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BRIEF COMMUNICATION

Heterosexual Activity and Cycle Length Variability: Effect of Gynecological Maturity[1,2]

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BURLESON, M. H., W. L. GREGORY AND W. R. TREVATHAN. *Heterosexual activity and cycle length variability: Effect of gynecological maturity.* PHYSIOL BEHAV **50**(4) 863–866, 1991.—Previous studies linking heterosexual activity to women's menstrual cycle variability have failed to take into account the effects of gynecological maturity. One hundred thirty-two women, all at least seven years postmenarche and not using birth control pills, completed daily records of their cycles and their heterosexual behavior. Data from women classified as sexually celibate or as regularly sexually active (having sex at least once per week in every nonmenstruating week) replicated previous findings while controlling for gynecological maturity: Women classified as celibate had more variable cycles than women who engaged regularly in heterosexual activity. An interaction between gynecological maturity and sexual status was also found, precluding a comparison involving women who were sexually active on an irregular basis. The interaction revealed that increased gynecological maturity is associated with less variable cycles in the sexually sporadic women, but is not associated with cycle variability in either celibate or sexually regular women. Possible biological mechanisms for these findings and their implications are discussed.

Menstrual cycle Sexual behavior Gynecological maturity Fertility Pheromones Human

RECENT research has suggested that a particular temporal pattern of sexual behavior may have a regulatory effect on women's reproductive health. In a series of studies, Cutler and her colleagues showed that heterosexual activity pattern is related to menstrual cycle length variability. They did not, however, examine the influence of gynecological maturity (years past menarche), a factor known to be related to cycle length variability throughout the lifespan (6).

Cutler et al. (1) classified women on the basis of their sexual activity patterns. Those who engaged in heterosexual activity (coitus or genital stimulation) at least once in every week throughout the semester-long study were deemed weekly, those who abstained for more than seven days but had sex at least once during the study were classed as sporadic, and women who did not have heterosexual relations were classed as celibate. The findings showed that weekly sexually active women displayed less cycle length variability than did the combined sporadically active and celibate women. Subsequently, Cutler et al. (3) replicated this pattern of findings, although in this study, their definition of weekly sexual behavior was slightly different (i.e., defined as occurring at least once in every nonmenstruating week).

In the studies reviewed above, most of the subjects were between 19 and 22 years old, except for one substudy with 60 infertility patients who ranged up to 41 years. Further, the only

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strategy employed to account for the possible influence of age or gynecological maturity was the requirement that all participants had to be at least seven years postmenarche. At this point, women are usually considered to be gynecologically mature—that is, their reproductive systems are supposed to have completed development. As described in Treloar et al. (6), however, both age and years postmenarche continue to be strongly associated with cycle variability until menopause. Thus systematic differences in gynecological age could account for Cutler et al.'s (1,3) results. The current study is a test of this possibility.

METHOD

Participants

Participants were recruited from introductory psychology and anthropology classes at New Mexico State University, and from a health club in a nearby city. They were required to be at least seven years past menarche, not currently nor within the last three months using birth control pills or an IUD, and not pregnant, lactating, or postmenopausal.

Procedure

The participants were told that the study concerned "factors affecting the menstrual cycle" and were asked to keep a daily record of the following for three months: menstrual status, heterosexual activities (which included coitus and/or genital stimulation by a man), and self-stimulation. Items such as exercise level, food and alcohol consumption, and stress and illness episodes were included to divert the participants' attention from the primary variables. Each woman also completed an initial questionnaire covering age, height, weight, age of menarche, drug usage, and pregnancies of more than six months duration.

Twenty of the 152 who completed the study were eliminated because of missing data, failure to meet entrance criteria, and/or having medical procedures or taking drugs that are known to affect the cycle, leaving 132 subjects. They ranged in age from 18 to 44 years (mean = 26.1, SD = 7.2). Half were more than 10 years postmenarche, and 35 had had at least one pregnancy which lasted longer than six months.

The 132 participants provided information on 258 menstrual cycles. Because the number of cycles per woman was variable, and because the cycles of an individual are not independent events, only the first cycle per participant was analyzed. Following the classification protocol of Cutler et al. (3), participants who reported having heterosexual activity at least once in every seven nonmenstruating days throughout the study were classified as regular. Those who engaged in sexual activity with a man one or more times during the study, but not at least once every seven nonmenstruating days, were classified sporadic; women who engaged in no heterosexual behavior during the study were classed celibate.

