

Biological Causes of Female Sex Drive.

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ABSTRACT

We sought to understand the biological causes of female sex drive so that we could learn about varying levels of sexual appetite, in genetically female individuals, in order to make educated choices involving sexuality and intimate partner relationships. Previous research has found that biological causes of sex drive in women include ovulation, nitric oxide levels, and red wine. In our correlational study, we tested the strength of these relationships by examining naturalistic daily changes in their variables longitudinally over a period of fourteen days. We measured ovulation by tracking the menstrual cycle, nitric oxide levels by using salivary nitric oxide test strips, red wine by tracking daily red wine consumption, and sex drive by completing a daily Female Sexual Function Index questionnaire. Data pooled across participants in our correlational study showed that red wine intake showed no correlation to increased sex drive, days further from ovulation showed slight increase in sex drive, and that lower nitric oxide levels correlated with higher sex drive. These results can help inform future research on biological causes of the female sex drive for diverse groups.

1. Introduction

1.1 Research Problem

We sought to understand the biological causes of female sex drive in order to learn about diverse and varying levels of sexual interest in genetically female individuals. This information could potentially help women make educated choices involving sexuality and intimate partner relationships. It is beneficial to understand female sex drive in order to empower women and to encourage the development of self-esteem in young women seeking to understand their sexuality. Once we understand some of the biological causes behind female sex drive, this information could potentially be used to

manipulate one’s own desire levels in order to accommodate a specific outcome.

1.2 Literature Review

Ovulation was found to be a biological cause of sex drive in a study by Pillsworth et al. (2004). Participants of this study were female university students, both partnered and non-partnered and who were not on any kind of hormonal birth control. Researchers used menstruation tracking to measure ovulation and its associated symptoms. Researchers used questionnaires to measure the sex drive of ovulating women not on hormonal birth control. The questionnaire was in two parts. The first part consisted of 9 questions centered around the participant’s

self-perception of sexiness and how physically attractive they felt each day. The second part of the questionnaire asked women in committed relationships how often they flirted with, or felt desire for, someone other than their partner. It was found that partnered women were more likely to have a higher sex drive during ovulation. However, overall sexual desire was not correlated with relationship status.

Circulatory nitric oxide levels in the body were found to be a biological cause of sex drive in a study by Meston et al. (2008). Participants from this study were 99 women aged 18-65 experiencing sexual arousal disorder. The study was divided into short- and long-term effects. The short-term trial measured the participants' responses 90 minutes after a dose of ginkgo biloba to stimulate nitric oxide levels, and for the long-term trial they were either given ginkgo biloba extract alone, a placebo, sex therapy, or ginkgo biloba extract combined with sex therapy for an 8-week trial. This study used vaginal photoplethysmography to measure vaginal pulse amplitude (VPA) in response to an erotic film. A 0-7 scale was used for subjective ratings of sexual arousal. The short-term trial showed significantly higher VPA responses in women who took the dose of ginkgo, although they reported to not experience higher arousal. Results showed that long-term increased nitric oxide levels combined with sex therapy was successful in increasing sex drive, but that long-term increased nitric oxide alone showed no results.

Red wine was found to be a biological cause of female sex drive in a study by Mondaini et al. (2009). The participants were 798 women aged 18-50. The women were divided into categories of 1) moderate daily red wine consumption (1-2 glasses/day), 2) no red wine consumption, and 3) more than 2 glasses of red wine per

day. The women were asked to complete the Female Sexual Function Index questionnaire, which is a series of questions such as, "how satisfied were you with your ability to reach orgasm (climax) during sexual activity" and "how satisfied have you been with your overall sexual life?". The Female Sexual Function Index questionnaire was used to measure female sexual function across 6 categories: arousal, desire, satisfaction, lubrication, orgasm, and pain. Group 1) had significantly higher scores in the category of desire, which asks the participants how often and how severely they felt sexual desire, on a scale of 1-5.

1.3 Hypotheses

Based on the above literature review, we predicted the following hypotheses:

Hypothesis #1: If days to/from ovulation increase then sex drive will decrease.

Hypothesis #2: If nitric oxide levels increase then sex drive will increase.

Hypothesis #3: If red wine intake increases then sex drive will increase.

2. Methods

2.1 Participants

The two authors of this paper served as the participants in its studies. The participants ranged in age from 23 to 45, with an average age of 32.5. The participants in this group are one cisgender, heterosexual, able-bodied female and one cisgender, queer, able-bodied female. The participants were all undergraduate students at Camosun College who completed the current studies as an assignment for Psyc 215 (Biological Psychology) and were grouped together due to their mutual interest in the biological causes of female sex drive. The participants vary from never having had

a strong sex drive to having always had a strong sex drive.

