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## Current Medical Research Winter/Spring 2015

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# Current Medical Research Winter/Spring 2015

Richard J. Fehring

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## Evaluation of a Web-Based Fertility Monitoring System

Over the past ten years, numerous fertility monitoring applications (i.e., apps) have been developed for tracking fertility and for use in smart phones, computers, and other hand-held type electronic devices. However, few studies have been conducted to determine the accuracy or effectiveness of these fertility monitoring applications, which are essentially used to help women achieve or avoid pregnancy. Researchers and developers of a new fertility monitoring application, however, recently published a study to provide evidence for the accuracy of determining ovulation and the fertile window of the menstrual cycle with their fertility monitoring app (Scherwitzl, Hirschberg, and Scherwitzl 2015).

The application system (called NaturalCycles) involves having the users entering basal body temperature (BBT) readings, the luteinizing hormone (LH) surge if available, the presence or absence of cervical mucus, and days of “protected” or “unprotected” intercourse. The system has a built in algorithm based on the (BBT) shift from baseline and provides the user with red or green icons that indicate fertile and nonfertile days, respectively. To test the accuracy of the device, volunteers were sought via blogs, online advertisement, and, in person, at select birth control clinics located in Sweden

and Switzerland. The criteria for the volunteer participants were that they should be between 18 and 40 years of age, sexually active, not pregnant, not using any method of birth control on the green days, and provide at least thirty data points of temperature readings.

They were able to obtain 317 women participants (mean age 30.1) who generated 1,501 cycles of data. They discovered that the average numbers of days from the subset of women who recorded LH results was 1.9 from the positive LH test to the estimated day of ovulation indicated by the BBT shift. They also found that only 0.05 percent of the non-fertile green days were actually in the estimated fertile window. There were no pregnancies recorded with intercourse on the green days, one pregnancy was reported with intercourse on a red fertile day among the participants using this system to avoid pregnancy. The researchers concluded that this fertility application monitoring device was accurate and could be used as a birth control device.

*Comments:* Although the developers and researchers of the NaturalCycles fertility monitoring app are to be commended for attempting to provide evidence of the app's accuracy and use, there is no evidence as to the apps' actual effectiveness in helping couples avoid or achieve pregnancy. Furthermore, the interface to the fertility app is rather basic and not as developed as other available fertility monitoring apps such as the Glow Fertility Tracker. In addition, the authors promote a fertility awareness combined approach, that is, they allow use of barrier methods during the fertile time. This philosophy is promoted in the app itself, web site that advertises the app, and the blog connected to the website.

## Source

Scherwitzl, E.B., A.L. Hirschberg, and R. Scherwitzl. 2015. Identification and prediction of the fertile window using NaturalCycles. *European Journal of Contraception and Reproductive Health Care* [Epub ahead of print]: 1–6.

## Long-Term Efficacy of Online Fertility Education Questioned

Women in the United States, Europe, and other developed countries are postponing marriage and delaying child bearing to later years with the average age of thirty for first pregnancy. It is well known that delaying child bearing results in a decreased fertility from the peak in the early twenties. Furthermore, it is also known that couples have low knowledge of fertility, the days of the fertile window and the efficacy of in vitro fertilization and other artificial reproductive technologies (ART). Since the internet is a prime source of health information for young women, researchers wished to determine if an online fertility knowledge program increased knowledge of fertility health immediately post-exposure to the program and at 6 months among young reproductive age women and men (Daniluk and Koert 2015).

Fertility information was provided online with ten postings that included information on fertility knowledge, i.e., optimal fertility age, ART, and general fertility knowledge. Prior to and after receiving the ten fertility information posts, they were administered an online fertility awareness survey that included questions on the optimal age for male and female fertility, two questions on their perceived fertility knowledge, their knowledge of ART, and twenty questions on general fertility knowledge. Participants were again invited to take the fertility awareness survey after a 6-month time period.

The participants were recruited by a Canadian national survey company which was able to obtain 200 men and women between 18 and 35 years of age from across Canada. One hundred ninety-nine individuals (151 women and 48 men) completed the immediate post-survey and 110 of the original participants (eighty-one women and twenty-nine men) completed the 6-month post-survey. The researchers discovered that there was a significant increase in fertility knowledge from the pre- and immediate post-intervention surveys but that there was no significant increase in knowledge from pre-testing at the 6-month survey, i.e., knowledge returned to pre-intervention levels. However, the females scored significantly higher in knowledge at all time periods. This likely reflects that fertility knowledge that involves child bearing has more relevance to women. The researchers concluded that long-term knowledge from a short online fertility knowledge intervention is called into question but has more relevance to women. They also called for assessing outcomes of whether it would lead to earlier child bearing and satisfaction.

