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INTERACTION OF CAFFIENE WITH EXOGENOUS OXYTOCIN ON LIMBIC SEXUAL BEHAVIOURAL ORIENTATION IN WISTAR ALBINO RATS

Olorunfemi Oluwadare Joyce*[1], Solomon Uvoh Micah[1], Kiridi Emily Gabriel[1], Ngaikedi Charles Nnamdi[1], Inwang Uduak Anthony[1] and Bohr Edward Lete[1]

[1]Department of Human Physiology, Faculty of basic Medical Sciences, College of Health Sciences, University of Port Harcourt, Choba, Port Harcourt, Rivers State, Nigeria.

***Author for Correspondence: Dr. Olorunfemi Oluwadare Joyce**
Department of Human Physiology, Faculty of basic Medical Sciences, College of Health Sciences, University of Port Harcourt, Choba, Port Harcourt, Rivers State, Nigeria.,

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ABSTRACT

Aim/background: Study of the Interaction of caffeine with exogenous oxytocin on limbic sexual behavioral orientations in wistar albino rats was carried out. **Method:** 30 male and female albino rats were divided into four study groups. Group 1 was treated with caffeine only, group 2 was treated with oxytocin and caffeine simultaneously, group 3 was treated oxytocin only and while group 4 was used as drug-free control. The 4-week study employed various standard sexual orientation behavioral observations and tests to study the direct influence of drug and drug-drug interaction on sexual activities in these categories; general sexual behaviors, (i.e. mounting frequency & latency, intromission frequency & latency), male sexual orientations towards female, (i.e. sniffing & licking, genital and non-genital grooming, raring & climbing), female sexual orientations towards male (i.e. solicitation, ear wriggling, lordosis, allowing mounting). **Results:** The observations and results revealed significant and marked improved sexual behavior in the group 3, treated with oxytocin and caffeine compared with those treated singly with either oxytocin or caffeine only. **Conclusion:** The synergy could suggest enhanced sexual performance both in the male and female and may prove to be useful in sex-related improvement regimen.

KEYWORDS: caffeine, oxytocin, sexual behavior, wistar rat, sexual orientation.

INTRODUCTION

Mating is a basic but complex phenomenon in which many parts of the nervous system are involved. Copulation itself is made up of a series of reflexes integrated in spinal and lower brain stem centers, but the behavioral components that accompany it, the urge to copulate and the coordinated sequence of events in the male and female that lead to pregnancy are regulated to a large degree by the limbic system and the hypothalamus[1] In humans and other primates all components of sexual behavior can be expressed in gonadally inactive individuals with very low levels of steroid hormones [2- 4] Learning plays a part in the development of mating behavior particularly in primates, but in non-primates mammals, courtship and successful mating can occur with no previous sexual experience. The basic responses are therefore innate and are undoubtedly present in all mammals. However, in humans, the sexual functions have become extensively encephalized and conditioned by social and psychic factors.[1]

Sex steroids of gonadal origin are not essential for human sexual behavior[5, 6, 7] However, social interactions and specific components of sexual experience may be modulated by gonadal steroid. In general, in most mammals, including nonhuman primates and humans, it appears that estrogens[8] and/or androgens[9, 5] facilitate sexual behavior, while chronic exposure to progesterone[10] inhibits sexual activity. The effects of various steroid hormones on the capacity to experience orgasm have not been adequately studied.

Based primarily on animal research and limited clinical and anecdotal findings in humans [11] it is likely that a variety of nonsteroidal hormones and neurotransmitters influence sexual behavior.

MATERIALS AND METHODS

Procurement and Rearing of Experimental Animal

Thirty Healthy wistar strain albino rats, two months old and weighing 160- 200g were procured from Pharmacology department, University of Port Harcourt (Rivers state). The rats were housed in wooden netted cages and maintained under environmentally controlled room provided with a 12:12 hours light and dark cycle approximately at 25^0C. They were fed on pellets (Lab Feeds) and tap water. The rats were allowed to

acclimatize to laboratory environment for 21 days before experimentation. All experimental protocols were subjected to the approval of Institutional Animal Ethics Committee.

Drugs

Exogenous oxytocin was bought from a certified and reputable drug company (Alpha) in the locality, the caffeine product was gotten from Nestle coffee company.

Grouping and Administration of Drugs

The subjects were divided into 4 groups with six rats (three males and females) in each group with different groups and sexes in different compartments.

Administration of drug is as follow: Test group 1

This group was administered with 0.1ml/100g b.w. of oxytocin for both male and female rats throughout the duration of study

Test group 2

This group was administered with 0.4mg/100g b.w. of caffeine + 0.1ml/100g b.w. of oxytocin to the female rats throughout the duration of study. No administration was given to the male rats

Test group 3

This group was administered with 0.4mg/100g b.w. of caffeine to both males and females in this group

Control Group

Received no administration of drugs or extract. This group is used to cross check the test groups for changes.

Mating Behavior Test

The test was carried out by the above grouping and administration. Healthy wistar albino rats (200– 300 g) that were showing brisk sexual activity were selected for the study. Since the animals should not be tested in unfamiliar circumstances hence the animals were brought to the laboratory and exposed to dim light at the stipulated time of testing daily for 6 days before the experiment.

The experiment was conducted at 7:00 and 16:00 hour in the same laboratory and under the light of same intensity. The receptive female animals were introduced into the cages of male animals with 1 female to 1 male ratio. The observation for mating behavior was immediately commenced and continued for first 2 mating series. The test was terminated if the male failed to evince sexual interest. If the female did not show receptivity she was replaced by another artificially warmed female.

