Relationship between the Menstrual Cycle and Sexual Activity: Maybe Women Do Not Lose Estrus

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Abstract

The menstrual cycle and women sexuality have long been an area of research to understand both evolutionary and hormonal influences. This study examined the relationship between menstrual cycle and libido in women with regular menstrual cycles. Two different studies were conducted for this purpose. In the first study, 489 women were surveyed and asked about the day of their menstrual cycle and their libido and sexual activities on the day of the survey. In the second study, 25 women provided a daily diary throughout their one menstrual cycle, and their daily libido scores, whether they masturbated, and rate of initiating sexual activity with their partner were determined. All data were analyzed before and after ovulation and sub-analyses made for periods close to ovulation. We found in both studies were that sexual libido and its behavioral reflections increased before and immediately after ovulation. However, the findings also reveal the complexity of the menstrual cycle and women sexuality.

Introduction

Sexuality has an important place in human life. It is a multidimensional social, cultural, biological, and psychological event. Sexuality is psychologically related to the basic needs of the individual, such as being loved, being loved, and obtaining pleasure. Moreover, reproduction and continuity of generation are closely related (Beji & Aşçı, 2011). There are various theories on the female reproductive system. One of the primary theories is that the ovulation period in women is considered latent (Buss et al., 2004). A critical view in accepting this theory is that latent ovulation supports monogamy, increases male parental investment, and reduces paternity suspicion (Alexander & Noonan, 1979). However, ovulation may not be so hidden. It might be expected that sexual selection led to the development of a male counteradaptation to detect the female's ovulation period. The attractive perception of women's changing facial symmetries during ovulation may indicate the development of such a counteradaptation (Baudouin and Tiberghien, 2004). In addition, given the focus on cyclical changes in women's sense of smell and visual perception reported in these studies, it has been observed that women in the ovulation period exhibit increased sexual motivation by turning to objects with sexual meaning when compared to women in the other phase of the menstrual cycle (Tarín & Gómez-Piquer, 2002).

In contrast to the ovulation hypothesis, recent research has shown that women do not lose estrus. Although women constantly have sexual libidos, their sexual desires are not always accepted in the same way during the cycle (Tarin and Gomez-Piquer, 2002). Many studies have shown that women have increased libido in the middle of their menstrual cycle or before ovulation (Adams et al., 1978; Matteo and Rissman, 1984; Stanislaw and Rice, 1988; Udry and Morris, 1968). Other studies have shown that sexual desire peaks before or after menstruation, while others have shown that the menstrual cycle is not a sexually peaked phase (Bancroft, 1987; 1993).

Research on this topic could not come together at a common point due to the lack of methods available for identifying the menstrual cycle phase, as well as differences in methodology, including the aspects of measured sexuality and the social and reproductive characteristics of the women studied. The

evolutionary advantage of coordinating sexual activity is increased libido during the ovulation phase of the menstrual cycle with fertility, as indicated by the majority of the available literature.

The reproductive system in women consists of different cyclical changes. It is assumed that each woman completes this cycle in an average of 28 days (Guyton et al., 2001). Studies on the cyclical nature of female fertility have concluded that ovulation is latent (Buss et al., 2004). In other words, it is difficult for spouses, including the woman herself, to detect this situation during ovulation when the woman is most prone to reproduction. Some studies seem to show that contrary views have emerged. It has been observed that female libido individuals exhibit high erotic motivation during the ovulation period (Beck et al., 1991; Adams et al., 1978).

Considering that the biological purpose of life is to reproduce, it is remarkable that women are most susceptible to sexual arousal during conception (i.e., during the ovulation period of the menstrual cycle). This process might be thought of as evolution's method of promoting reproduction. Moreover, even if female libido increases during this period, it is also affected by a wide variety of factors. Many factors, such as the use of birth control pills, stress, psychological disorders, the presence of a sexual partner, the intensity of the emotional relationship with the sexual partner, the use of certain drugs such as antidepressants, and sexual orientation, affect libido (Silber, 1994). In this study, we aimed to observe the course of women's erotic motivations during the menstrual cycle by limiting such points.

MATERIALS AND METHODS

Two separate datasets were used for this research. One is from women who keep diaries, and the other is from women whose random sexual activities are obtained. In the first study, the participants consisted of 489 heterosexual women who were older than 18 years of age, did not experience menopause, had regular menstrual cycles, did not receive any psychiatric treatment, and were not pregnant. The Personal Information Form, Beck Depression Inventory, and Visual Analog Scale were administered to the participants at various times via an online questionnaire. In the second study, 25 women with partners provided a daily diary throughout their menstrual cycle, and their daily libido scores, whether they masturbated, and rate of initiating sexual activity with their partner were determined. The patients’ diaries were kept between the end of one menstrual period and the end of the next. All the data from both studies were compared on the follicular and luteal menstrual cycles. For analyses, survey days in both studies were superimposed on the single menstrual cycle time series for all women. Comparisons were planned by dividing the menstrual cycle into 14-day follicular and luteal phases, as well as four separate 7-day periods, with ovulation in the middle. Thus, the data obtained from all women were superimposed on the menstrual time series in terms of their libido scores, whether they masturbated, whether they initiated sex themselves, and their libido scores.