*Comments:* The main limitation of this study is that it had a very small sample size and a high dropout rate of 45 percent at the post 6-month survey. As such, the final sample of Canadians was no longer representative of reproductive age men and women in Canada. I would also question the depth of the knowledge intervention and the means to assess compliance with actually reading the materials on fertility knowledge. It would be interesting to see the levels of knowledge among women participants who are asked to chart their fertility through natural family planning with those who just receive fertility information.

## Source

Daniluk, J.C. and E. Koert. 2015. Fertility awareness online: the efficacy of a fertility education website in increasing knowledge and changing fertility beliefs. *Human Reproduction* 30: 353–63.

## University Students Underestimate Fertility Decline and Overestimate Success of Assisted Reproductive Technologies (ART)

Women are delaying marriage and pregnancy to later in life in most developed countries. In fact, the percentage of women having their first baby over the age of 35 is at an all-time high. This change in marital and pregnancy dynamics is thought to be a result of greater access to education and career development among women. However, the delay in marriage and pregnancy could be problematic due to a steep decline in fertility at that age and to less energy to care for young children at an older reproductive age. These same trends exist in New Zealand and as such researchers were interested in determining the knowledge of fertility, age-related fertility decline, and the perceived efficacy of ART and in vitro fertilization (IVF) among college age students (Lucas, Rosario, and Shelling 2015).

The participants in the study were 683 University of Auckland students, out of 961 total students, who were administered and completed a fertility knowledge questionnaire in twelve different classes in the first semester of 2012. The fertility knowledge questionnaire had items to assess knowledge of age-related fertility decline, the success of IVF, and an understanding of medical procedures that might prolong or enable fertility in later life. There were 453 female and 226 male participants with an average age of 22.3 years.

The authors found that student participants underestimated age-related fertility decline. For example, they estimated that there was a 19 percent chance of pregnancy among women between the ages of 46 and 50, whereas the real rate is from 0 to 5 percent. In regards to the efficacy of IVF, they did realize that the efficacy of the procedure declines with age but overestimated its efficacy. For example, they provided an average chance of pregnancy of 18 percent for women aged 48 to 52, whereas, the real rate is near 0, i.e., these women would require donor oocytes from younger women. In regards to methods that would prolong the chance of pregnancy to later in life, IVF and ART were the most common answers. Based on the results, the authors felt it was imperative that students (and the general public) be educated in age-related fertility decline and the limited effectiveness of IVF and other ART procedures.

*Comments:* A sub-finding of interest is that those students who took a reproductive biology class had answers closer to the actual medical data in regards to fertility decline. However, those students taking a health-related degree (e.g., nursing students) consistently overestimated chances of pregnancy. There was no mention of the value of having students learn how to observe and chart natural signs of fertility to aid in their understanding and appreciation of having a healthy fertility.

In a related study, 367 Chinese university students from Hong Kong (275 female and 92 males with a mean age of 23) responded to an e-mailed survey to determine fertility knowledge and attitudes towards parenthood (Chan et al. 2015). Like their Western student counterparts, 92 percent of the students underestimated age-related fertility decline and 66 percent overestimated the success of fertility treatments. Chinese students, however, were less inclined to have children, and were less concerned with infertility. Thirty-three percent of the students either did not think of marriage or did not have desire to marry. One in five did not desire to have children and those that did, the average projected age for the first child was 30. Limitations of this study were that there was self-selection bias in responding to the survey and there was no way to determine the characteristics of the non-respondents.

## Sources

- Chan, C.H.Y., T.H.Y. Chan, B.D. Peerson, C. Lampic, and M.Y.J. Tam. 2015. Intentions and attitudes towards parenthood and fertility awareness among Chinese university students in Hong Kong: a comparison with Western samples. *Human Reproduction* 30: 364–72.
- Lucas, N., R. Rosario, and A. Shelling. 2015. New Zealand University student's knowledge of fertility decline in women via natural pregnancy and assisted reproductive technologies. *Human Fertility* [Epub ahead of print]: 1–7.

## Luteal Phase Defect (LPD) as Cause of Infertility Has Not Been Proven

The Practice Committee of the American Society of Reproductive Medicine (ASRM 2015) has developed an expert-consensus evidenced-based document to determine if LPD is a condition with insufficient endogenous progesterone that is not adequate to maintain a secretory endometrium and subsequent implantation of a developing embryo. The corollary is that LPD can be diagnosed or detected and that supplemental progesterone is warranted as a treatment.