The occurrence of events and phases of mating were recorded on audio video-camera (Sony Handycam) as soon as they appeared. Their disappearance was also recorded. Later, the frequencies and sexual behavior phases were determined from camera playback transcriptions: number of mounts before ejaculation or Mounting Frequency (MF), number of intromission before ejaculation or Intromission Frequency (IF), time from the introduction of female into the cage of the male up to the first mount or Mounting Latency (ML), time from the introduction of the female up to the first intromission by the male or Intromission Latency (IL), time from the first intromission of a series up to the ejaculation or Ejaculatory Latency (EL) and time from ejaculation.

Orientation Activity

Healthy albino rats (200– 300 g) that were showing brisk sexual activity were selected for the study. This method similarly involved grouping and administration as stated above. The orientation activity was carried out periodically throughout the duration of treatment and was analyzed in segments with little modification.

Orientation behavior of male rats was determined using the following headings

- Orientation towards female – sniffing and licking
- Orientation towards self – genital and non-genital grooming
- Orientation towards environment – exploration, raring and climbing.

Orientation behavior of female rats was determined using the following

- Solicitation
- Ear wiggling
- Lordosis
- Allowing mount

Effect on Weight: This is to study the effect of caffeine on body weight. All the control and experimental groups of albino rats were evaluated for their body weight throughout the duration of study.

RESULTS
GENERAL SEXUAL BEHAVIOURS

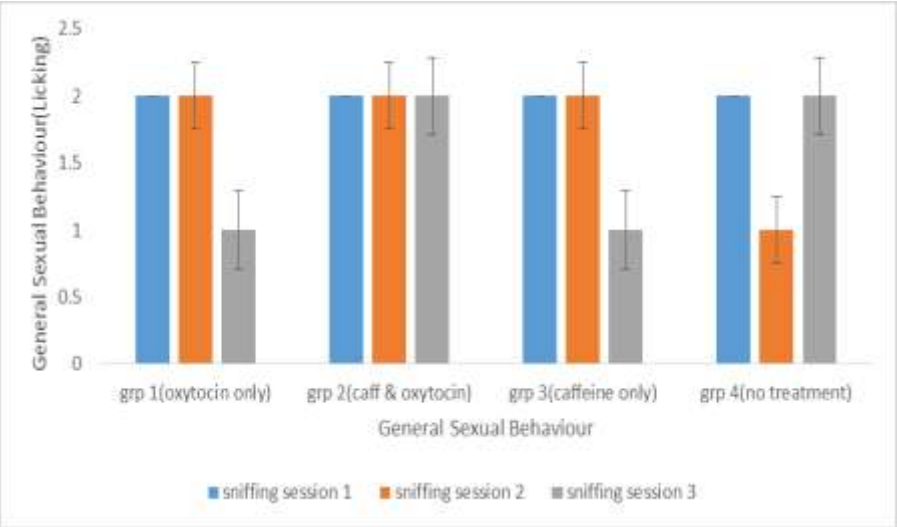

Figure 1. Sniffing behavioral assessment over three separate trial sessions

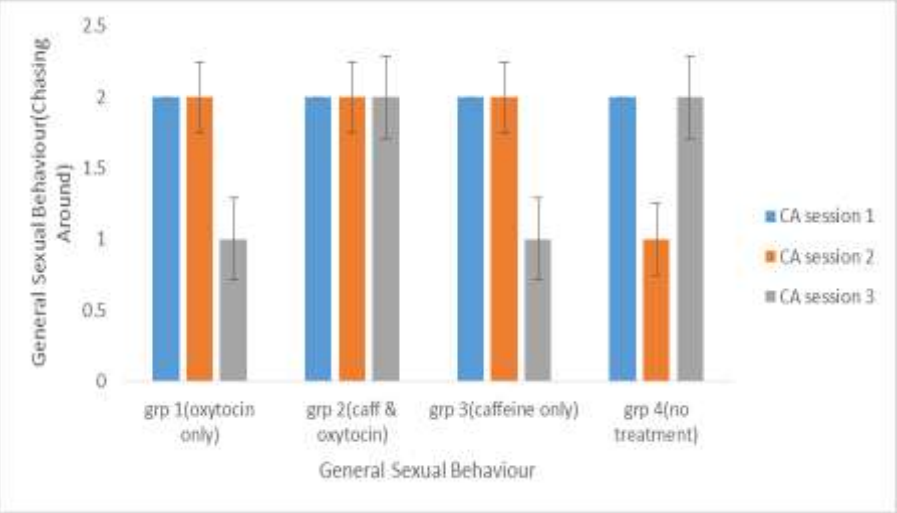

Figure 2. 'Chasing Around' behavioral assessment over three separate trial sessions