2.2 Materials and Procedures

We first performed a correlational study to test concurrently all of our hypotheses by examining naturalistic daily changes in their variables longitudinally. Over a period of four weeks, each participant recorded self-observations of the following 4 variables:

(1) ovulation, (2) red wine, (3) nitric oxide and (4) female sex drive.

Ovulation: By maintaining daily tracking of the menstrual cycle, with Day 1 being the first day that bleeding starts, we were able to keep track of when ovulation occurs, which is mid-way through the cycle. For an average 28 day cycle, ovulation occurs on Day 14 (see Appendix A). This variable was quantified by measuring the number of days to/from ovulation.

Nitric Oxide: Circulatory nitric oxide levels were measured using Nitric Oxide Indicator Strips from TONNYLAB (see Appendix B). Nitric oxide measurements were taken at the end of each day. A photo of the strip was taken each time under the exact same lighting conditions, and analysis of the resulting color change was quantified using the eye-dropper tool in the Paint program in Windows. The resulting luminance, or Lum number, was used to detect varying color changes on the indicator strip. Full luminance is 255 (white) and is indicative of no nitric oxide, while a 0 Lum setting results in black and is indicative of high levels of nitric oxide.

Red wine: Red wine intake was measured daily by recording the milliliters of red wine consumed, if any.

Female sex drive: Sexual interest/activity was recorded each day by completing a modified Female Sexual Function Index (FSFI; see Appendix C). The sections on lubrication and pain were omitted, and the

questions reference a 24 hr period, rather than a 4-week period as seen in the original. The Female Sexual Function Index is a questionnaire that measures sexual functioning using a numerical scale across six categories: desire, arousal, lubrication, orgasm, satisfaction, and pain. With the omitted categories, the questionnaire generates a score between 2.0 - 24.0, with 2.0 being low sex drive and 24.0 being high.

2.3 Planned Analyses

To assess the strength and statistical significance of associations between variables predicted by our 3 hypotheses, we performed Pearson product moment correlations of their predictor variables (ovulation, nitric oxide levels, and red wine) with their outcome variable (female sex drive). For testing Hypothesis #1, we correlated the days to/from ovulation with the level of sexual interest. For testing Hypothesis #2, we correlated the level of nitric oxide in the saliva with the level of sexual interest. For testing Hypothesis #3, we correlated the amount of red wine consumed each day with the level of sexual interest. We performed all of the above correlations separately for each participant as well as using data pooled across all of the participants. For the correlations using pooled data, in addition to using the raw data, we also performed correlations after we had first transformed the data from each participant into *z*-scores in order to standardize differences in averages and variability seen between the participants in their data and thus make them more comparable. A correlation coefficient was considered statistically significant if the probability of its random occurrence (*p*) was < .05 (i.e., less than 5% of the time expected by chance alone).

3. Results

This study showed no significance in the relationship between red wine and sex drive (see Table 3), while nitric oxide levels and days away from ovulation both showed significant results (see Tables 1&2). The correlation between days away from ovulation and sex drive showed no significance for Participant #1 ($r = 0.16$, $p = 0.56$), high significance for Participant #2 ($r = 0.82$, $p = 0.00059$), no significance for pooled raw data ($r = 0.03$, $p = 0.89$; see Figure 1), and significance for pooled standardized data ($r = 0.43$, $p = 0.019$; see Figure 2). The correlation between nitric oxide levels and sex drive showed no significance for Participant #1 ($r = 0.28$, $p = 0.28$), high significance for Participant 2 ($r = 0.89$, $p = 0.000015$), significance for pooled raw data ($r = -0.44$, $p = 0.016$; see Figure 3), and significance for pooled standardized data ($r = 0.53$, $p = 0.0026$; see Figure 4). The correlation between red wine intake and sex drive showed no significance for Participant #1 ($r = 0.04$, $p = 0.87$), no significance for Participant #2 ($r = 0.19$, $p = 0.57$), no significance for pooled raw data ($r = -0.06$, $p = 0.74$; see Figure 5), and no significance for pooled standardized data ($r = 0.10$, $p = 0.59$; see Figure 6). Of the three variables, the strongest correlation was between low nitric oxide levels and higher sex drive with an r -value of 0.53 for the pooled standardized data.