However, the committee (after review of the evidence) provided some unexpected recommendations as follows:

- An abnormal luteal function maybe a result of a medical problem such as abnormal thyroid or elevated prolactin. These conditions should be evaluated and treated.
- There is no valid and reliable diagnostic test for LPD in a clinical setting, even serum progesterone levels post-ovulation or endometrial biopsy.
- No treatment for LPD has been shown to improve pregnancy outcomes in natural unstimulated menstrual cycles.
- Luteal support after artificial reproductive technologies (ART) with progesterone or Human Chorionic Gonadotropin (hCG) improves pregnancy outcomes.
- There is no proven role in adding progesterone or hCG for luteal support once a pregnancy has been supported—i.e., providing progesterone supplements 2-week post-ovulation is not proven to be beneficial.

*Comments:* Even the use of natural indicators of ovulation, such as cervical mucus peaks, urine LH detection, or the basal body temperature shift to determine the length of the luteal phase was not recommended as a test for LPD. The recommendations from the ASRM expert committee challenges what has been taught in natural family planning programs and natural procreative protocols for treating a suspected LPD.

However, there are two observational studies with outcomes that support the use of progesterone with unexplained miscarriage (Stanford, Parnell, and Boyle 2008; Tham, Schliep, and Stanford 2012) and an ongoing randomized control trial of progesterone versus placebo has been endorsed by the International Institute for Restorative Reproductive Medicine (<http://restorative-reproductive-medicine.com>).

## Source

- Practice Committee of the American Society of Reproductive Medicine. 2015. Current clinical irrelevance of luteal phase deficiency: A committee opinion. *Fertility and Sterility* 103(4): e27–32.
- Stanford, J.B., T.A. Parnell, and P.C. Boyle. 2008. Outcomes from treatment of infertility with natural procreative technology in an Irish general practice. *Journal of the American Board of Family Medicine* 21: 375–84.
- Tham, E., K. Schliep, and J. Stanford. 2012. Natural procreative technology for infertility and recurrent miscarriage. Outcomes in a Canadian family practice. *Canadian Family Physician* 58: e267–74.

## Systematic Review Indicated Need for Prospective Randomized Trials on the Use of Cervical Mucus Monitoring to Evaluate Effectiveness in Sub-Fertile Couples (Thussen et al. 2014)

Belgium health scientists conducted and published a systematic review of research articles to determine the state of the science on the effectiveness of self-monitoring cervical mucus to determine

the fertile window of the menstrual cycle and to determine the association of cervical mucus monitoring (CMM) and day-specific probabilities of pregnancy. The assumption of the review is that use of CMM can help sub-fertile couples achieve pregnancy as a first inexpensive approach to their desire for achieving pregnancy and, as a result, do not have to rely on expensive assisted reproductive technologies (ART). The scientists' conducted a MEDLINE search for published articles and based on the review of content and relevant terms of fertility and CMM accepted ten articles (out of 331 reviewed). Most of the accepted articles dealt with day-specific probabilities of pregnancy and fertility rating levels of CMM. Only one article included a comparison of fertile couples with sub-fertile couples and only one was a prospective study of focused intercourse and pregnancy rates. The review emphasized that there was a good correlation with the levels of cervical mucus ratings and day-specific probability of pregnancy, with peak mucus ratings having the highest probability. There is some evidence that the mucus ratings of sub-fertile couples are diminished. The authors indicated a need for prospective randomized studies comparing pregnancy rates between couples using CMM and those using frequent intercourse. They also encouraged prospective cohort studies with sub-fertile couples and pregnancy rates with use of CMM.

*Comments:* Since the publication of this article, there was a comparison study of CMM with random intercourse that showed no statistical difference in pregnancy rates, i.e., the cumulative probabilities of pregnancy for those couples attempting to conceive were 51 percent and 63 percent (respectively for the control group and the CMM group) by menstrual cycle 3, and 88 percent and 93 percent (respectively for the control group and the CMM group) by cycle 7 (Stanford, Smith, and Varner 2014). However, the study was underpowered statistically and conducted with women with no known fertility problems. It is a lot more difficult to demonstrate differences in pregnancy rates among couples with normal fertility compared to couples with sub-fertility. There also has been a comparison study with the use of hormonal fertility monitoring among sub-fertile women in comparison with random intercourse (Tiplady et al. 2013). They found that 43 percent of the women in the digital hormonal monitor group achieved pregnancy as compared 30 percent in the control group of women who used frequent intercourse. The odds of achieving pregnancy with the hormonal monitor group was 59 percent greater compared to the control group.

## Sources

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- Tiplady, S., G. Jones, M. Campbell, S. Johnson, and W. Ledger. 2013. Home ovulation tests and stress in women trying to conceive: a randomized controlled trial. *Human Reproduction* 28: 138–51.
- Thussen, A., A. Meier, K. Panis, and W. Ombelet. 2014. 'Fertility awareness-based methods' and subfertility: A systematic review. *Facts Views Vis Obgyn* 6: 3–123.