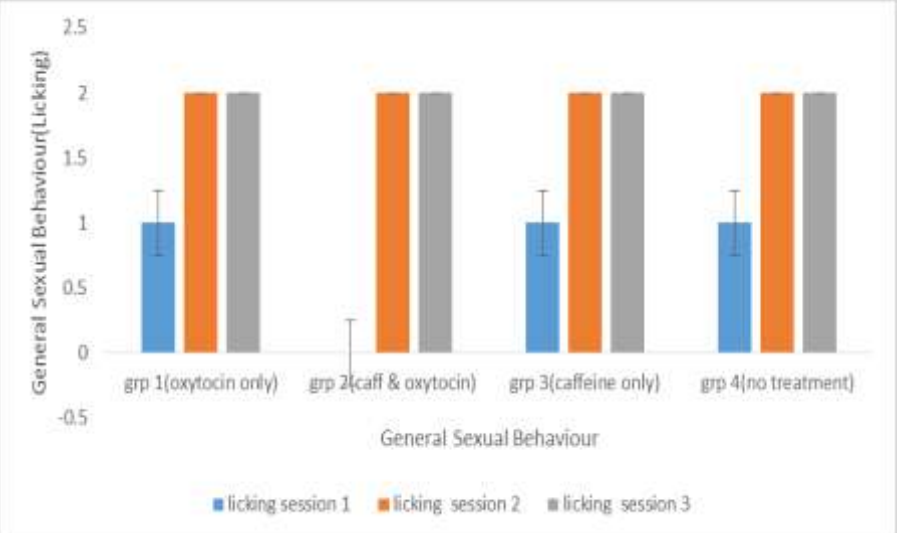

Figure 3. 'Licking' behavioral assessment over three separate trial sessions

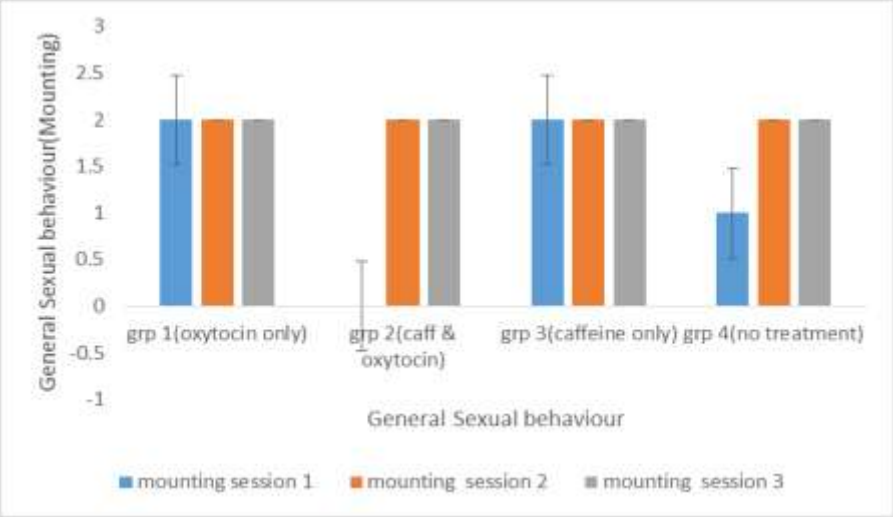

Figure 4. 'Mounting' behavioral assessment over three separate trial sessions

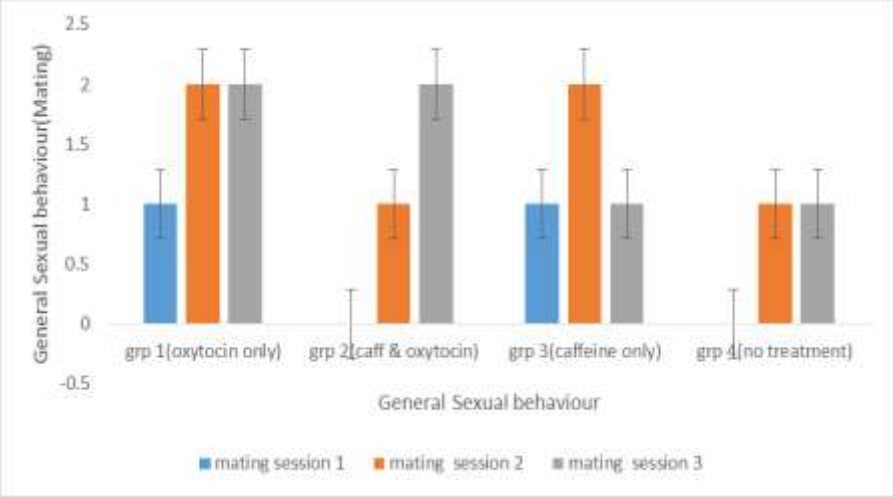

Figure 5. 'Mating' behavioral assessment over three separate trial sessions

2. FEMALE SEXUAL BEHAVIOURS

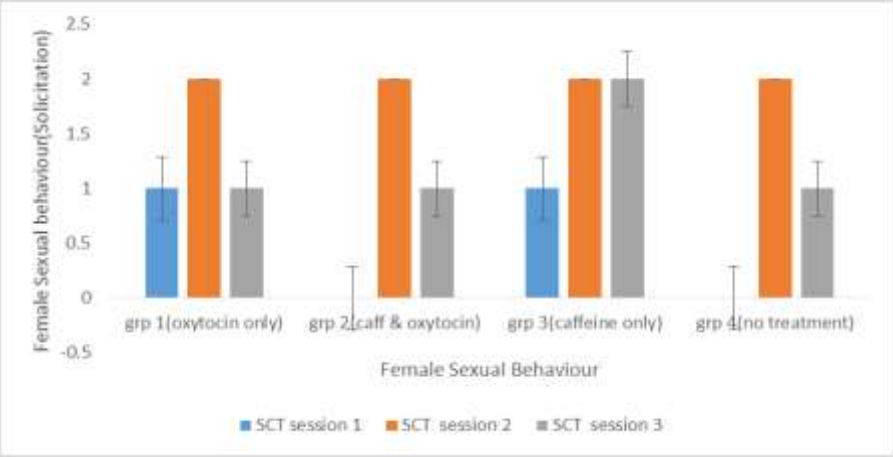

Figure 6. 'Female sexual activity (solicitation) assessment over three separate trial sessions