4. Discussion

4.1 Summary of Results

Based on previous research, we hypothesized that an increase in red wine, higher circulatory nitric oxide levels, and proximity to ovulation, would result in higher sex drive. Although the correlation

between nitric oxide & sex drive, and ovulation & sex drive was significant, the results showed correlations in the opposite directions from what we originally predicted in our hypotheses. Our correlational study showed no significant relationship between red wine consumption and sex drive.

4.2 Relation of Results to Past Research

In the study by Pillsworth et al. (2004), proximity to ovulation was found to be a biological cause of elevated sex drive in women who were in relationships, but no relation was found between ovulation and sex drive for single women. Pillsworth et al. (2004) hypothesized that women who were in a relationship were more likely to want sex closer to ovulation to enable higher conception probability, with the paired women being hypothetically ready to procreate and the single women being not. Our study showed significance for higher sexual desire on days further from ovulation, which opposes our hypothesis that days closer to ovulation would result higher desire. In our correlational study, Participant #1 was beyond healthy child-bearing years, while Participant #2 was single and not yet ready for procreation, which supports the hypothesis that higher sex drive near ovulation is driven by conception. This might explain why our results were different from those of the mated women, but likely closer to the results of the single women in the Pillsworth et al. (2004) study.

Circulatory nitric oxide is a known vasodilator, which can increase blood flow to genitalia and stimulate arousal (Meston, 2008). In a study by Meston et al. (2008), subjects were given ginkgo biloba, which supplies flavonoids that increase nitric oxide levels, and their results showed that sex drive did increase when ginkgo biloba intake was coupled with sex therapy, but there

were no significant results with long-term ginkgo biloba intake alone. In the short-term trial of the study by Meston et al. (2008), women who took one dose of ginkgo biloba to increase nitric oxide levels showed significantly higher vaginal pulse amplitude responses after 90 minutes, although they reported to not experience higher sexual arousal. This suggests that genital vasodilation does increase with a rise in nitric oxide levels, but may not contribute to the improvement of the overall conscious sexual experience. If this is the case, a questionnaire such as the FSFI would not be sufficient in measuring the changes in sex drive due to fluctuating nitric oxide levels. The results of our two-week study showed a correlation between low nitric oxide levels and higher sex drive for both participants, which opposes out hypothesis that increased nitric oxide levels would result in higher arousal. It is interesting to note, however, that Participant #2 did have both high sex drive and high nitric oxide levels compared to Participant #1 who had consistently low measurements for both. A further study would be to test the nitric oxide levels of a much larger group of women and compare it to their overall sex drive in a between-subjects design. Meston et al. (2008) conducted their short-term and long term trials each with a within-subjects design.

In a study by Mondaini et al. (2009), it was hypothesized that regular moderate red wine intake would increase overall sex drive in women. As with the ginkgo biloba, red wine contains flavonoids that boost nitric oxide levels, which contribute to blood flow to genitalia. That study showed that women who drank 1-2 glasses of red wine daily showed significantly higher scores in sexual desire using the FSFI questionnaire. Our study showed no correlation between red wine consumption and higher sex drive. In our correlational study, our consumption of

red wine was quite variable and likely did not result in a consistent increase in nitric oxide, and therefor sex drive. Also, it is possible that the impairment of brain activity by alcohol could inhibit the cognitive experience of sexual arousal, essentially cancelling out the effects of red wine.

4.3 Implications of Results

The goal of our research was to increase understanding of the biological causes of sex drive for genetically female individuals, in order to enable increased control over sexual encounters. This type of research could help to improve gender equity by giving women tools to manipulate their own desire levels. Women with high sex drives can often find themselves in awkward, or even dangerous situations, while women with low sex drives risk having troubled intimate partner relationships. Having the ability to increase or decrease sexual appetite through diet or home remedies would help mitigate risks involved in sexual encounters and give women sexual confidence, leading to a higher quality of life.

References

- Meston, C. M., Rellini, A. H., & Telch, M. J. (2008). Short- and long-term effects of Ginkgo biloba extract on sexual dysfunction in women. *Archives of Sexual Behavior*, 37(4), 530–547. <https://doi.org/10.1007/s10508-008-9316-2>
- Mondaini, N., Cai, T., Gontero, P., Gavazzi, A., Lombardi, G., Boddie, V., & Bartoletti, R. (2009). Regular moderate intake of red wine is linked to a better women's sexual health. *Journal of Sexual Medicine*, 6(10), 2772-2777. <https://doi.org/10.1111/j.1743-6109.2009.01292.x>

Pillsworth, E. G., Haselton, M. G., & Buss, D. M. (2004). Ovulatory shifts in female sexual desire. *Journal of Sex Research*, 41(1), 55–65.
<https://doi.org/10.1080/00224490409552213>

Table 1: Statistical results for correlations between ovulation and sex drive.