Personal Information Form

The personal information form is a 14-item questionnaire that includes background variables and demographic information. The demographic information was collected as background variables. Patients

were asked when the participant had had intercourse at last, what stage of the menstrual cycle he was in, who started the relationship, whether she masturbated, how many days the menstrual bleeding lasted, which day it was after the end of the menstrual bleeding on the day he filled out the form, and sexual orientation and age were collected. There are questions about partner status, whether they have children, education status, and regular drug use.

Visual Analog Scale

Each emotion is determined between experiencing it very intensely (e.g., my libido is too high today = 10) and not sharing it at all (e.g., I do not feel sexually enthusiastic at all today = 0). According to reliability studies of the scale, the Cronbach's alpha values determined by the researchers within the scope of their studies are at acceptable levels (Besser et al., 2004; Besser and Priel, 2009).

Beck Depression Inventory (BDI)

The scale was developed by Aaron T. Beck et al. and was adapted into Turkish by Hisli (1989); it consists of 21 items to determine the emotional state of individuals. There are four self-evaluation sentences for each item. In my research, each item is provided with a four-point Likert-type scale, scored as 0 = never, 1 = a little, 2 = usually, or 3 = a lot, according to the severity of depression. Tegin reported that the reliability coefficient of the BDI was α = 0.86, and the validity coefficient was α = 0.75 (Öner, 2006). In BIM, those who showed symptoms of depression were not included in the study. It was used for pre-screening purposes.

Analysis of Data

Levene's F test will be used to analyze the variance between groups. One-way ANOVA will be used to compare more than two groups, and the LSD test for equal variance will be used as a post hoc test. If variance equality cannot be achieved in this test, the LSD test will be chosen. Both the women keeping a diary (n = 25) and the data obtained online (n = 489) were reduced by considering the menturial cycle as 28 days. For all the data obtained, analyses were performed by dividing the menstrual cycle into two and four periods. In the analysis, the menstrual cycle was divided into four periods to determine whether there was a cluster in terms of the increase in libido before and immediately after ovulation. For this purpose, the samples were divided into four different phases, namely, days 1–7, 8–14, 15–21, and 22–28, and the Libidos in these phases were compared via one-way ANOVA. Again, the independent sample test was used when the menstrual cycle was divided into two periods (follicular, 1–14 days; and luteal, 15–28 days). The libido scores of all women who kept a diary were summed per day and divided by the number of 25 women. In this way, the average libido score per menstrual day was obtained. Again, the number of masturbations and the number of initiations of sexual intercourse obtained from the diaries were collected and used on consecutive menstrual cycle days. The chi-square test was used for appropriate categorical variables. If the variances are equal, the dependent sample t test will be used to compare the same parameters of the cases with those of the first and second groups. If the variances are not equal, appropriate nonparametric tests will be selected. The confidence intervals were 95% for all tests. All p

values less than 0.05 were considered to indicate statistical significance. Standard deviations ± were added to the calculated mean values.

Ethics

It is stated at the beginning of the survey form that the participants in the research will not violate their privacy rights in any way. The basic rule of participation in the study was voluntary. The authors were also informed that the information to be obtained would be used within the scope of the master's thesis or scientific publications. This information will not be used for other purposes or shared with third parties.

RESULTS

ANALYSIS OF ONLINE SURVEY RESULTS

The online survey was conducted with 489 heterosexual female participants at any time during their menstrual cycle. The mean age of the participants was 27.96 ± 7.16 years. While the youngest participant in the study was 18 years old, the oldest participant was 52 years old. Two hundred forty-five participants in the group graduated from a university, and 245 had high school diplomas.

There were 403 people who did not have children (82.4%), while 86 people (17.6%) had children. While 86 participants (17.6%) were using a drug, 393 people (80.4%) were not using any medication. Ten people did not answer this question. There were 205 (41.9%) participants who had a partner. A total of 161 (32.9%) participants did not has a partner. The number of married people was 123 (25.2%). The mean menstrual bleeding time was determined to be 5.16 ± 1.97. The shortest (zero) days and the longest (ten) days of bleeding were reported. Among the participants who reported that they were 12.12 days (± 8.4 days) after the end of their menstrual bleeding during the response to the study, this period was reported as a minimum of 0 and a maximum of 30 days.

On the day, they responded to the test, regarding the follicles they were in and the luteal period, the follicular phase (bleeding period + proliferative phase, time until ovulation, 14 days). In addition, for the luteal phase between the 14th day and the 28th day of ovulation, information was obtained from 485 participants and 296 people (60.5%), while in the follicular phase, 189 (38.7%) individuals were in the luteal phase after ovulation.