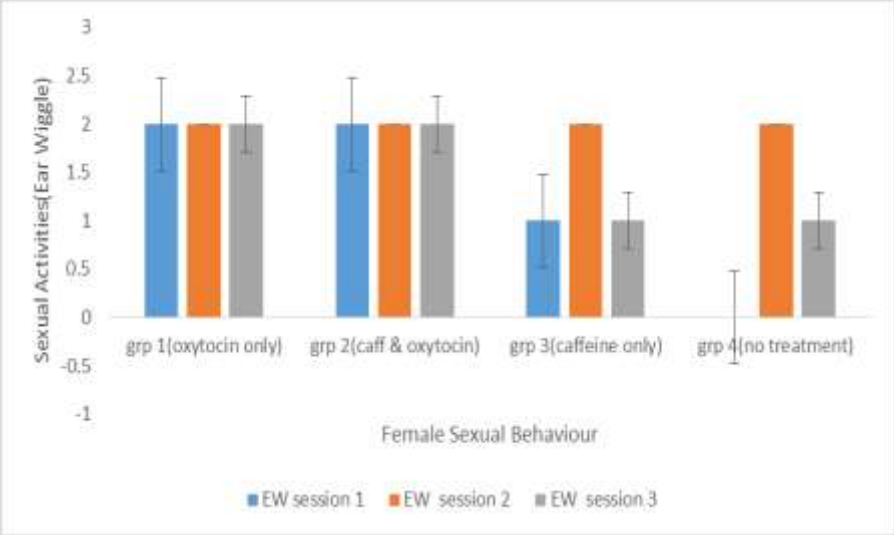

Figure 7. 'Female sexual activity (Ear wiggle) assessment over three separate trial sessions

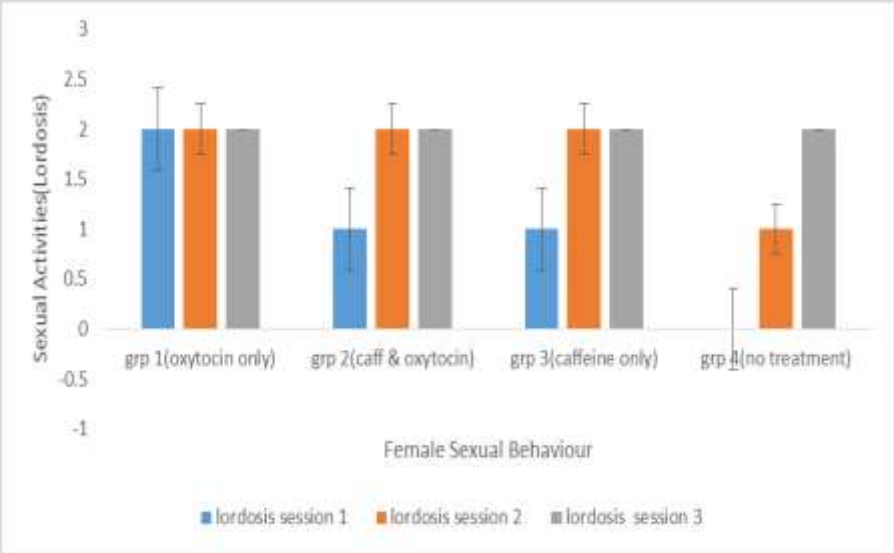

Figure 8. 'Female sexual activity (Lordosis) assessment over three separate trial sessions

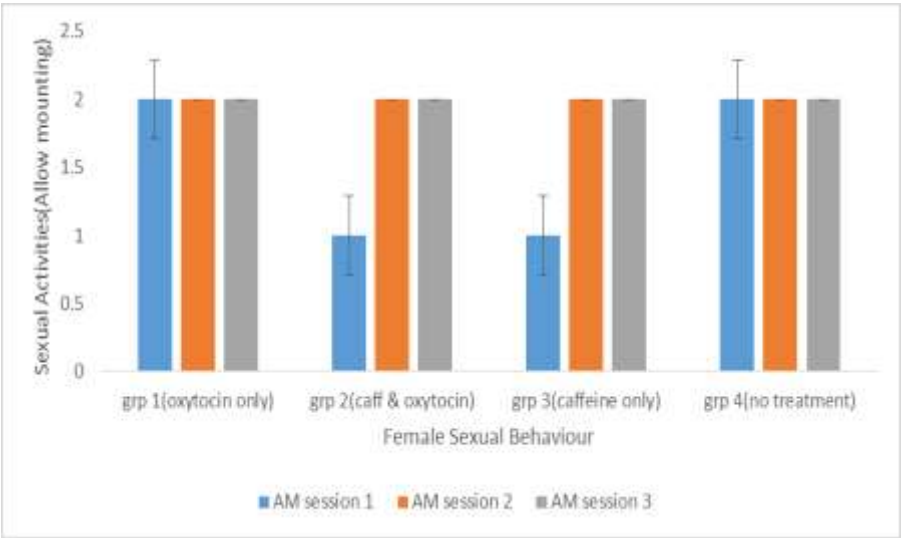

Figure 9. 'Female sexual behavioral (solicitation) assessment over three separate trial sessions

3. MALE SEXUAL BEHAVIOURS

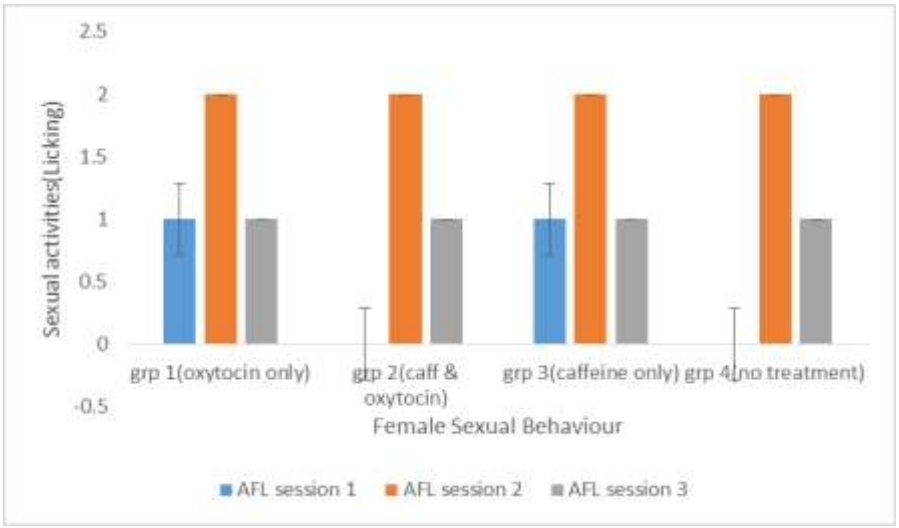

Figure 10. Female Sexual Behaviour (Licking)