## Urinary and Serum Luteinizing Hormone (LH) Surges found to be Excellent Predictors of Ovulation

Over the past 10 to 20 years, scientists have discovered that there is a lot of normal variability in the parameters of the menstrual cycle. However, the earlier research on the parameters and hormonal

markers (both serum and urinary) of the menstrual cycle was based on older technology for determining metabolites of reproductive hormones and the use of ultrasound to estimate the day of ovulation. European researchers therefore set out to determine the correlation of serum and urinary reproductive hormones in relation to the ultrasound determined estimated day of ovulation and to establish more modern standards of reproductive hormone variation among women with normal menstrual cycles (Roos et al. 2015). The thinking is that these standards and variations need to be established in order to be able to determine abnormal parameters and potential health problems.

The study involved fifty-one women volunteers, recruited by word of mouth, who were between the ages of 18 and 40, were not on any hormonal form of contraception and reported to have normal length menstrual cycles. Of the fifty-one volunteers, forty (with a mean age of 29.5 years, range 18–37 years) met the study criteria and provided data from one full menstrual cycle. Each participant provided a daily first morning void urine sample and received daily transvaginal ultrasound once a follicle diameter of 16 mm was detected. On days of ultrasound, serum samples were also taken. Urine and serum samples were tested for serum LH, progesterone, estradiol, and urinary LH, pregnanediol-3-glucuronide (P3G) and estrone-3-glucuronide (E3G). Ultrasound was conducted by two physicians and results of the ultrasound were reviewed by experts to determine the estimated day of ovulation.

The forty menstrual cycles of data generated by the participants had a median length of 27 days and a range of 22 to 37 days. The estimated day of ovulation had a median of 15 and range of days 8 to 26 of the menstrual cycle. The researchers found excellent correlations between serum and urine measures of the reproductive hormones, i.e., with urinary LH against serum LH (coefficient of correlation  $r = 0.72$ ), urinary E3G with serum E (coefficient of correlation  $r = 0.51$ ), and urinary P3G with serum progesterone (coefficient of correlation  $r = 0.81$ ). The rise in estrogen and LH always occurred before ovulation and the rise in progesterone from baseline always after ovulation. However, the serum and urinary peaks in estrogen and LH had more variability around the estimated day of ovulation. They concluded that the LH surge was an excellent predictor of ovulation, the rise in progesterone from baseline was a good consistent marker for confirming ovulation, and both LH and progesterone surges were clear and sharp signals for detecting and confirming ovulation. They also indicated that this study confirmed or validated the use of hormonal endocrine monitoring for purposes of family planning, help in achieving pregnancy, and for detecting menstrual cycle abnormalities.

*Comments:* This study provides good evidence for the use of urinary LH tests for aiding women in using natural family planning, to either help confirm other markers of fertility.

## Source

Roos, J., S. Johnson, S. Weddell, E. Godehardt, J. Schiffner, G. Freundl, and C. Gnoth. 2015. Monitoring the menstrual cycle: comparison of urinary and serum reproductive hormones referenced to true ovulation. *European Journal of Contraception and Reproductive Health Care* [Epub ahead of print]: 1–13.

## Peak Mucus Found to Have Good Sensitivity in Estimating Fertile Window

There are two phases in the menstrual cycle, the follicular and luteal phases. The follicular phase begins on the first day of menses and ends on the day of ovulation. The luteal phase begins on the day



after ovulation and continues until the day before the next menses. However, the follicular phase also contains two sub-phases, a quiescent phase of minimal follicular development and the fertile window with significant follicular development ending with ovulation. Research on day-specific probabilities of fertility has determined that the fertile window is 6 days in length that includes the day of ovulation and the previous 5 days. Estimating the fertile window and the variability of the fertile window within the menstrual cycle is important for couples using natural family planning (NFP) and for health professionals assessing the health of the menstrual cycle and in conjunction the health of women.