As shown in Fig. 1, when we analyzed the menstrual cycle in four different seven stages, 176 (36%) of the participants were in the 1st stage (1–7 days), 122 (24.9%) were in the 2nd stage (8–14 days), 103 (21.1%) were in the 3rd stage (15–21 days), and 84 (17.2%) were in the 4th stage (22–28 days).

Considering the masturbation rate, the person who stated that he did not masturbate was 160 (32%), while the number of masturbations was 329 (67.3%). On the day of participation, the average Libido score was 6.21 ± 2,530 (min 0 and max 10) out of 10. Of the 489 people who participated in the study, 214 had participated in sexual activity in the last week (43.8%), while 275 had not (56.2%).

Libido in Menstrual Cycles Stages

During the menstrual cycle, the follicular stage before ovulation and the luteal stage after ovulation were compared in terms of libido.

Hypothesis

The libido phenotype is more prevalent in the preovulation follicular phase than in the postovulation luteal phase.

The mean Libido scores in the follicular and luteal periods were found to be slightly greater in the follicular phase and the preovulation period (6.62 vs 6.53). This difference was statistically significant (F = 4.58 and p = 0.033).

Hypothesis

An increase in libido will be observed on days 8–14, the previous phase closest to ovulation.

The menstrual period days 1–7, 8–14, 15–21, and 22–28 were divided into four stages (bleeding, preovulatory, ovulatory, and luteal stages), and visual analog libido scores were compared via one-way ANOVA and post hoc tests; the only difference was a mean score difference of 1,136 in the first seven days. The process produced between 1–2 phases. As observed in the experiment, a higher visual analog libido score was detected in the first seven days.

Hypothesis

Women who initiate sexual intercourse before ovulation are in the previous closest phase to ovulation.

The libido values were greater (7.18 vs 6.11) for women who started sexual intercourse than for those who started sexual intercourse for their spouse or partner (F = 2.86 and p = 0.001). While 67 (62%) women-initiated sex in the follicular phase and 41 (38%) women in the luteal phase, their male partners initiated 97 (59.9%) follicular and 65 (40.1%) luteal sexual intercourse sessions. Women were slightly more likely to initiate sexual intercourse in the follicular phase than in the luteal phase (62% vs 38%). In total, the number of sexual intercourse sessions was greater in the follicular phase (n = 164 vs. 106 and 60.7 vs 39.3%, respectively) for both sexes. However, a significant difference was not detected between the two groups (χ^2 = 0.127 and p = 0.410). After ovulation, a decrease in the frequency of initiating sexual intercourse is observed in both sexes. The rate of initiating sexual intercourse decreased from 62–38% in women and from 59.9–41.1% in men (Fig. 2).

When examined over four different seven-day menstrual periods, 43 (39.8%) women initiated sexual intercourse in the first seven days immediately after the end of menstrual bleeding, 25 (23.1%) in the second seven days after ovulation, 17 (15.7%) in the third seven days and 17 (15.7%) in the last seven

days. The frequency of initiating sexual intercourse in the first seven days was significantly different ($\chi 2$ = 8.68, df = 3 and p = 0.034).

Hypothesis

There will be an increase in the tendency to thaw before or near the ovulation period.

Considering the masturbation status of 489 individuals, the distribution weights were n = 329 (67.3%) for yes and n = 160 (32.7%) for no. When the participants were compared according to whether they had masturbated or not and according to the 14-day follicular and luteal periods, chi-square tests revealed a greater frequency of masturbation in the follicular phase (289 versus 40). The difference was statistically significant (χ^2 = 12.263; df = 2 and p = 001). The libido score was significantly greater in those who masturbated (F = 8,413 and p = 0.0001). Interestingly, a relationship was detected between menstrual bleeding duration and masturbation frequency. It was determined that women with shorter menstrual bleeding durations masturbated more frequently (F = 2.417 and p = 0.002).

ANALYSIS OF MENSTRUAL CYCLE DIARY

To examine the relationship between sexual libido and the menstrual cycle in a healthy female population, 25 heterosexual women with partner were asked to maintain a daily sexual interest record during from one menstrual cycle to other. Each person was given a fixed chart on a daily basis and recorded their libido scores, whether they masturbated, whether they had sexual intercourse, and whether they initiated sexual intercourse themselves. The average age was 25 women (min 22 and max 36 age) for. None of them had signs of depression on the Beck depression scale.

Hypothesis

The libido phenotype is more prevalent in the preovulation follicular phase than in the postovulation luteal phase.

The 28-day menstrual cycle was compared with the results of repeated measurements 14 days before and 14 days after ovulation, when the mean pre- and postovulation Libido scores were relative to the 14th day of ovulation. The mean libido score of 25 women before ovulation was 4.39 ± 1.32, while the mean libido score was 5.12 ± 0.56 after ovulation. The difference was statistically significant (F = 0.93 and p = 0.04; Cohen's d = 0.99). When menstrual periods were divided into two 14-day periods, the average libido score was generally greater in the second period. Interestingly, considering the correlation between the mean libido score 14 days before ovulation and 14 days after ovulation, the increase in the libido score 14 days before ovulation was important (r = 0.561) and significant (p = 0.004). On the other hand, a weaker (r = 0.388) and partially significant (p = 0.05) correlation was found with the mean libido score 14 days after ovulation.