RESULTS

Replication Analyses

The first analysis was performed to determine if the pattern of results reported in the various studies by Cutler and her colleagues was replicated in the present sample. Following the analysis protocol of Cutler et al. (3) (and similar to that employed in their other studies), data from women classified sporadic were pooled with women classified celibate. Next, the absolute value of the difference of each woman's first reported cycle length from the median first cycle length for her group was determined. These difference scores served as an index of the variability in cycle lengths within each group. The difference scores were ranked, and a nonparametric analysis of variance (ANOVA) of the ranked data was then performed to determine if there was any difference in cycle length variability between the sexually regular group and the combined sporadic/celibate group. The result was significant, $F(1,129) = 4.91$, $p < 0.014$ (one-tailed). One-tailed tests were justified here and in certain subsequent analyses based on the previous findings of Cutler et al. (3). The combined sporadics/celibates had significantly more variable cycles (rank mean = 69.1, SD = 36.1, n = 117) than did the regulars (rank mean = 46.2, SD = 46.5 n = 15). These findings replicate the pattern found in Cutler et al. (3).

Additionally, an ANOVA on the raw cycle length data revealed no significant differences between the three groups, $F(2,129) < 1$. The means (and standard deviations) for the celibate, sporadic, and regular groups were 30.9 (7.0), 30.3 (6.5), and 30.5 (8.1) days, respectively.

Analyses Involving Gynecological Maturity

Next, an ANOVA showed that the three groups differed in gynecological maturity, $F(2,129) = 3.20$, $p < 0.04$. Unlike the previously reported analysis, sporadics and celibates were not combined into a single group because there was no a priori basis for assuming that they would be similar or different in gynecological maturity. Women classified as regular (mean = 17.9, SD = 7.4 years, n = 15) were more gynecologically mature than either of the other two groups (celibates mean = 12.6, SD = 6.1 years, n = 41; sporadics mean = 13.6, SD = 7.5 years, n = 76).

The finding of a group difference in gynecological maturity supported the use of analysis of covariance to control for this variable. Covariate analysis on the ranked cycle lengths revealed a trend toward significance in the interaction between gynecological maturity and sexual status group, $F(3,128) = 2.34$, $p < 0.07$ (two-tailed), implying that the relationship between gynecological maturity and cycle variability differs as a function of sexual status. To explore the interaction, the Spearman rank correlation between gynecological maturity and the variability index was computed separately for each group. The resulting correlation was not significant for celibates, $r(39) = .14$, $p > 0.40$, nor for regulars, $r(13) = -.12$, $p > 0.67$. However, the correlation was significant for the sporadics, $r(74) = -.26$, $p < 0.025$ (two-tailed). For sporadic women, greater gynecological maturity is associated with less variable cycle lengths. The finding of a correlation between gynecological maturity and cycle length variability in only one sexual status group precluded any further comparisons involving all three groups.

Gynecological maturity was not related to cycle length variability in the celibate and regular groups. Thus they were first contrasted without controlling for this factor, using the ranked difference scores described previously as the dependent variable. The contrast was significant, $F(1,129) = 3.75$, $p < 0.025$ (one-tailed). Celibate women had more variable cycles (rank mean = 68.1) than regular women (rank mean = 46.2). When gynecological maturity was controlled, the contrast remained significant, although the effect was smaller, $F(1,128) = 2.50$, $p < 0.05$ (one-tailed). To summarize, when adjusted for their differences in gynecological maturity, celibate women still had more variable cycles (adjusted rank mean = 67.3) than regular women (adjusted rank mean = 49.1).

The above analyses deal with the linear relationships between gynecological maturity, sexual status, and cycle length variability. The findings of Treloar et al. (6), in which cycle length variability first decreases and then increases, suggest a curvilinear relationship may exist. Therefore, the analyses were repeated, testing for quadratic effects. None of the results approached

significance, possibly due to a restricted age range.

Analyses were also performed on ranked cycle length data using only self-stimulation as the criterion for classification into celibate, sporadic, and regular groups. These analyses revealed no significant effects.

