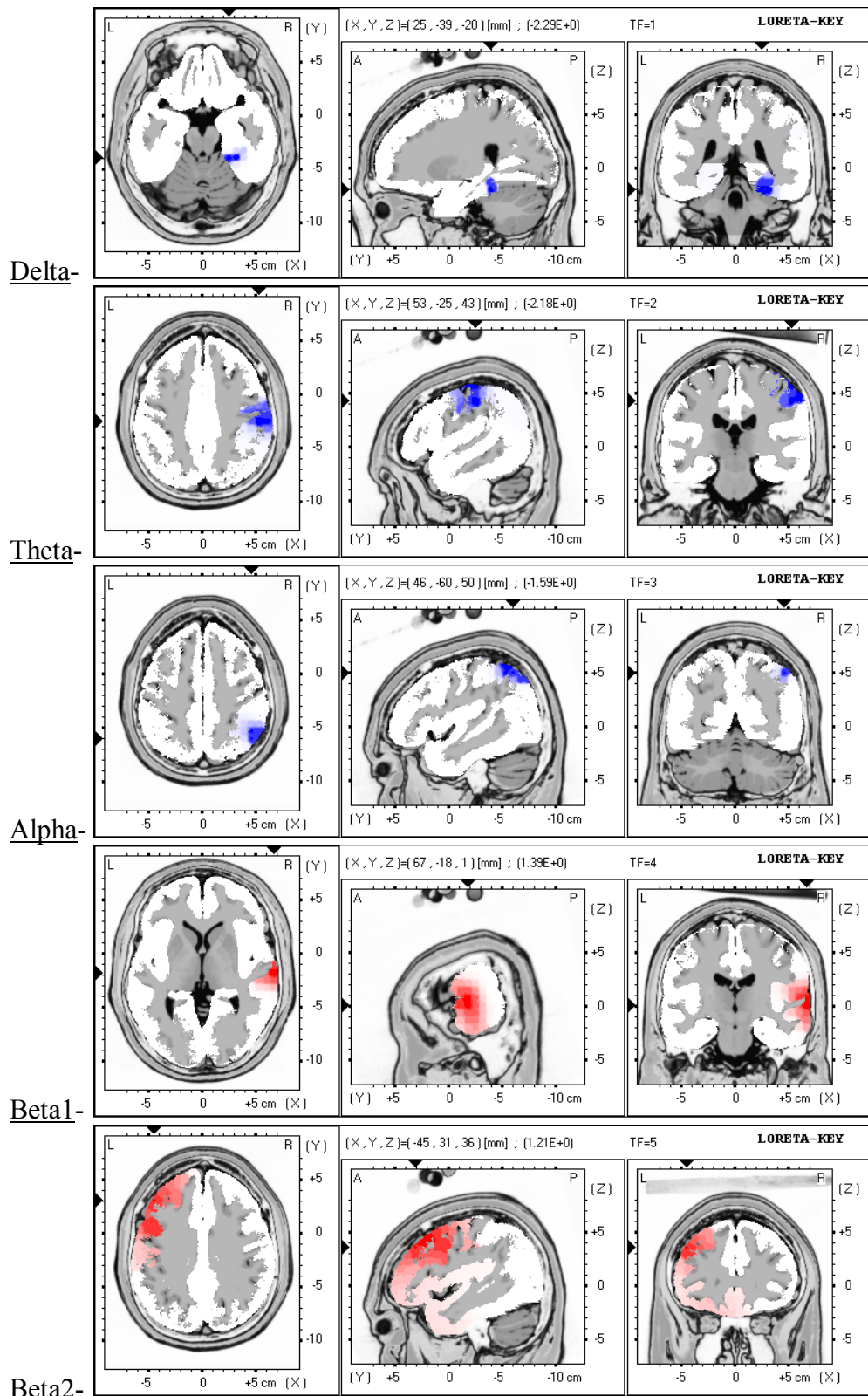
Appendix E- T-Max Maps



T-max maps for the emotional condition (female - male) between-subject multiple t -test.



T-max maps for females (sexual - active baseline) within-subject multiple t-test.



T-max maps for males (emotional - active baseline) within-subject multiple t-test.

VITA

Aric R. Gerke was born on September 16, 1980, in Fort Wayne, Indiana. He graduated from Norwell High School in Ossian, Indiana, in 1999. He then attended the Virginia Military Institute in Lexington, Virginia, graduating with academic honors, earning a Bachelor's Degree in Psychology and a minor in philosophy in 2003. He is currently attending the University of Tennessee-Knoxville, working on the completion of his Master's Degree in Psychology.