Hypothesis

An increase in libido will occur at 8–21 days or in the closest phase to ovulation.

The menstrual cycle was divided into four different phases: days 1–7, 8–14, 15–21, and 22–28 days, and the Libidos in these phases were compared via one-way ANOVA. The average Libido scores obtained from the diaries of 25 women in the first seven days were 3.93 ± 1.71 and 4.99 ± 0.25 in the second seven days and 5.04 ± 0.83 in the third seven days and 5.04 ± 0.28 in the last seven days. One-way ANOVA was used to detect differences between groups (F = 2.86, p = 0.05 and eta-squared = 0.264). According to the post hoc LSD analysis, a clear and significant difference was detected between the first seven days and the second seven days of libido (mean difference: -1.06, p = 0.049) and between the first seven days and the third seven days just after ovulation (mean difference: -1.42 and p = 0.013). A significant difference (mean difference: -1.11 and p = 0.034) was also detected between the first seven days and the last seven days of menstruation. In this respect, while the lowest libido was immediately after menstruation, the increase in libido showed a remarkable increase seven days before and seven days after ovulation (Fig. 3).

Hypothesis

Women who initiate sexual intercourse before or closest to ovulation.

The 14 days of the follicular phase before ovulation and the 14 days of the luteal phase after ovulation were calculated by sex resumption in the diaries of the pregnant women. The capacity of 25 women to initiate sexual intercourse for 28 days was assessed daily according to the day of their menstrual cycle. Accordingly, while the percentage of women who did not initiate sexual intercourse in the follicular phase was 5.30 ± 3.47, it was slightly greater in the luteal phase (6.66 ± 2.63). However, a statistically significant difference was not detected between the follicular and luteal phases (F = 2.09 and p = 0.160). The menstrual cycle was divided into four seven-day periods, and the initiation of sexual activity was compared. The average time to initiate sexual activity was 3.57 ± 3.64 in the first seven days, 6.71 ± 2.42 in the second seven days before ovulation, 6.83 ± 2.92 in the seven days after ovulation, and 7.0 ± 2 in the last seven days. It was found to be 39. Although there was an increase in the incidence of ovulation and sexual intercourse after ovulation, no significant difference was detected in the ANOVA between groups (p = 0.103).

Hypothesis

There will be an increase in the tendency to masturbate before or closest to ovulation.

The 14 days of the follicular phase before ovulation and the 14 days of the luteal phase after ovulation were calculated by sex resumption in the diaries of the masturbation. The average masturbation frequency was determined to be 1.46 ± 0.96 in the follicular period and 1.5 ± 1.18 in the luteal period. No significant difference was detected between the two periods (F = 0.576 and p = 0.86). The menstrual cycle was divided into four seven-day periods, and the participants' masturbation frequency was compared. An average of 1.42 ± 1.13 was detected in the first seven days, 1.85 ± 1.21 in the second seven days before

ovulation, 1.14 ± 0.89 in the seven days after ovulation and 1.5 ± 1.13 in the last seven days. No significant difference was detected between the groups (p = 0.679).

Discussion

Previous studies have suggested that hormones affect sexual activity and sexual motivation (Bullivant et al., 2004; Gangestad et al., 2010; Slob et al., 1996; Stanislaw and Rice, 1988). According to the present study, the latent ovulation hypothesis and preovulation (follicular) sexual activity are expected to differ from the menstrual cycle's nonfertile (luteal) phases. A total of 296 (60.5%) of the participants were in the follicular phase, and as expected, a slightly greater libido score (mean score 6.62) was detected in the follicular period before ovulation. Moreover, the frequency of masturbation in women in the follicular phase was significantly greater than that in women in the postovulation luteal phase (χ^2 = 12,263; df = 2 and p = 0.01).

The occurrence of an increase in sexual activity before the ovulation period is not surprising. From an evolutionary point of view, it seems plausible that humans desire and engage in more sexual activity before fertility. While there is a mechanism such as oestrus in animals that are phylogenetically similar to humans, it could not be expected that human sexual behavior would be completely devoid of this condition. Biologically elevated hormone levels may mediate increased female sexual activity before ovulation.

When similar studies were evaluated, in the study of Roney et al. (2013) with 52 women, people were asked to regularly complete a questionnaire every day throughout the cycle. In the questionnaire, “can you rate your sexual motivation, have you masturbated Have you had sexual intercourse? If the answer is yes, who started it?” In addition, the women were asked to provide saliva samples 30 minutes after waking up each morning without eating or drinking water, and these saliva samples were kept in the refrigerator and subsequently taken to the laboratory every week. The results indicate an increased desire toward the middle of the cycle, that is, close to the time of fertility.