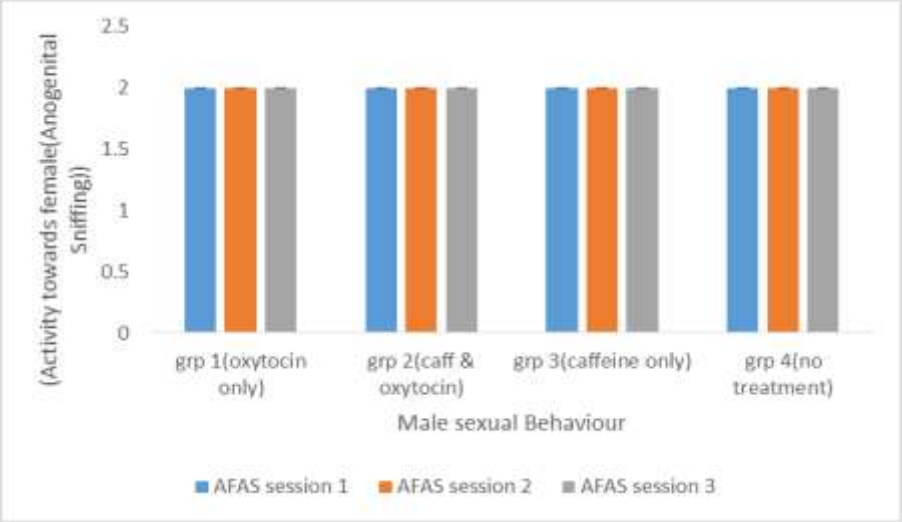

Figure 11. Acitivity towards female (Anogenital Sniffing Bahavior).

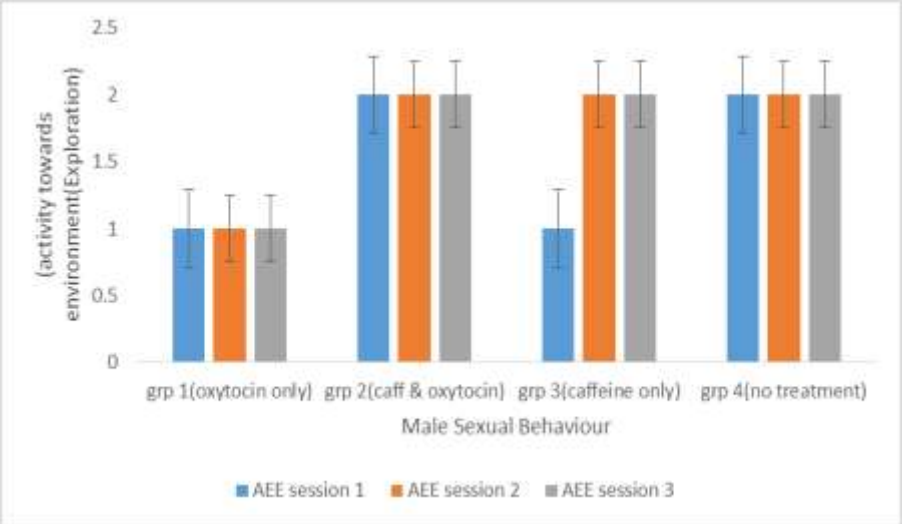

Figure 12. Activity towards environment (Exploration).

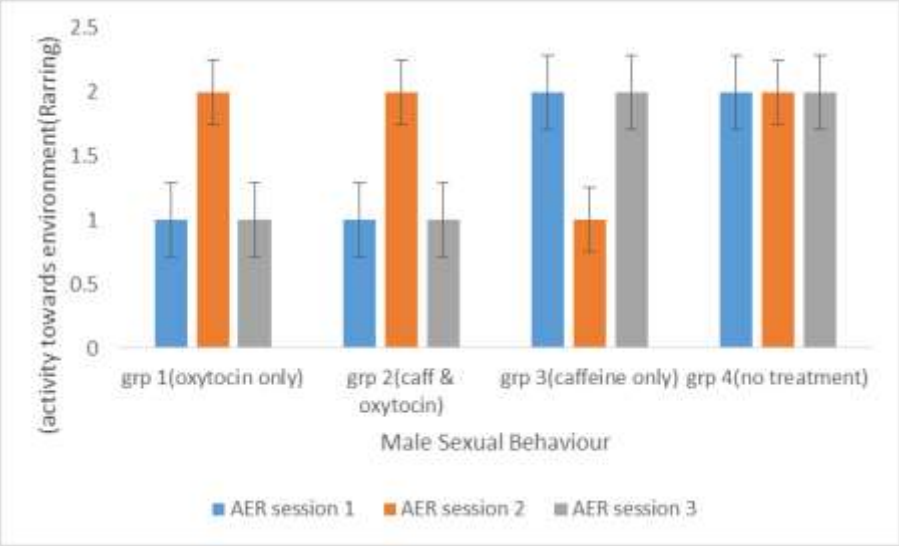

Figure 13. Activity towards environment (Raring Behavior).

