BRAIN, PSYCHOLOGY, AND MATE VALUE:

MATING PREFERENCES IN A 53-YEAR OLD MALE FOLLOWING A SURGICALLY PLACED LEFT AMYGDALA LESION

By

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Abstract:

For this study we investigated the relations among brain structure, psychological states, and perceived mate value of self and others. We hypothesized perceived mate value of self and mate value of others is a function of lesion to specific of regions (i.e. the amygdala). We administered self-report questionnaires to a single participant to capture this construct. Our results indicated a lack of interest and desire for indicators of reproductive success. Indicators for companionship and friendship remained intact. Presently, there is evidence supporting the claim that the amygdala plays a role in mediating sexual desire but firm causal claims cannot be made without experimental design.

Introduction:

People who suffer a traumatic brain injury or undergo medical surgery resulting in lesions to the brain often experience irreversible changes in cognitive, emotional, and social areas of their life. Areas such as perception of mate value, sexual desire, and mating effort may be drastically changed as a function of lesions to specific supporting brain regions. For example, damage to the amygdala, which is widely known for playing role in activating the sympathetic nervous system, the "fight or flight" response, and in certain aspects of human sexuality is of particular interest (see e.g., Salamon, Esch, and Stefano, 2005).

The amygdala, a small bilateral structure consisting of distinct nuclei, has been implicated in conditioned emotional and sexual responding (Baird, Wilson, Bladin et al., 2004; Salu, 2013). Using extensive data from non-human studies as a guide, neuropsychologists developed tests sensitive to the relations between amygdala damage and emotional responding but little is known about the impact of amygdala damage on day-to-day life. The present research

seeks to fill a portion of that gap by investigating links among amygdala damage, sexual desire, and self-perceived mate value under semi-naturalistic conditions. Specifically, we will observe and describe relations among measures of amygdala damage, perceived mate value of self and others, sexual desire, i.e., preference for short-term versus long-term relationship seeking, mate poaching strategies, and mate retention strategies.

With some exceptions, neural tissue has no ability to regenerate itself following injury. In the case of the amygdala, severe gross changes typically produce irreversible changes in phenotypic behavior (i.e., action, thought, and emotion). Because we cannot assign or remove a lesion condition in humans, it is necessary to use quasi-experimental methods that allow us to indirectly infer relationships among amygdala and various aspects of sexual desire.

Obviously, quasi-experimental designs investigating this problem require reliable normative data obtained from comparison groups indicating prototypic and sex-specific desires. Clark and Hatfield (1989) published one of the earliest studies indicating clear sex specific mating preferences. Clark and Hatfield based their work on questionnaire research indicating that men are eager and willing to engage in sexual intercourse, presumably as often as possible, whereas women act as gatekeepers by setting limits on access to sex (McCormick; 1979). To examine this further, Clark and Hatfield devised a study that took place on a local university campus. In each of six conditions, a physically attractive male or female researcher approached a member of the opposite sex offering one of three randomly assigned scripts; “Would you go out with me tonight?” “Would you come over to my apartment tonight?” or “Would you go to bed with me tonight?” (Clark and Hatfield, 1989). In two samples, one taken in 1979 and the other taken in 1982, the majority of men (75%, and 69% respectively) accepted the offer to go to bed

with the female requester. Conversely all females declined the offer to go to bed with the male requester. Men and women responded similarly on receptivity to a date.

This classic study illustrates clear sex specific sexual desires. These normative data serve as a reliable comparison (historical control) to our present research.

David Buss (1989) examined mate preferences among heterosexuals across 37 cultures. This work emphasized universal species-specific (human) preferences that hold true independent of ethnic or racial backgrounds. The results of the study revealed a number of sex-specific adaptive mating preferences in humans. Importantly the results clearly indicated consistent and reliable differences between the biological sexes, suggesting an evolutionary origin for sex-specific preferences. In normal populations, men show a preference for women ranging from 18-24 years of age, with specific fitness indicators such as a 0.7 hip-to- waist ratio, luxurious hair, unblemished skin, and the like (Buss, 1989). Women in that age range possess a higher mating potential (in terms of potential years of mating and birthing offspring) than older women. It appears that human male mate preferences are geared towards improving their chances of increasing their reproductive success. These results provide a "sexual preference base rate", which allows us to compare our participant's preferences on similar questionnaires to the norms of a male population residing in various countries and cultures. In doing so we may begin to form hypotheses regarding relations between sexual desire and damage to the amygdala.