Common natural self-indicators or estimators of the actual (or biological) fertile window (BFW) are the changes in the characteristics of cervical mucus and the shift in basal body temperature (BBT). Cervical mucus monitoring (CMM) can be used to estimate the beginning and end of the BFW and BBT to estimate the end of the BFW. Both indicators are used in NFP methods and both are somewhat “fuzzy” in estimating the BFW. Therefore, researchers sought to determine the accuracy (i.e., the sensitivity and specificity) in the use of these natural self-indicators in estimating the BFW. The three scenarios used for estimating the BFW with the natural indicators were: (1) from the beginning of any observed cervical mucus until 4 days past the peak day of cervical mucus (i.e., the last day of peak type mucus), (2) from the beginning of observed cervical mucus and ending 3 days after the elevated body temperature, and (3) from the beginning of cervical mucus with peak type characteristics (i.e., egg white and slippery) and ending with the peak day of cervical mucus. The researchers were able to obtain a data set that included these natural indicators among women who also had serial transvaginal ultrasound to determine the actual day of ovulation. Therefore, the three scenarios in estimating the fertile window were compared with the ultrasound determined BFW (Ecochard et al. 2015). Sensitivity was defined as having at least 1 day of the estimated fertile window within the BFW, and specificity was defined as the number of days that the estimated fertile window fell outside of the BFW, either before or after.

The data set was from a large mid-1990s observational study that included 171 volunteer women between the ages of 19 and 45 years and with menstrual cycles from 24 to 34 days in length. These volunteer women had serial ultrasound performed beginning either when cervical mucus was observed or when an LH surge was detected (i.e., they were also collecting urine samples for analysis of LH, FSH, and E3G). The volunteers contributed an average of three menstrual cycles of data with a total of 326 cycles included in the analysis.

The researchers discovered that the mean duration of the estimated fertile window by scenarios 1 and 2—i.e., with the identification of any type of cervical mucus and ending 4 days past the peak day or 3 days of elevated BBT was 11 days. These two scenarios also had a sensitivity of 100 percent, i.e., at least 1 day of estimated fertility within the BFW. However, the peak mucus scenario had a mean duration of 4 days and had a sensitivity of 96 percent and a specificity of 88 percent; in less than 10 percent of the menstrual cycles did peak mucus appear before the BFW. The researchers concluded that a more accurate identification of the BFW can be obtained by the self-observation of peak mucus and that it would be recommended to focus intercourse on those days for couples seeking to achieve pregnancy.

*Comments:* The authors also mentioned that NFP methods have been designed with maximum sensitivity for couples using NFP to avoid pregnancy and therefore, specificity is less important. I would

agree with this, but the excessive over estimation of the BFW is a problem for couples trying to avoid pregnancy due to the problem of excessive abstinence. The researchers also noted that the peak mucus symptom was only self-observed in 67 percent of the menstrual cycles produced for the study. This is problematic, since without the peak symptom there is no end to the estimated fertile window without the use of the BBT shift.

## Source

Ecochard, R., O. Duterque, R. Leiva, T. Bouchard, and P. Vigil. 2015. Self-identification of the clinical fertile window and the ovulation period. *Fertility and Sterility* 103: 1319–25.

## In Depth—Under the Microscope: Marital Dynamics of Practicing Natural Family Planning

Very little is known about how the use of various methods of natural birth regulation affects marital relationships and sexual dynamics. In 1970, Marshall and Rowe published one of the first studies on the psychological aspects of practicing natural family planning (NFP) (Marshall and Rowe 1970). They were concerned with the “psychological repercussions” that might occur with the required abstinence from coitus while using the basal body temperature (BBT) method of NFP to avoid pregnancy. Marshall and Rowe (1970) administered a detailed psychological questionnaire to 502 couples that were current users of BBT. Their results showed that 48 percent of husbands and 50 percent of wives experienced psychological stress from periodic abstinence and unfavorable effects on their marital relationship. However, they concluded that despite difficulties a majority found the BBT method satisfactory in general and thought it helped their marriage. This study has not been repeated with couples using modern methods of NFP.

Promoters of NFP believe that the practice of periodic abstinence and the broader expression of sexuality are dynamics that will strengthen marriage (Billings, Billings, and Caterinich 1989; Hilgers et al. 1982). The positive dynamics of practicing NFP that are often cited are a greater understanding of human reproduction, increased communication, increased self-mastery, increased intimacy, an appreciation for intercourse, and an increased spiritual well-being (Borkman and Shivanandan 1984; Fehring and Lawrence 1994; McCusker 1977; Rodriguez and Fehring 2012; Tortorici 1979). Others believe that periodic abstinence and the daily monitoring of the women's menstrual cycle is stressful to the married couple and detrimental to married life. The perceived lack of spontaneity, difficulty with abstinence and fear of pregnancy are often cited as responses to this process (Fragstein, Flynn, and Royston 1988; Hefernan 1977; Klann, Halweg, and Hank 1988; Marshall, 1995; Oddens 1999).

Since the 1970 Marshall and Rowe study, a number of modern methods of NFP have been developed and utilized throughout the world, specifically the Billings Ovulation Method (BOM) and the Creighton Model (CrM) system of NFP (Billings, Billings, and Caterinich 1989; Hilgers et al. 1982). The BOM and CrM are single indicator methods of NFP that utilize the changing nature of cervical secretions as a marker for fertility. These newer methods of NFP are thought to be less restrictive in the length of time required for abstinence from sexual intercourse than BBT and more effective when used to avoid or achieve a pregnancy.