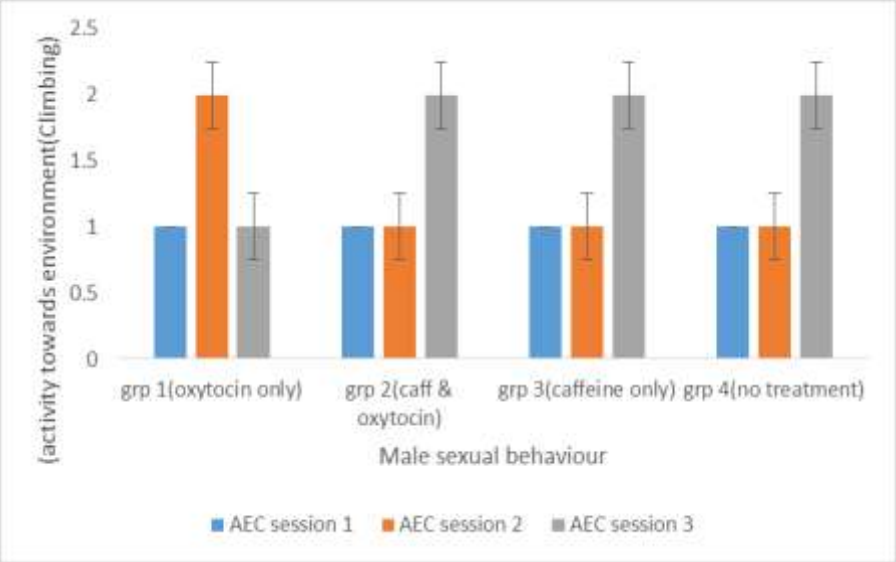

Figure 14. Activity towards environment (Climbing)

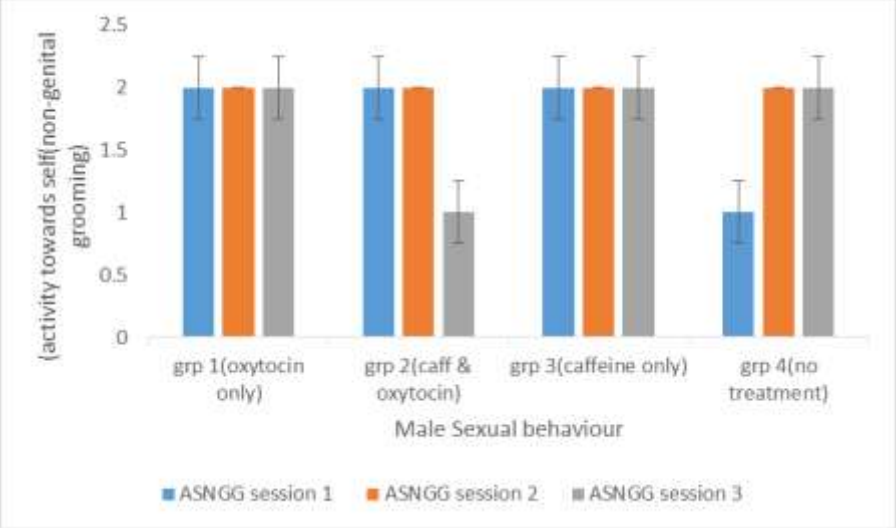

Figure 15. Activity towards self (non-genital grooming).

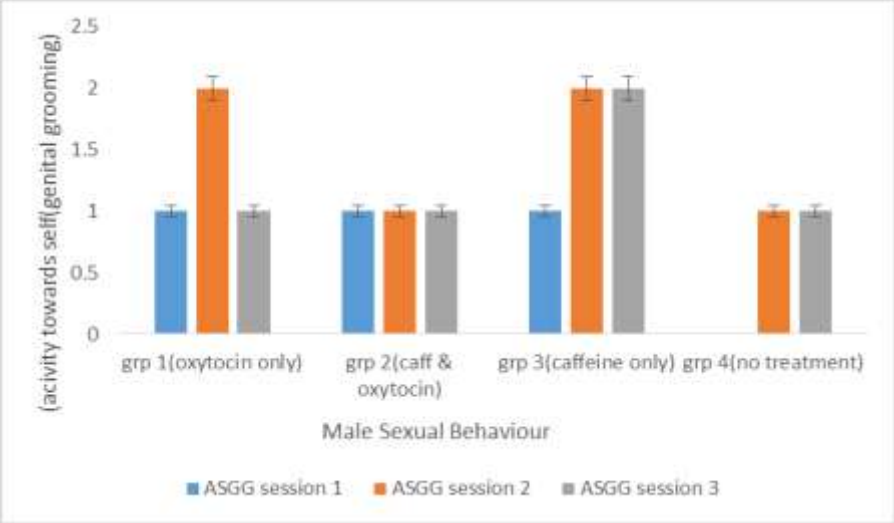

Figure 16. Activity towards self (Genital grooming).