Method:

Participants: The participant, MK, is a white, right-handed 53 year-old male (DOB 9/11/1964) working at the Department of Defense and the Defense Information Systems Agency, as an Electrical Engineer, GS-13. MK holds a Masters in Systems Engineering from a prominent

University in the Southern United States. Both parents attended college earning bachelor's degrees. Additionally, his mother holds a master's degree in Elementary Education. He was raised by both parents in the same house through the age of 16.

History: MK has a history of epilepsy resulting from a traumatic brain injury sustained in 1976 at the age of 11. He was struck by a vehicle while riding his bicycle without a helmet. Seizures began about one year later. Dilantin and Epital were prescribed; he reported the seizures were well controlled. MK was struck by a vehicle a second time while riding his bicycle on 23 January 2012 resulting in an injury to the right side of his head. Initially, he reported being uncertain if he lost consciousness during the event; he later stated he remained conscious throughout the incident. He returned to work instead of seeking medical attention but reported seeing a primary care physician some time later. Soon after the second accident, MK began experiencing petit mal seizures three to five times per week.

MK was placed on Lamictal in 2012 which decreased seizure frequency dramatically. In 2013, MK complained of sensations that began on the right side of his head and traversed to the left. EEG monitoring confirmed six seizures with left temporal rhythmic sharp activity lasting less than a minute each. An MRI detected significant reduction in the size and mass of the left hippocampus. MK underwent surgery on 23 June 2013 to resolve recurrent left temporal epileptic seizures.

Since that time, MK reported increased difficulties with memory, word acquisition, accessing information that he has learned, and keeping his focus at work meetings. He reports becoming more easily confused in conversations and is prone to distraction. A collateral stated he becomes absorbed in one task while disregarding other important tasks and that he must

constantly be reminded of things. In addition, collaterals noticed an increased irritability in him but denies he is aggressive or violent. Finally, a collateral reported a marked decrease in motivation and excitement for activities he previously found stimulating.

Imaging Results: Scans following the surgical procedure show a lesion to the most anterior 3.5 cm left ventrolateral and medial temporal lobe. Extensive tissue loss and encephalomalacia is evident and extends caudally and medially from the temporal pole and includes superior, middle, and inferior temporal gyrus, fusiform gyrus, perirhinal and entorhinal cortex, parahippocampal gyrus, amygdala, and the anterior portion of the hippocampus. Reports indicate the superior temporal gyrus is partially spared.

Neuropsychological Test Results: Post-surgery, MK demonstrates average intelligence with impairment restricted to verbal episodic memory. Confrontation naming and category fluency tasks confirm mild impairment to semantic memory for superordinate knowledge. No notable impairments were found during performance tests of processing
speed, working memory, or executive functioning.

Design: This single-case study attempted to characterize mating preferences in an adult male following the surgically placed lesion described above.

Procedure: Data collection took place over a three-week period consisting of four sessions. Sessions lasted fewer than two hours to ensure minimal response burden. MK drove himself to each appointment and arrived on time. He was well groomed and dressed casually. On one

occasion, he arrived with a large abrasion to the right side of his face. He explained it arose from an incident during which his dog tried to escape his leash. MK's demeanor was calm, joking, and pleasant. He displayed no visible signs of agitation or discomfort during the questionnaires. During conversation, MK listened with undivided attention. He answered only after careful thought and did not deviate from the subject at hand.

MK exhibited an abstract way of speaking relying heavily on the use of analogies and metaphors. For example, he stated that our conversation was like the "birdie" (shuttlecock) used in the game badminton. He stated it was easy for us to "keep the birdie in the air" unlike conversations with his wife which he often referred to as a "tin can." Other times he mentioned that he "feels free of social games" and can "ride the delta waves." Doing so allows him to step out from behind the "veil" that other people hide behind. This quality of conversation appeared to be his preferred method of communication, allowing him to convey more meaning than could be expressed with less abstract speech.

A trained Research Assistant (RA), a 31 year-old, casually dressed, white male, administered a battery of self-report questionnaires to MK in a quiet setting. The RA read each question to MK. To ensure comprehension of each item the RA asked the following; (1) "Do you have any questions regarding this item?" (2) "Do you have any comments regarding this item?" While answering the questions, MK reasoned his way through items out loud and asked for clarification as needed. He was routinely inquisitive and demonstrated enthusiasm in his responses. He appeared confident and satisfied with his responses on all completed questionnaires, omitting only those questions he felt did not reflect aspects of the "truth" (MVI-Ideal Short-term Partner). He stated that answering MVI- Ideal Short-term Partner would mean,

"Playing like someone else." We believe the present data to be an accurate representation of MK's desire and psychological state.