Participant	<i>r</i>	<i>n</i>	<i>p</i>	Significance
Participant #1	0.16	17	0.557768	Not significant
Participant #2	0.82	12	0.000592	Significant
Pooled raw data	0.03	29	0.893183	Not significant
Pooled standardized data	0.43	29	0.019584	Significant

Notes. *r* = correlation coefficient, *n* = number of days sampled, *p* = probability of achieving this result by chance.

Table 2: Statistical results for correlations between nitric oxide levels and sex drive.

Participant	<i>r</i>	<i>n</i>	<i>p</i>	Significance
Participant #1	0.28	17	0.283313	Not significant
Participant #2	0.89	12	1.5E-05	Significant
Pooled raw data	-0.44	29	0.016327	Significant
Pooled standardized data	0.53	29	0.002635	Significant

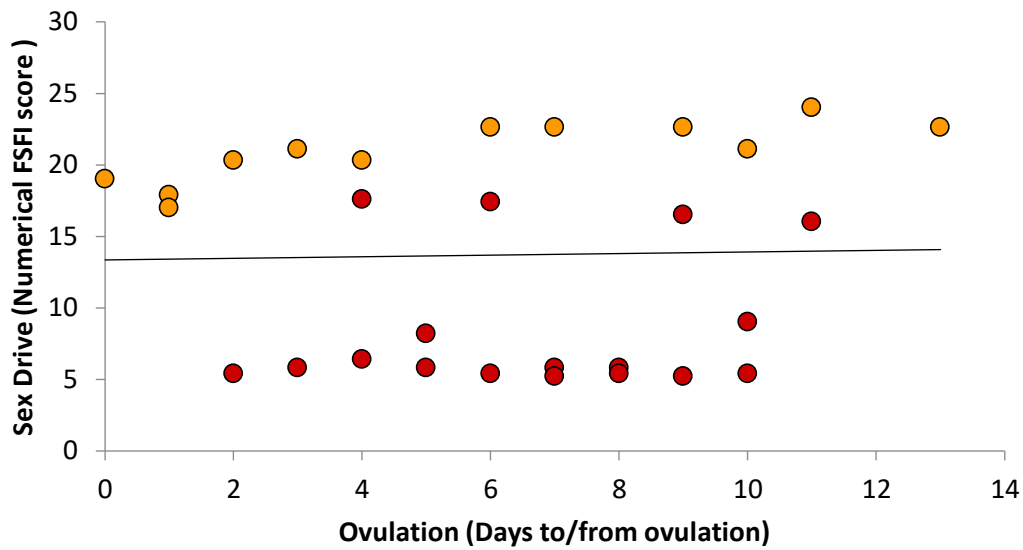
Notes. *r* = correlation coefficient, *n* = number of days sampled, *p* = probability of achieving this result by chance.

Table 3: Statistical results for correlations between red wine consumption and sex drive.

Participant	<i>r</i>	<i>n</i>	<i>p</i>	Significance
Participant #1	0.04	17	0.866303	Not significant
Participant #2	0.19	12	0.566868	Not significant
Pooled raw data	-0.06	29	0.741655	Not significant
Pooled standardized data	0.10	29	0.592276	Not significant

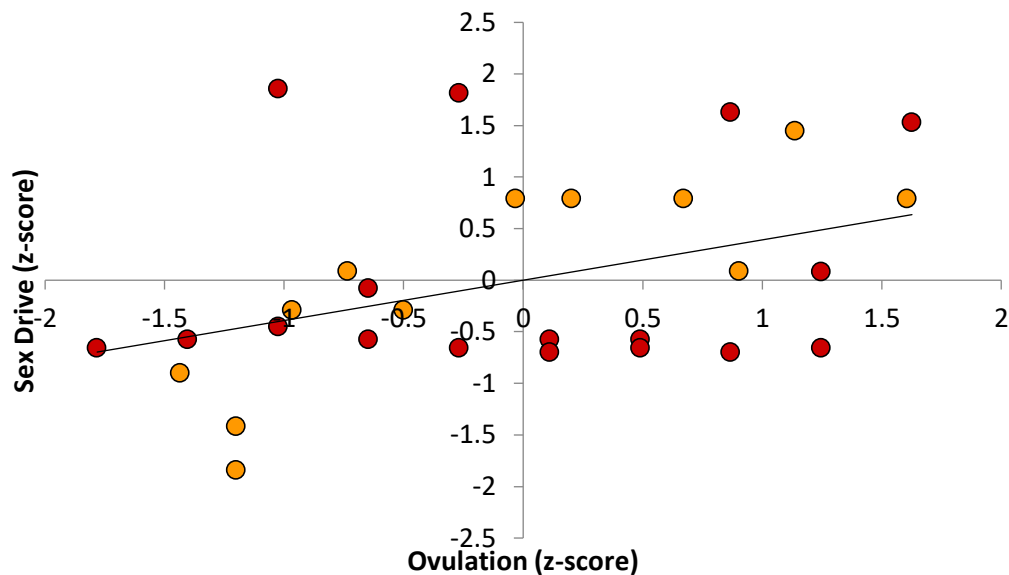
Notes. *r* = correlation coefficient, *n* = number of days sampled, *p* = probability of achieving this result by chance.