Additional Variables

To eliminate possible competing explanations for the apparent relationship between sexual activity and cycle length variability, several other variables were examined. Because the number of pregnancies was correlated significantly with gynecological maturity, $r(130) = .58$, $p<0.001$, and the groups differed in gynecological maturity, the relationship between the number of pregnancies and cycle length variability was explored separately for each of the groups. The Spearman rank correlation did not approach significance for either the celibates, $r(39) = .4$, ns, or the regulars, $r(13) = -.04$, ns. The analysis of the sporadics revealed a trend toward significance, $r(74) = -.18$, $p<0.12$, indicating that more pregnancies were associated with less variability. Since gynecological maturity and pregnancies were correlated significantly, a multiple regression analysis was performed to assess the effects of these two variables on cycle variability while controlling for their collinear relationship. Both gynecological maturity and number of pregnancies were entered as predictors of cycle variability. This analysis revealed that number of pregnancies was unrelated to variability when gynecological maturity was in the model, $F(1,73)<1$. However, gynecological maturity was still related to variability when number of pregnancies was in the model, $F(1,73) = 2.85$, $p<0.048$ (one-tailed).

Both age of menarche and height:weight ratio were also examined. Neither correlated significantly with cycle variability, both p's>0.48. Nor did either variable differ as a function of group, both F's<1.32.

DISCUSSION

The primary purpose of this study was to investigate the relationship between sexual activity and cycle length variability while taking the known effects of gynecological age into account. When the data were analyzed without considering gynecological maturity, the pattern of findings replicated Cutler et al. (1,3): regular women have less variable cycle lengths than the combined sporadic and celibate groups. When gynecological maturity was examined, however, the results required qualification.

In this sample, sporadic women displayed an inverse relationship between gynecological maturity and cycle length variability, whereas there was no such relationship in celibate and regular women. This qualitative difference necessitated the deletion of the sporadics from the comparison of regular heterosexually active women to the nonregular group, and restricts the association between greater cycle length variability and nonregular heterosexual activity to celibate women only. The final comparison between regulars and celibates revealed that regulars display less cycle length variability even when gynecological maturity is statistically controlled, supporting Cutler et al.'s (1,3) previous results. Further analyses demonstrated that this dissimilarity between celibates and regulars was not explained by number of pregnancies, age of menarche, or height:weight ratio.

Treloar et al. (6) reported that the length of the menstrual cycle is highly variable during the first seven years following menarche, reaches its least variability at age 36, and increases in variability again six years later. With two exceptions, the current subjects are younger than 42 years of age. Therefore, in this group, greater gynecological maturity is expected to be associated with less cycle length variability. As noted, in the present sample, this finding holds true only in those women who are sporadically sexually active. Contrary to expectations, within the celibate and regular groups, there is no significant correlation between gynecological maturity and cycle length.

The lack of relationship between gynecological maturity and cycle length variability in the celibate and regular groups suggests the possibility that either weekly heterosexual behavior or its complete absence may override the effects of gynecological maturity, and supports the idea, proposed by Cutler et al. (3), that early female reproductive development may be accelerated by weekly heterosexual activity or delayed by celibacy. Further, these findings support the belief that the amount or timing of sexual activity may affect a woman's current internal reproductive condition. This interpretation should be made with caution, however, owing to the correlational nature of the existing research in this area.

The mechanism by which this postulated influence may occur remains speculative. The lack of an effect of self-stimulation, also replicating the findings of Cutler et al. (3), supports the idea that some form of interaction or exchange with a partner is a necessary condition. Numerous authors have proposed the existence of sexual pheromones to account for behaviorally associated changes in women's ovarian cycles (2,7). This hypothesis was tested experimentally (4) and received mixed support [see (8) for critique]. Ney (5) has suggested that the high concentrations of hormones and prostaglandins in semen could be biologically active if absorbed through the vagina; this phenomenon might cause the observed changes. Further studies should attempt to distinguish between these two possibilities.

Conclusions

The results of the current study have several implications for future research, as well as for the interpretation of past findings. First, the restriction of the relationship between gynecological maturity and cycle length variability to the sporadic group precludes any meaningful comparison or combination of data from sporadics with those from celibate and regular groups. This provides an important qualification to earlier studies. For example, Cutler et al. (1,3) combined sporadics with celibates and contrasted them with regulars. This practice may have masked the true relationships among the variables. Second, the studies that established the relationship between gynecological age and cycle length variability [e.g., (6)] may need to be reexamined in light of the impact of sexual activity pattern. Future investigations of women's reproductive cycles should assess sexual activity.

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