Measures: We used a comprehensive battery of self-report questionnaires consisting of two groups of measures. The first group captured elements of MK's psychological state and traits (states depression, state anxiety, trait anxiety etc.). The second group captured sexual history, sexual jealousy, mate poaching, mate value, partner preferences, life history, and mating preferences. The measures included the Spielberg State-Trait Anxiety Inventory (STAI), The Beck Depression Inventory (BDI), Jake's Temptations Scale, Life History- Mini K, The Mate Value Inventory (MVI), Sexual Situations Inventory, The Sexual Preferences Scale, Mate Poaching Subscale ARAS Inventory, and Jealousy Events Questionnaire.

The Spielberg State/Trait Anxiety (STAI) is a well-validated self-report inventory that assesses State and Trait anxiety. It consists of 40 questions, 20 pertaining to *State* anxiety, 20 pertaining to *Trait* anxiety. Internal consistency of scores range from .86 to .95 (APA, 2017). The STAI is widely used due to its reliability and strong construct validity.

The Beck Depression Inventory (BDI) is 21-item self-report rating inventory that assesses attitudes, dispositions toward, and symptoms of depression. Internal consistency of the scales ranges from .73 to .92 (APA, 2017). This measure was used to determine presence and current level of depression.

The Sexual Preferences Inventory is a self-report inventory that assesses male and female mate preferences. The measure has been validated as a universal measure of human mate preferences and has been used in over 37 countries (Buss, 1989).

The Mate Poaching Anonymous Romantic Attraction Survey (ARAS) is a 13-item questionnaire that assesses mate-poaching tactics during short-term and long-term partnerships. The scale measures willingness to poach and perception of being poached upon.

The Jealousy Events Questionnaire is a 22-item self-report questionnaire that assesses sex differences in attitudes toward infidelity. It is based on the well-documented fact that men and women react to acts of infidelity differently (Buss, 1999). The questionnaire measures the degree to which men and women respond with jealousy to acts of emotional or physical infidelity.

The Life History Mini-K is a short form of the Arizona Life History Battery (ALHB) used to assess a latent construct, the K-Factor (Figueredo et al., 2006). It is a 20-item scale with an internal consistency and test-retest reliability of about 0.70. When used in the full ALHB this coefficient improves, possibly due to increased number of items in the inventory (Figueredo et al., 2006).

The Mate Value Inventory (MVI) is a comprehensive inventory that assesses desirable traits and characteristics of self and others. The MVI measures these characteristics using multiple forms for self, real friend, ideal friend, real partner, ideal long-term partner, realistic long-term partner, ideal short-term partner, and realistic short-term partner (Kirsner, Figueredo & Jacobs, 2003).

Internal reliability of the measure ranges from .89-.97.

Results:

Three questionnaires were used to capture MK's mate preferences. The BDI-II and STAI were both administered to determine current level of depression and anxiety. The BDI-II score (10) for MK was within normal parameters *(Population: M=26.7, SD=11.73)* indicating the absence of depression at the time of the study. The STAI score (43) for MK was below the normal cutoff (54) for state/trait anxiety (Kvaal, K., Ulstein, I., Nordhus, I. H., & Engedal, K.,2005) indicating a lack of anxious state/trait. MK demonstrated no detectable anxiety or depression at the time of the study.

When comparing MK's Sexual Preferences responses to the US population for "Choosing a Mate" we found numerous mean scores which fell greater than two standard deviations below that of the population mean (Table 1.1). His preference for a partner who is good housekeeper/cook, similar education/background, is refined and neat, who wants home and kids, who is good looking and in good health were two SD below the normative mean. Other values which scored one SD below the mean were a desire for a partner who is sociable, who has good financial prospects, is of a favorable social status or rating, a similar religious background, and who is ambitious & industrious.

Sexual Preferences Scale: Choosing a Mate Table

	US Mean	SD	MK
Choosing a Mate			
Good cook/housekeeper	1.45	0.74	0
Pleasing disposition	2.53	0.6	3
Socioability	2.1	0.67	3
Similar education/backgro	1.67	0.8	0
Refinement/neatness	1.87	0.72	0
Good financial Prospect	1.02	0.84	0
Chastity	0.8	0.91	0
Dependable Character	2.57	0.58	3
Emotional stability/matur	2.59	0.54	3
Desire for home and kids	2.08	0.9	0
Favorable social status or	1.15	0.86	0
Good looks	2.1	0.7	0
Similar Relgious Backgrou	1.12	1.04	0
Ambition & industriousne	1.83	0.74	3
Similar political backgroun	0.81	0.86	0
Mutal attraction/love	2.94	0.28	3
Good Health	2.15	0.68	0
Education & Intellegence	2.26	0.65	2

Table 1.1 MK compared to US mean

Scores for the Mate Value Inventory produced a result of interest (Table 1.2). MK's mean score *M=.16* for realistic short-term partner was two standard deviations below that of the normative population mean. All others forms of the MVI-7 were within normal parameters of the population.