Figure 1: Association Between Days to/from Ovulation and Sex Drive Using Pooled Raw Data



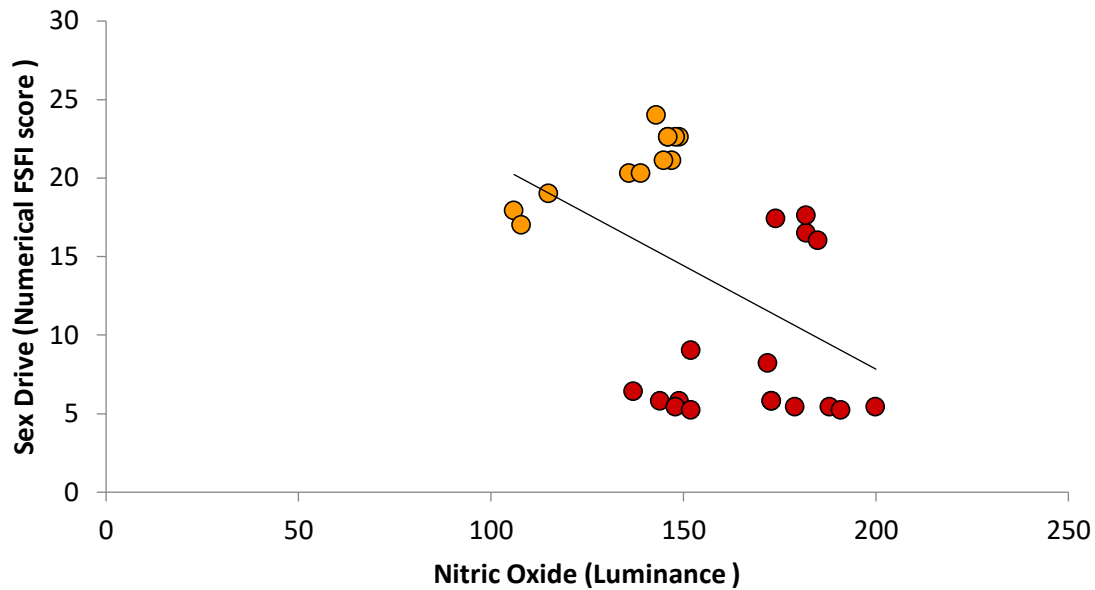
Notes. Marker colour differentiates participants: red = Participant #1 and orange = Participant #2. Some data might not be visible in the figure due to overlapping markers.

Figure 2: Association Between Days to/from Ovulation and Sex Drive Using Standardized Raw Data