Since the Marshall and Rowe study was never repeated with newer methods of NFP, the current study was carried out for the purpose of repeating the Marshall and Rowe study among current and past couple users of modern methods of NFP, i.e., BOM and CrM. The questionnaire from the Marshall and Rowe study, however, was updated to include items that reflect marital dynamics as expressed in qualitative findings from more recent research studies (VandeVusse et al. 2003).

## Methodology

### *Subjects and Setting*

The participants for this descriptive comparative study were married couples who are current or past users of either the BOM of NFP or the CrM system of NFP. The NFP couples were randomly selected from a list of couples that were taught either BOM or CrM through two Midwest United States NFP service programs and from the membership lists of two United States NFP organizations that represent either the BOM or the CrM system of NFP. Each potential respondent couple (husband and wife) was mailed a set of psychological questionnaires that was adapted from the 1970 Marshall and Rowe study. A letter accompanying the questionnaires explained the purpose of the study, that the study was anonymous and that they should respond separately. Approximately 2 weeks after they received the questionnaires, the subjects were sent a postcard reminding them to complete the questionnaires and thanking them if they already have returned them. The Marquette University Office of Research Compliance reviewed the study proposal for human subject protection.

The total number of couples that responded was 334 (668 individuals) or 23.8 percent of the 1,400 couples that were sent questionnaires. Of these 334 couples, 248 or about 75 percent were current users of NFP. The low response rate from the couples was largely due to being over researched, i.e., 6 months prior to this study another survey study on family dynamics utilized the same pool of subjects.

### *Instrumentation*

The Marshall and Rowe Questionnaire is composed of nineteen questions that are grouped according to (1) frequency of worry, (2) difficulty of abstinence, (3) spontaneity in intercourse, (4) behavior during abstinence, and (5) general attitude. Most of the questions have either a “yes,” “no”; “good effect,” “bad effect”; “increased,” “decreased” type of dichotomous response and some type of default answer such as “no effect” or “no change.” There is no report on the validity and reliability of the questionnaire. Some of the items of the questionnaire were given minor changes to update and make them clearer for couple users of modern methods of NFP. For example, “the method” was changed to “natural family planning,” and “love making” was changed to “genital contact.”

In addition to the original nineteen items from the Marshall and Rowe questionnaire, fifteen new items were added that reflected the dynamics of the use of NFP from past studies. These items included to the effects of the use of NFP on reproductive understanding, increased communication, sexual spontaneity, intercourse frequency, self-mastery, satisfaction, and spiritual well-being. Four expert practitioners in NFP reviewed all of the items of the questionnaire and found them to be relevant to the psychological and marital dynamics of NFP.

Demographic items in the questionnaire included age, number and length of marriage, religion, education and income level, ethnicity, number of children, and history of previous methods of family planning. Included with the mailing was a consent form that explained the study and informed the

couples that all information from the questionnaires will be kept confidential and kept in locked file cabinets until they are destroyed. Data sheets and measurement tools were identified by a code known to the project director and the NFP teacher research assistant.

## Results

### *Participants*

The average age of the wives was 39 years (SD = 10.1) and the husbands 41 years (SD = 10.4). They were married a mean of 15 years (SD = 11.2), used NFP for an average of 10 years and had a mean of 3 children (SD = 2.0). The majority were Roman Catholic (98% husband and 91% wives), Caucasian (84% husbands and 85% wives), had at least a high school education (69% of the husbands and 67% of the wives), and most (71%) had combined incomes above \$40,000.

### *Quantitative Results*

The following results are reported in the style of the Marshall and Rowe study that presented tabled data for each section of the questionnaire:

- *Frequency of worry:* The first three questions of the Marshall and Rowe (MR) questionnaire addressed whether the use of NFP was associated with worry. The questions asked in this section were:
  - Did you worry about an unplanned pregnancy while learning NFP?
  - Did you worry about an unplanned pregnancy after you were confident in the use of the method?
  - If you did worry about an unplanned pregnancy, did it affect your attitude toward intercourse?

The grouped responses to these questions can be found in [table 1](#). The results show that the current study NFP couples, on a percent basis, were less worried in the use of NFP than the MR couples. Both the husbands and the wives were less worried by about 20 percent while learning and after confidence in use.