MVI Realistic Short-term Partner

Realistic Short-term Partner	US Mean	SD	**MK**
Ambitious			0
Intelligent			0
Enthusiastic about sex			0
Attractive face			0
Good sense of humor			1
Desires children			0
Financially secure			0
Shares my interests			2
Generous			0
Emotionally stable			0
Healthy			0
Independent			0
Faithful to partners			0
Kind and understanding			0
Loyal			0
Responsible			0
Shares my values			0
Attractive body			0
Sociable			0
Mean/SD	1.6	0.91	0.1578947368

Table 1.2 MVI Realistic short-term partner

Finally, MK performed on the Mini-K with a mean of 1.40 *(SD= 2.58)*, 25% of a SD *above* that of the national norm *(M= .97, SD= 1.72)* on life history speed. The variance in his responses was unusually high because, in general, MK's responses were all at the extreme ends of the scale.

Discussion:

At the time of the study MK presented with no detectable signs of depression or state/trait anxiety. The responses which he provided appeared to be accurate and were not influenced by either of these psychological factors.

Overall, MK's responses on the Mini-K indicate that he adopts a slower life history speed strategy than that of the normal male population. Nevertheless, MK typically responded either at the high or the low end of the Likert scale for each item. The variation within his responses was far greater than that of the male comparison population. It is as if for him there is no middle ground but only polar alternatives.

His responses on the Sexual Preferences scale indicated a lack of interest in indicators of reproductive potential. Reproductive potential indicators such as good looks, desires children and home, good health, good financial prospects, and favorable social status seemed to matter very little to MK and were scored as "unimportant." In contrast, there appeared to be strong interests in compatibility and companionship. MK marked indicators for this aspect of a relationship, aspects such as sociability, pleasing disposition, dependable character, ambition, and emotional stability, as "indispensable". It is as if major social aspects of MK's life have been spared while reproductive interests are non-existent. MK appears to prefer the social, not sexual aspects of a partnership.

While responding to the MVI, MK commented, although he himself is a heterosexual, he

would respond to those item as being able to attract either sex independent of orientation. It is unclear at this time if this is because he sees himself as a compatible friend to either sex or an object of sexual desire. If the latter is true, then it would appear that although he himself has experienced a drastic decline in desire, his appraisal and evaluation of what others may desire has been spared.

MK declined to respond to the ideal short-term portion of the MVI, stating, that he would be "playing a game" by answering the questions asked. He stated that he would only be saying what he *thought* we would want to hear and did not feel the questionnaire applied to him because he had no desire to pursue a short-term relationship. This yet again illustrates a division between MK and the general male population. Although the overwhelming majority of males in the normal population would favor a short-term partnership (Clark and Hatfield, 1989) MK indicates no desire for such a relationship.

MK responded on the Short-term realistic partner in a manner that was significantly different than the male population. He rated the majority of characteristics as unimportant while giving only minimal importance to characteristics for "good sense of humor" and "shares my interests." This may be because MK has no desire to pursue a short-term relationship based in sexual desire. His relationships which he commits to are meaningful friendships and companionships which he puts forth effort to maintain. We see yet again that MK does not have a disdain for human contact but rather a preference for friendship over sexual relationships.

Although the present findings alone do not permit us to make claims of causality, there is evidence supporting the claim that the amygdala plays a role in mediating sexual desire. We find this evidence in the way MK responded to the questionnaires which indicate a lack of desire but not a lack of human contact. His desires for friendships and companionships remain intact and he

simply prefers to focus on the social aspects of those friendships.

The comparison group which MK's results were evaluated against remains a limitation to the study. The norms for the Sexual Preferences measure, Mate Value Inventory, BDI-II, STAI, and Mini-K were derived from college age, male student populations. In addition, the Mini-K and MVI Self form did have a nationally representative sample but drawing firm conclusions about the generalizability of these findings is not possible at this time. This is expected to change as national norms for male mating preferences become better established.

Future research would benefit from using non-human primates to place surgical lesions which similar sexual and social behaviors can then be observed. An animal model permits the use of true experimental designs. The benefits of such a design would bring us closer to understanding how the amygdala supports sexual desire and how social animals react and cope to such a surgically placed lesion.

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