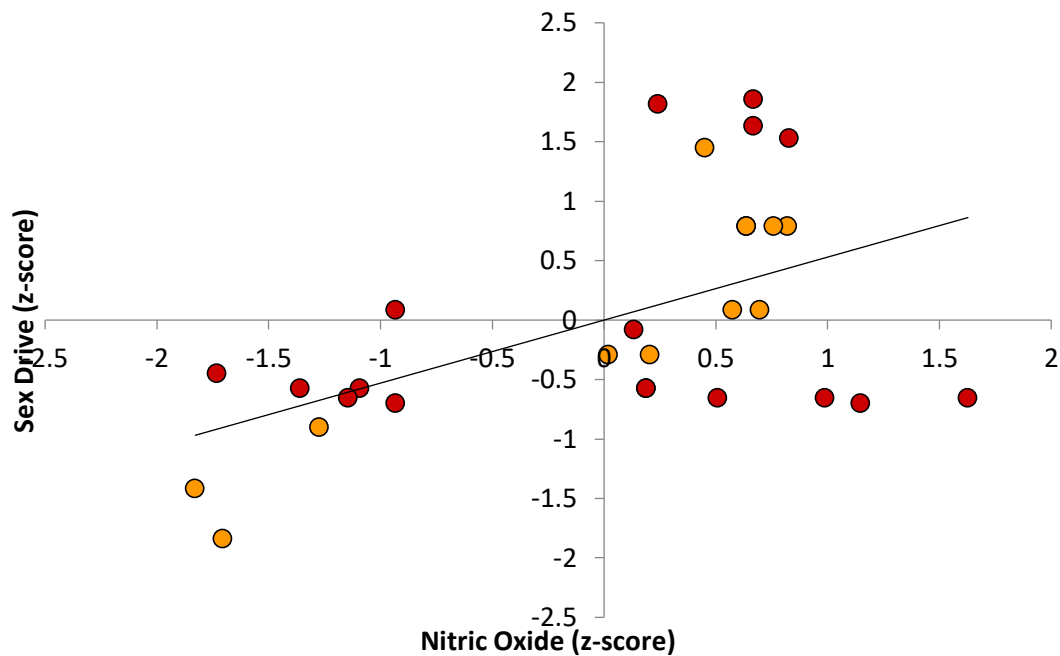
Notes. Marker colour differentiates participants: red = Participant #1 and orange = Participant #2. Some data might not be visible in the figure due to overlapping markers.

Figure 3: Association Between Nitric Oxide Levels and Sex Drive Using Pooled Raw Data



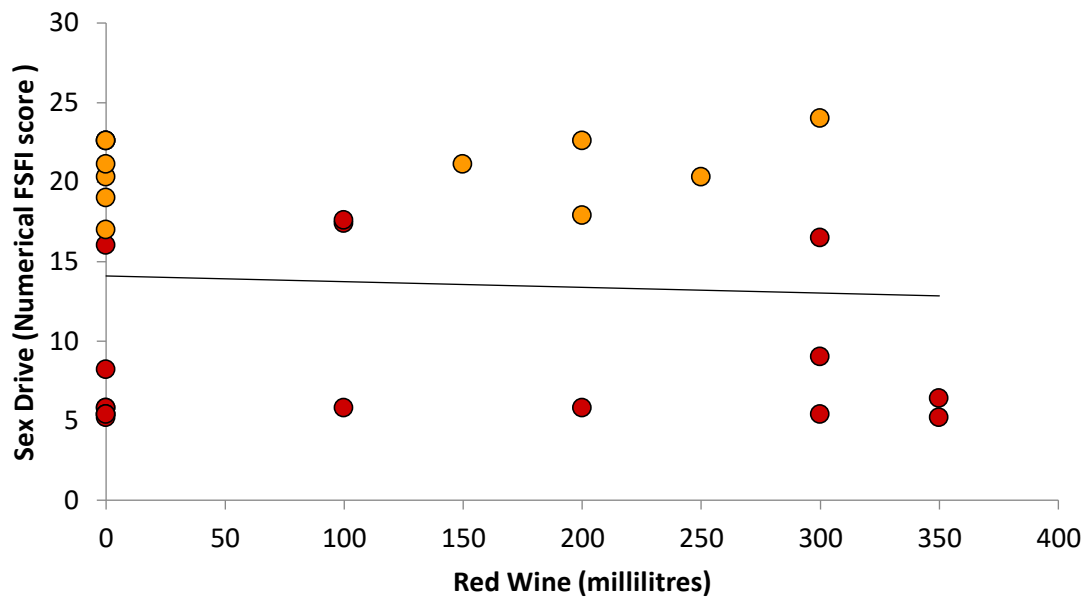
Notes. Marker colour differentiates participants: red = Participant #1 and orange = Participant #2. Some data might not be visible in the figure due to overlapping markers.

Figure 4: Association Between Nitric Oxide levels and Sex Drive Using Standardized Raw Data