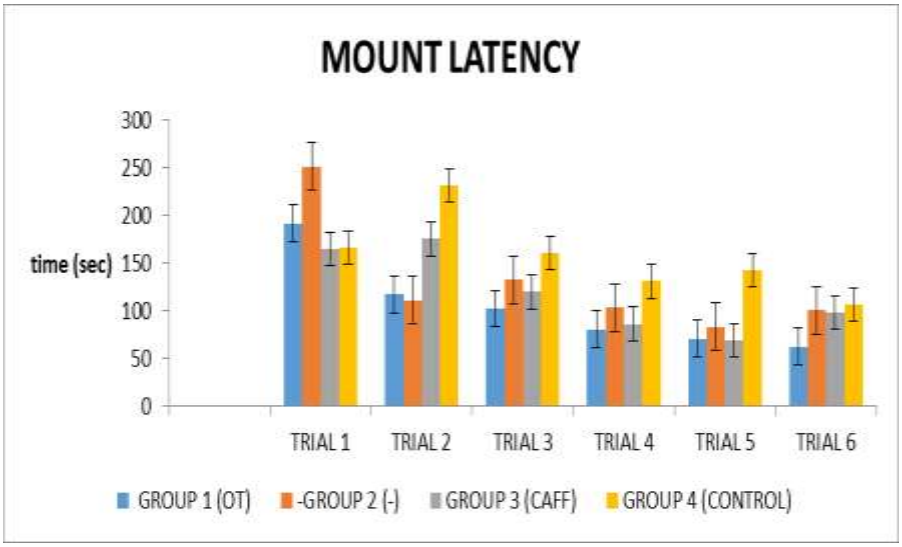

Figure 17. Mount latency: Time duration (in seconds) from the introduction of the female into the cage till the first mount.

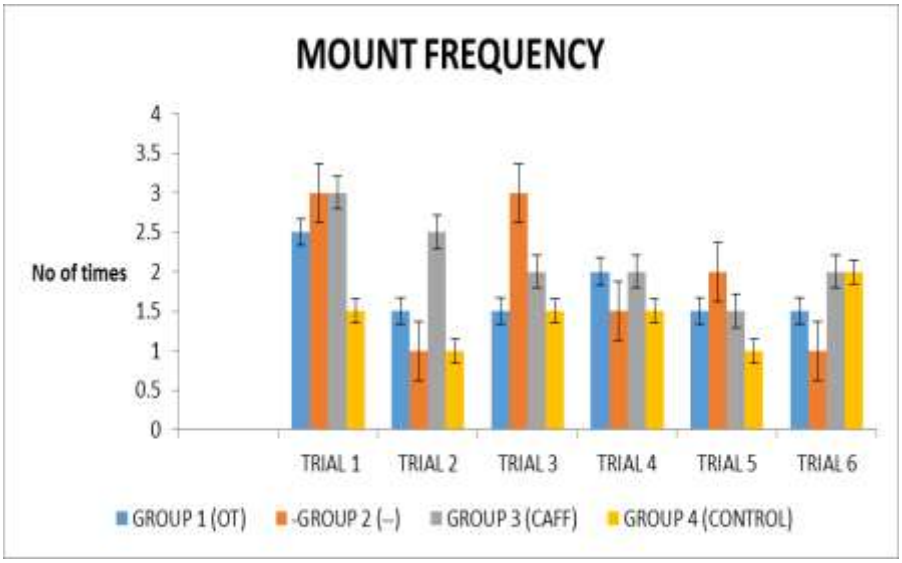

Figure 18. Mount frequency: Total number of mounts preceding ejaculation.

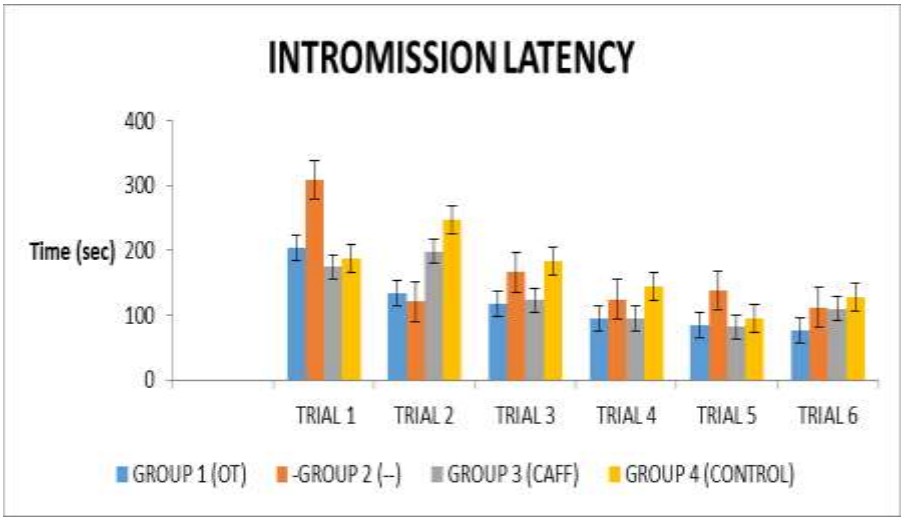

Figure 19. Intromission latency: Time duration (in seconds) from the introduction of the female into the cage till the first intromission (vaginal penetration).

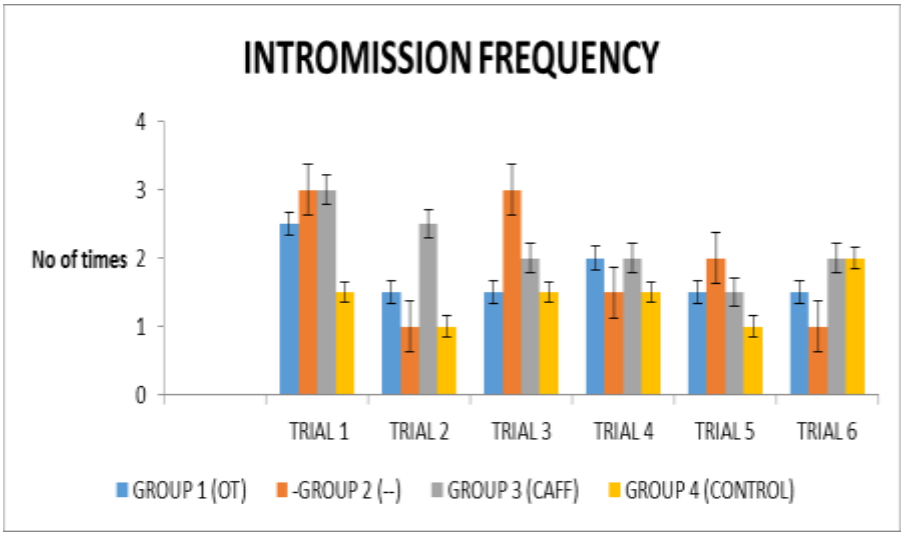

Figure 20. Ejaculation Frequency: Time duration (in seconds) of the number intromission till ejaculation.