The results of the daily survey study conducted by Dawson et al. (2012) were different than those of the present study. In the study, 34 heterosexual women aged 18–30 years who did not use birth control pills and who were not pregnant were included because they did not have a relationship or had a relationship for more than six months (21–35 days). First, individuals were asked to evaluate their sexual and biological histories. The participants were then sent a questionnaire to fill out their sexual fantasies every day for 30 days; these were modified versions of the questions in Ellis and Symons' (1990) Sexual Fantasy Questionnaire. The occurrence of ovulation was determined at 10-day intervals in individuals using the reverse counting method, and the midstream test was used to measure the luteinizing hormone present in the urine during this period. Thus, the ovulation time was determined. A set of stimulating visual imagery consisting of 84 pieces of content was subsequently presented to the participants regularly. After the stimulating images, the women were asked to note their sexual fantasies. The results of this study showed that not all aspects of female fantasies and sexual interests are due to hormonal

changes. Sexual fantasies became more feminine during the fertile period, but sexual interest did not increase at this stage. One reason for such a difference in the results of this study may be that the participants did not have partners. In my research, 75% of the participants had a partner. The presence of a partner may increase the desire to reproduce. The libido score was also greater for women who initiated sexual activity themselves than for those who initiated sexual activity for their partners (7.18 vs 6.11 and $p = 0.001$). When this situation is evaluated in terms of evolution, it is proven that there is a process for reproduction.

According to the study of Slob et al. (1991; 1996), 24 heterosexual, pregnant, and not breastfeeding women aged between 18 and 50 years were selected. While 12 of these women use birth control pills, the other 12 do not. The subjects were asked to come to the laboratory on the 9th and 20th days of the menstrual cycle, and half of both groups participated in the process. In other words, half of the mothers in the group used birth control pills on the 9th day, half of the participants did not use birth control pills, and the rest of the participants used them on the 20th day. Labial thermistor clips were attached to the subjects in the laboratory. This device is used to measure the skin temperature of the labia minora; it determines the physiological location of the female genital response. The participants completed the sexual activity inventory and mood scale before the measurements started.

In our study one, women's libido and sexual-associated behaviors increased in the early follicular phase of the menstrual cycle before ovulation. The sample of the study consisted of women in Turkish society. This may have had many sociocultural effects on the results of the study. First, false beliefs about having sexual intercourse during menstruation (cultural contamination, lack of pleasure, etc.) may have increased the sexual activity of people after the end of menstruation. As a psychological dimension of this, the person may want to engage in more sexual activity when he or she releases himself or herself after the bleeding because he or she was conditioned not to engage in sexual activity at that time.

When we divided the menstrual cycle into two phases (before and after ovulation), women had a higher libido score in the follicular phase than in the luteal phase (Figs. 3 and 4). From an evolutionary point of view, this change encourages the female libido to breed. The results of Study 2 revealed an increase in the luteal phase. Future studies can direct their studies by considering this process, which may be related to learning behavior with age. When the menstrual cycle is divided into four different phases, the increase in libido before and after ovulation is greater than that in the other phases. One of the factors affecting female libido is the presence of a partner. This may be one reason for the increased libido before or after ovulation, as more than half of the participants in this study had partners, increasing the likelihood of reproduction.

Conclusion

As a result of the present research, although there were visual, graphical and numerical increases in libido and behavioral characteristics before and immediately after ovulation, the difference may be due to two reasons. First, our sample size and the number of women keeping diaries may not be sufficient. Another

issue may arise from the complexity of women's sexuality. This situation can be explored again in further studies in the future. When we divided the menstrual cycle into two phases (before and after ovulation) in study I, women's libido scores were greater in the follicular phase, that is, in the preovulation phase, than in the luteal phase. When evaluated from an evolutionary perspective, female libido seems to encourage reproduction. According to the results of study II, an increase in the luteal phase occurs when the menstrual cycle is divided into two different phases; however, this change differs as women age and manifests as an increase in libido before ovulation. We found in both studies were that sexual libido and its behavioral reflections increased before and immediately after ovulation. However, the findings also reveal the complexity of the menstrual cycle and women sexuality.

Declarations

The research was conducted with the permission of the ethics committee of Üsküdar University, İstanbul, Türkiye