- *Difficulty of abstinence:* Difficulty of abstinence was examined through a series of seven questions. The results can be found in [table 2](#). The questions are as follows:
  - When using the method, did you find the periods of abstinence difficult?
  - Did you notice any change in your general relationship with your spouse during the periods of abstinence?
  - Did you find you were more or less conscious of “sex” during the periods of abstinence?
  - Were you more or less inclined to have sexual contact of any kind during the periods of abstinence?
  - Was your religious practice affected during the periods of abstinence?
  - Did the periods of abstinence have any effect upon your attitude toward your children?
  - Did the periods of abstinence have any effect upon your attitude toward your work?

Table 1 Frequency of worry (Marshall and Rowe results are in parentheses, new results are outside of parentheses)

	Husbands				Wives			
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Good effect	(22)	23	(5)	7	(6)	24	(1)	8
Bad effect	(28)	11	(7)	4	(19)	4	(5)	1
No effect	(359)	281	(88)	89	(382)	293	(94)	91

The results in this section show that the modern users of NFP had on a percent basis less difficulty with abstinence than the MR couples. On a percent basis, the modern NFP husbands also felt that abstinence had a positive effect on their relationship by more than a 20 percent difference from the MR husbands. The modern husband and wife users also felt (31% vs. 2%) less inclined to temptation than the MR couples, i.e., less inclined to sexual contact outside of a marital relationship or immoral sexual practices like mutual masturbation. The modern wife NFP users had double the rate of a perceived increase on religious practices compared to the MR wife users.

- *Spontaneity in intercourse*: A common criticism of NFP is that it interferes with spontaneity of love making and sexual intercourse. The following three questions analyzed this criticism. The answers can be found in [table 3](#).
  - Did intercourse during the infertile period seem spontaneous and natural?
  - Could you express your love for your spouse adequately during the periods of abstinence?
  - Did you find that your appreciation of intercourse was greater or less after a period of abstinence?

Table 3 Spontaneity in intercourse (Marshall and Rowe results are in parentheses, new results are outside of parentheses)

	Husbands				Wives			
	Number		Percent		Number		Percent	
Intercourse spontaneous								
Yes	(208)	201	(51)	64	(236)	207	(58)	65
No	(124)	20	(30)	6	(110)	21	(27)	7
Varies	(36)	92	(9)	29	(17)	93	(4)	29
Express love adequately								
Yes	(191)	222	(47)	71	(198)	249	(48)	78
No	(147)	14	(36)	4	(153)	16	(37)	5
Varies	(70)	79	(17)	25	(58)	55	(14)	17
Appreciation for intercourse								
Greater	(284)	247	(69)	79	(248)	257	(61)	80
Less	(36)	4	(9)	1	(53)	3	(13)	1
Same	(58)	44	(14)	14	(78)	35	(19)	11
Varies	(31)	19	(8)	6	(28)	26	(7)	8

Both a high percentage (greater than 50%) of the new NFP users and the MR NFP users felt that intercourse was spontaneous and that they had a greater appreciation for intercourse. The modern NFP users however had a much higher rate indicating that they could express love adequately during times of abstinence.

- *Behavior during abstinence*: Four questions were developed to examine how couples coped with periods of abstinence. The results can be found in [table 4](#).
  - Did you have some degree of genital contact during the periods of abstinence?
  - Did the genital contact lead to a climax on your part?
  - Did you find it better or worse to avoid all sexual contact during the periods of abstinence?
  - If you did avoid all sexual contact during the periods of abstinence, did this affect your general relationship with your spouse?

Table 4 Behavior during abstinence [Marshall and Rowe results are in parentheses, new results are outside of parentheses]

	Husband				Wives			
	Number		Percent		Number		Percent	
Love making during abstinence								
Yes	(361)	188	(88)	60	(368)	194	(90)	61
No	(48)	125	(12)	40	(41)	125	(10)	39
Lead to an orgasm								
Often	(74)	55	(20)	19	(44)	41	(12)	15
Sometimes	(156)	78	(42)	27	(169)	100	(45)	36
Rarely	(80)	58	(22)	20	(84)	55	(23)	20
Never	(59)	96	(16)	33	(74)	84	(20)	30
Better or worse to avoid contact								
Better	(132)	141	(33)	45	(187)	164	(46)	52
Worse	(169)	46	(42)	15	(136)	45	(34)	14
Not sure	(101)	127	(25)	40	(80)	106	(20)	34
Did avoidance affect relationship								
Good effect	(15)	59	(6)	22	(10)	70	(3)	26
Bad effect	(130)	44	(48)	16	(135)	50	(48)	19
No effect	(123)	170	(46)	62	(138)	147	(49)	55

In general, the modern NFP couples had about 20–30 percent less reporting of genital contact during abstinence than the MR couples. About 20 percent more of the modern couples felt that avoidance had a good effect on their relationships.