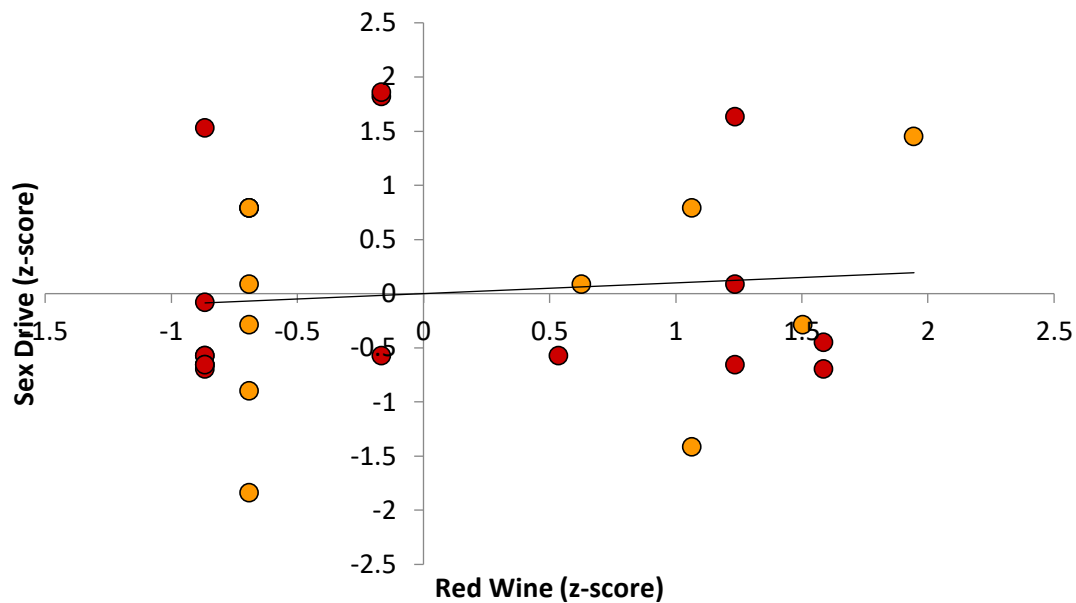
Notes. Marker colour differentiates participants: red = Participant #1 and orange = Participant #2. Some data might not be visible in the figure due to overlapping markers.

Figure 5: Association Between Red Wine Consumption and Sex Drive Using Pooled Raw Data



Notes. Marker colour differentiates participants: red = Participant #1 and orange = Participant #2. Some data might not be visible in the figure due to overlapping markers.

Figure 6: Association Between Red Wine Consumption and Sex Drive Using Standardized Raw Data



Notes. Marker colour differentiates participants: red = Participant #1 and orange = Participant #2. Some data might not be visible in the figure due to overlapping markers.

Appendix A - Hormonal fluctuation during the menstrual cycle

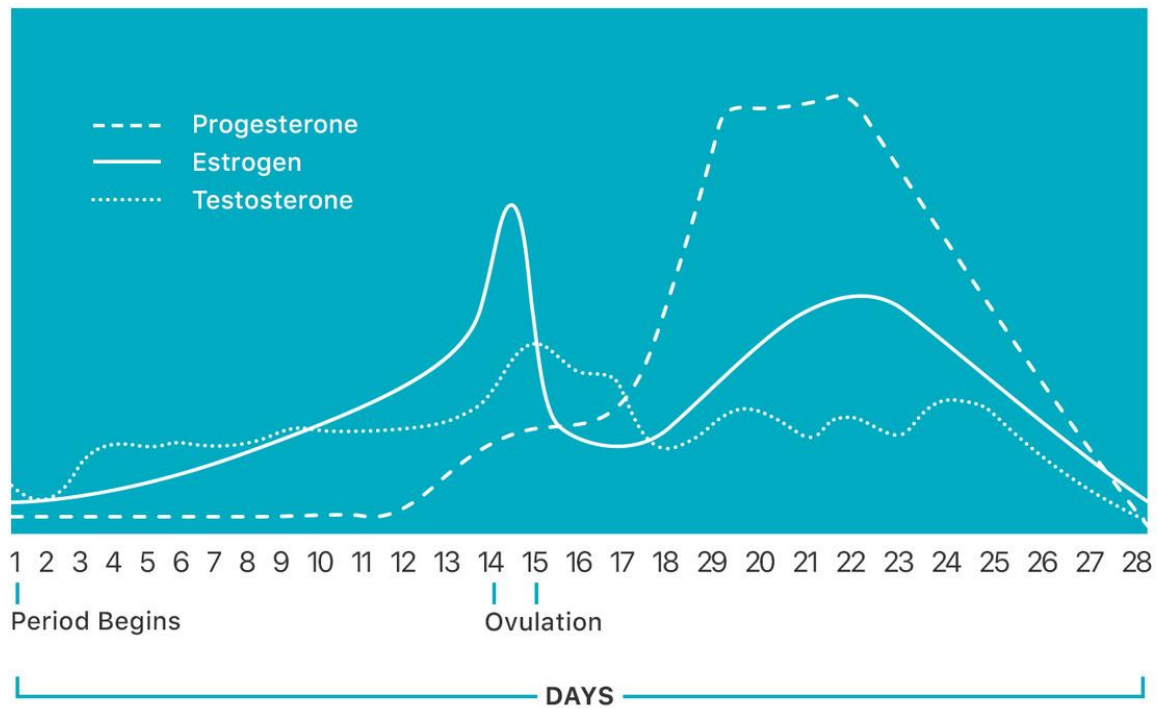


Image taken from <https://clube.zeros.eco/male-vs-female-hormone-cycle-h-40529653>