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Figures

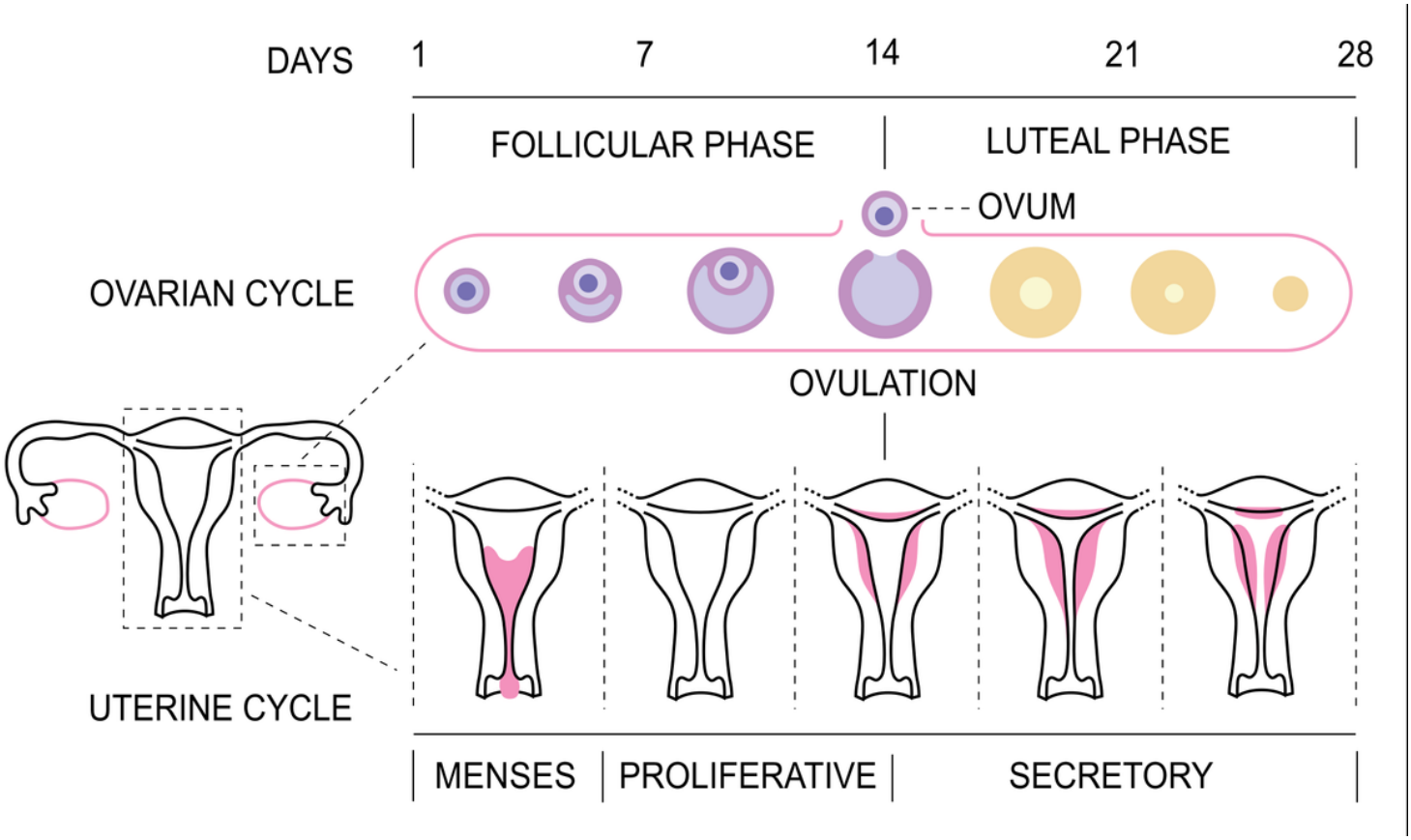

Figure 1

In this research, a schematic representation of the division of the mensurial cycle into preovulation and four separate seven-day periods was generated.