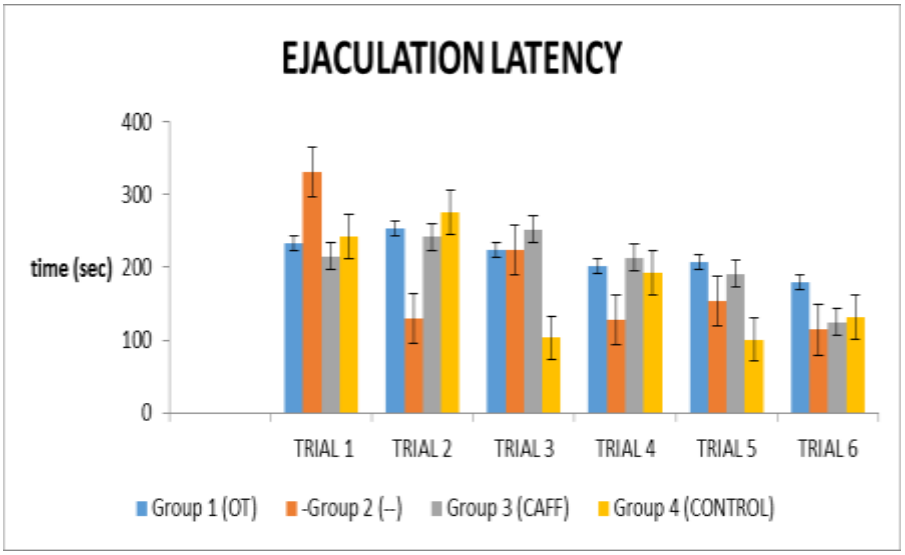

Figure 21. Ejaculation latency: Time duration (in seconds) from the first intromission till ejaculation

DISCUSSION

In the last decade there has been an explosion of new knowledge in the neurosciences on social behavior. However, little is known regarding the neurobiological sexual behavior in humans. This research, is to contribute to the previous works done using oxytocin and caffeine as stimulants to evaluate their effect on various parameters and also the orientation in sexual behaviors in male and female using albino rats In the present study, clinical toxicity symptoms such as respiratory distress, salivation, drastically weight loss and change in appearance of hair as well as maternal mortality were not observed at any period of the experiment. Hence it can be suggested been that short term use of caffeine or oxytocin for this purpose is apparently safe. Similar finding was also observed previously by Carmichael [12] working on mating behaviors in male rats.

In mating behavior in male rats, latency for mount and intromission are considered as indicators of the sexual motivation, whereas intromission and mount frequencies with ejaculation latency are considered as behavioral indication of sexual performance and facilitation [13]From the table and chart after treatment with the doses of oxytocin and caffeine there was a significant decrease in the latency for mount and intromission latencies indicating enhancing of sexual motivation, which was predominant towards the last days of the trial of observation.

Similarly an increase in the number of mount and intromission with an increase in the ejaculation latency indicated an increase in the sexual performance. The caffeine have a pronounced effect on sexual behavior shown by significant increase in Mounting frequency (MF) and Intromission frequency (IF) as compared to control with little change in oxytocin.

In ejaculation latency, there was a moderate change seen in treated groups compare the control. Averagely it showed that caffeine followed by oxytocin group had a more time than, which means it enhances the sexual performances of the wistar rats. In female sexual activities; The solicitation activity shows that test group one (treated with 0.1ml of oxytocin) showed markedly increase in this activity than the rest. The remaining group showed no change between themselves here. Secondly in ear wiggle activity no significant change here among groups. Thirdly lordosis activity the groups also showed no significant change. And lastly allowing mounting; test group three (3) which was treated with 0.4mg/ml of caffeine showed a significant change than the other treated and control groups.

In male orientation behavior, the oxytocin and caffeine at the dose level of 1ml and 0.4mg/ml were given to test group one and three respectively markedly influenced the orientation behavior of the treated animals, which showed more attraction towards female rats.

The studies revealed significant increase in number of licking and in the anogenital smelling of treated male rats towards receptive female comparable to the control group of animals. The behavioral assessment of rats towards environment (exploration, raring and climbing) was significantly decreased in treated animals. The studies on the genital grooming of male rats revealed that there was significant increase in genital grooming in all treated groups, while moderate decrease or no change in non-genital grooming was observed as compared with the control group.

From the result, it is hypothesized that oxytocin and caffeine play roles in improving sexual behavior is due to the fact that oxytocin could play a direct and/or indirect role in the experience of orgasm [14or the fact that Research in prairie voles [12] and rats [15] has shown that intracranial injections of oxytocin produce increases in social contact.

Also caffeine contains psychomotor stimulants affect intrinsically motivated behaviors, such as sexual behavior. It is possible that caffeine may be altering neurotransmission in the hypothalamus to affect female sexual behavior. It has been identified A2A receptors in the hypothalamus, although they are not as densely localized as in the striatum (dorsal or ventral) [16, 17] increase the latency of a female rat to return to a male rat following an ejaculation [18, 19]

CONCLUSION

This activity study lends support to the claim for usage of oxytocin and caffeine as a sexual function enhancing medicine. Thus, this study may prove to be an effective and safe alternative remedy in sexual disorders.

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