Appendix B - Nitric Oxide Indicator Strips used to measure nitric oxide levels



Appendix C - Modified Female Sexual Function Index with scoring table

Female Sexual Function Index Scoring

Category	Questions	Factor	Min. Score	Max. Score	Score
Desire	1,2,	0.6	1.2	6.0	
Arousal	3,4,5,6,	0.3	0	6.0	
Orgasm	11,12,13	0.4	0	6.0	
Satisfaction	14,15,16	0.4	0.8	6.0	
Total			2.0	24.0	

The individual domain scores and overall score of the FSFI can be derived from the computational formula outlined in the table above. For individual category scores, add the scores of the individual items that comprise the category and multiply the sum by the factor. Add the four scores to obtain the overall score. It should be noted that within the individual categories, a score of zero indicates that the subject reported having no sexual activity during the past 24 hrs.

FSFI Questions:

1 Over the past 24 hrs., how often did you feel sexual desire or interest?

5 = Almost always or always 4 = Most times (more than half the time) 3 = Sometimes (about half the time) 2 = A few times (less than half the time) 1 = Almost never or never

2 Over the past 24 hrs, how would you rate your level (degree) of sexual desire or interest?

5 = Very high 4 = High 3 = Moderate 2 = Low 1 = Very low or none at all

3 Over the past 24 hrs, how often did you feel sexually aroused ("turned on") during sexual activity or intercourse?

0 = No sexual activity 5 = Almost always or always 4 = Most times (more than half the time) 3 = Sometimes (about half the time) 2 = A few times (less than half the time) 1 = Almost never or never

- 4 Over the past 24 hrs, how would you rate your level of sexual arousal ("turn on") during sexual activity or intercourse?

0 = No sexual activity 5 = Very high 4 = High 3 = Moderate 2 = Low 1 = Very low or none at all

- 5 Over the past 24 hrs, how confident were you about becoming sexually aroused during sexual activity or intercourse?

0 = No sexual activity 5 = Very high confidence 4 = High confidence 3 = Moderate confidence 2 = Low confidence 1 = Very low or no confidence

- 6 Over the past 24 hrs, how often have you been satisfied with your arousal (excitement) during sexual activity or intercourse?

0 = No sexual activity 5 = Almost always or always 4 = Most times (more than half the time) 3 = Sometimes (about half the time) 2 = A few times (less than half the time) 1 = Almost never or never

- 11 Over the past 24 hrs, when you had sexual stimulation or intercourse, how often did you reach orgasm (climax)?

0 = No sexual activity 5 = Almost always or always 4 = Most times (more than half the time) 3 = Sometimes (about half the time) 2 = A few times (less than half the time) 1 = Almost never or never

- 12 Over the past 24 hrs, when you had sexual stimulation or intercourse, how difficult was it for you to reach orgasm (climax)?

0 = No sexual activity 1 = Extremely difficult or impossible 2 = Very difficult 3 = Difficult 4 = Slightly difficult 5 = Not difficult

- 13 Over the past 24 hrs, how satisfied were you with your ability to reach orgasm (climax) during sexual activity or intercourse?

0 = No sexual activity 5 = Very satisfied 4 = Moderately satisfied 3 = About equally satisfied and dissatisfied 2 = Moderately dissatisfied 1 = Very dissatisfied

- 14 Over the past 24 hrs, how satisfied have you been with the amount of emotional closeness during sexual activity between you and your partner?

0 = No sexual activity 5 = Very satisfied 4 = Moderately satisfied 3 = About equally satisfied and dissatisfied 2 = Moderately dissatisfied 1 = Very dissatisfied

- 15 Over the past 24 hrs, how satisfied have you been with your sexual relationship with your partner?

5 = Very satisfied 4 = Moderately satisfied 3 = About equally satisfied and dissatisfied 2 = Moderately dissatisfied 1 = Very dissatisfied

16 Over the past 24 hrs, how satisfied have you been with your overall sexual life?

5 = Very satisfied 4 = Moderately satisfied 3 = About equally satisfied and dissatisfied 2 = Moderately dissatisfied 1 = Very dissatisfied