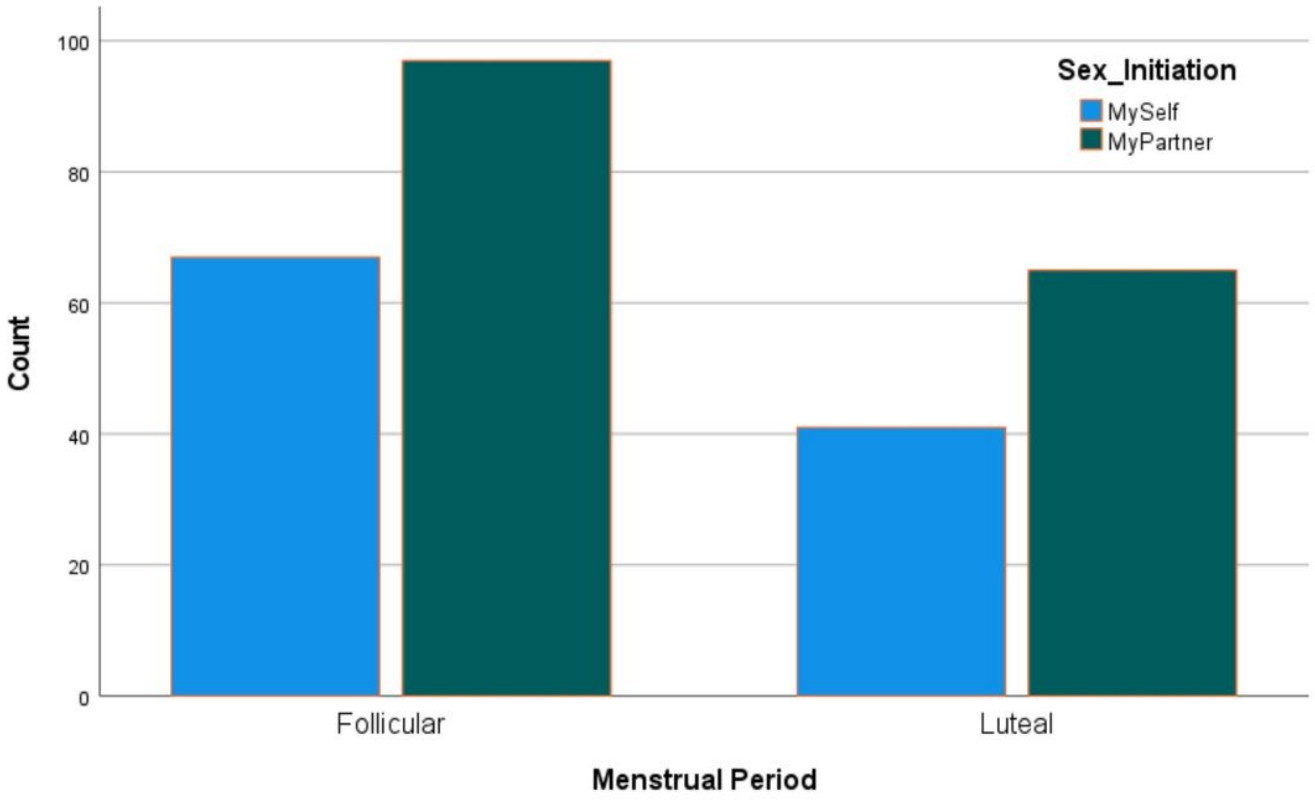

Figure 2

Although it was significantly more common for women to initiate sexual intercourse in the follicular phase (n=97 vs 41), this difference was not statistically significant. See the text for a detailed explanation.

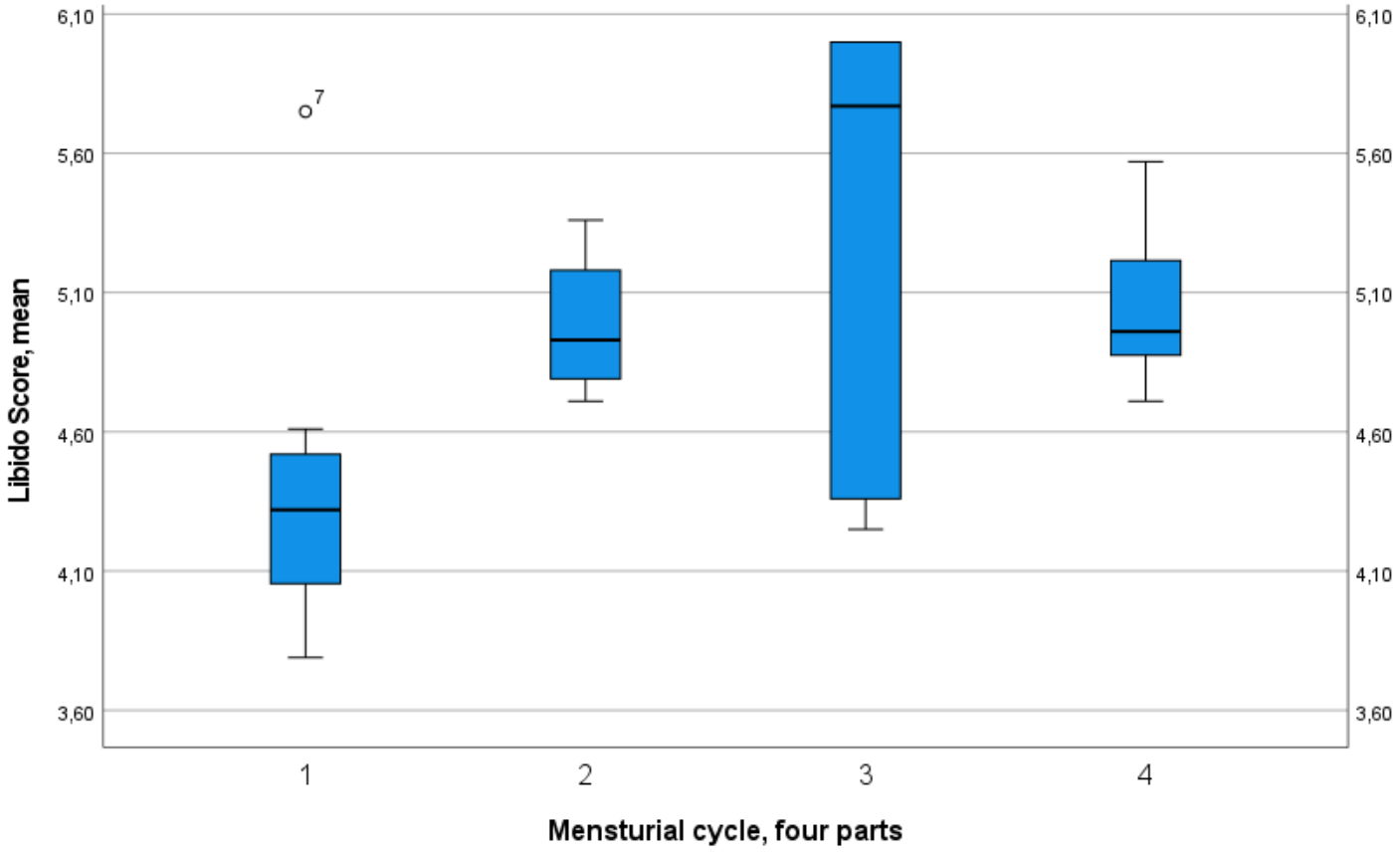

Figure 3

Libido scores in diaries were maintained by 25 women during their menstrual cycles. Each box plot shows the four seven-day phases of the mentrial cycle. The ovulation time was 14 days between days 2 and 3. See the text for details.

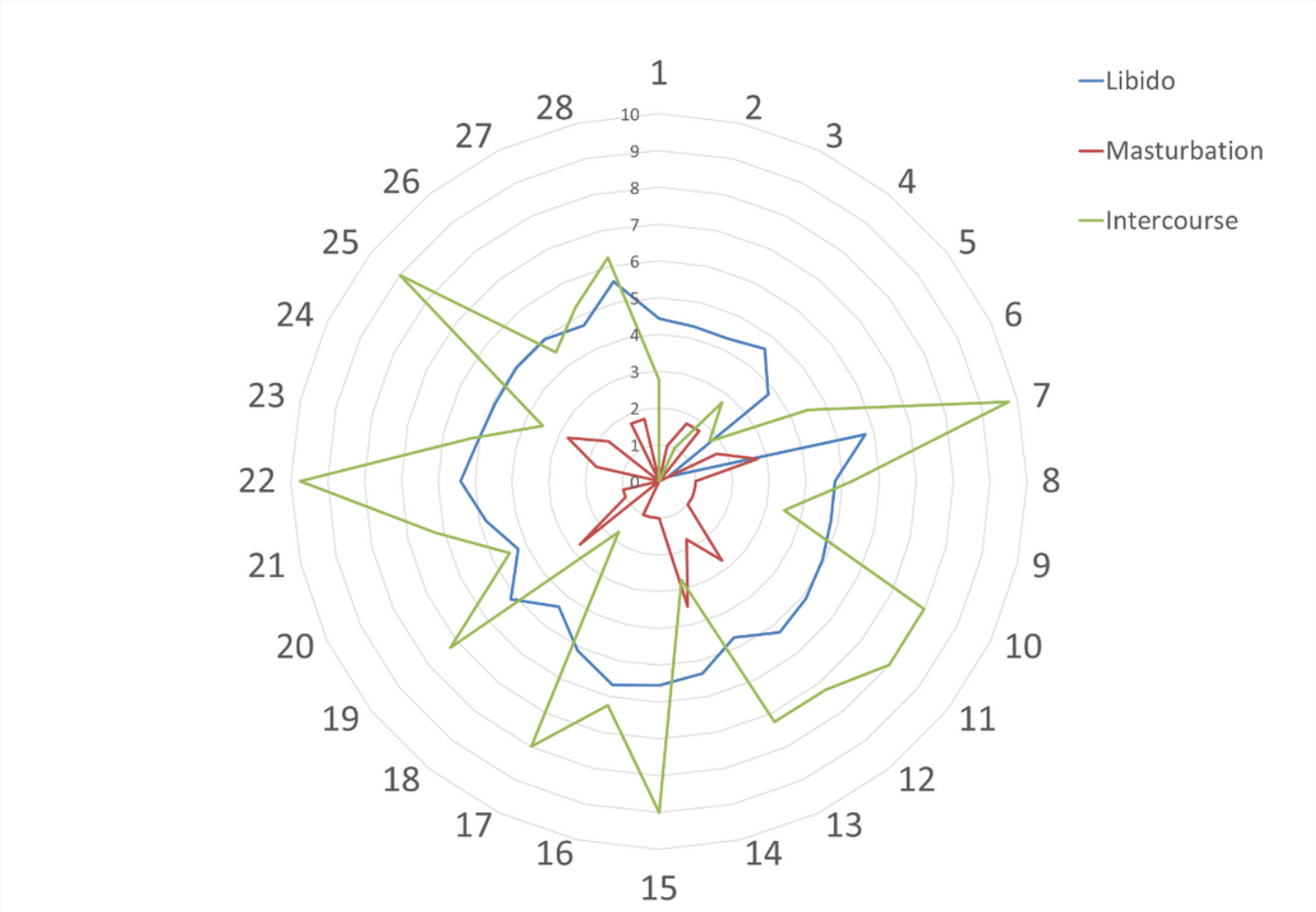

Figure 4

Spider graphic of libido, number of masturbations and women's initiation of sexual intercourse during the 25 women's menstrual period diary. The innermost graph shows the masturbation scores, the middle graph shows the libido scores, and the outermost graph shows the number of sexual initiations. On day 14, a 28-day cycle indicated ovulation.