- *General attitude*: Two questions were utilized to determine the couples' overall impression of NFP. The results can be found in [table 5](#).
  - Overall, how would you describe NFP?
  - Overall, do you think NFP helped or hindered your marriage?

Table 5 General attitude about NFP (Marshall and Rowe results are in parentheses, new results are outside of parentheses)

	Husband				Wives			
	Number		Percent		Number		Percent	

Overall affect of NFP								
Satisfactory	(270)	275	(66)	87	(308)	294	(75)	91
Unsatisfactory	(91)	13	(22)	4	(71)	9	(17)	3
Unsure	(47)	27	(12)	9	(31)	19	(8)	6
Helped or hindered marriage								
Helped	(302)	249	(74)	80	(307)	270	(75)	85
Hindered	(36)	9	(9)	3	(33)	17	(8)	5
Not sure	(70)	55	(17)	18	(67)	31	(16)	10

Both the modern and the MR couples reported high satisfaction with the use of NFP; however, the modern NFP couples had a 15–21 percent higher percent of reported satisfaction. Likewise, most (greater than 70%) of the modern and MR NFP couple users felt that NFP helped their marriage rather than hindered it. Only 3–5 percent of the modern couple NFP users felt that NFP was unsatisfactory or hindered their marriage.

- *Effects of NFP on marital dynamics:* The additional items on marital dynamics and spirituality can be found in [tables 6](#) and [7](#). Greater than 75 percent of the NFP wives and 65 percent of the NFP husbands felt that NFP increased their awareness of their reproductive cycle, had a good effect on their communication, increased their self-mastery and their expression of sexual intimacy. Greater than 70 percent of the NFP husbands and wives felt that NFP had a good effect on their spirituality and their relationship with God. In essence, the majority of the couples found that NFP increased fertility awareness, spiritual well-being, appreciation for intercourse, communication, and self-control.

Table 6 Effects of NFP on marital dynamics

	Husband		Wives	
	Number	Percent	Number	Percent
Awareness of reproductive cycle				
Increased	254	83	318	99
Decreased	1	0	0	0
No change	51	17	33	1
Effect on communication				
Good effect	213	69	248	78
Bad effect	7	2	11	3
No effect	88	29	60	19
Self-mastery of sexual urges				
Increased	203	65	227	72
Decreased	13	4	5	2
No change	95	31	84	27
Expressing sexual intimacy				
Increased	236	75	252	79
Decreased	80	25	66	21
No change	NA	NA	NA	NA



Effect on sexual pleasure				
Increased	156	51	166	54
Decreased	28	9	25	8
No change	123	40	116	38

Table 7 Effect of NFP on spirituality

	Husband		Wives	
	Number	Percent	Number	Percent
Effect on spiritual well-being				
Good effect	218	70	279	88
Bad effect	6	2	3	1
No effect	86	28	35	11
Effect on relationship with god				
Good effect	221	71	268	85
Bad effect	2	1	2	1
No effect	87	28	45	14
Effect on satisfaction with life				
Good effect	211	68	271	86
Bad effect	9	3	5	2
No effect	90	28	39	12
Effect on being open to having new baby				
More open	172	56	215	69
Less open	6	2	11	4
No change	132	43	88	28

## Discussion

In comparison with the MR study, the couples in the current study had less worry (on a percent basis) about having an unplanned pregnancy while learning NFP and after developing confidence in the use of NFP. The current study couples also had on a percent basis less difficulty with abstinence, more felt spontaneity with intercourse, more appreciation for intercourse and were able to express love adequately. Over 60 percent of the husbands and the wives in the current sample had positive responses to the three questions on spontaneity. Only 16 percent of the husbands and 19 percent of the wives in the current sample (as opposed to 48% in the MR study) found their behaviors during abstinence to have a bad effect on their relationship. The overall satisfaction of the current couples in the use of NFP was (by percent) at least 20 percent higher than the MR couples satisfaction.

The more positive response to the use of NFP in the current study could be due to the use of “modern” methods of NFP in comparison with the older BBT method. This could be related to the fact that the more modern methods require less days of abstinence. According to previous studies, the BOM requires on average about 12 days of abstinence out of a 28-day menstrual cycle for couples who are avoiding pregnancy (World Health Organization 1987). Another plausible reasons could be that the current study couples were using NFP in a different time period (i.e., after the sexual revolution) and had a more secure sense of wanting to use NFP. Furthermore, modern NFP teachers are trained how to help couples understand and cope with abstinence. The current study is flawed in that it only had a 24

percent response rate. The other 76 percent of the NFP couples users could have been much less satisfied with their use of NFP and failed to respond to the survey because of their dis-satisfaction. The study respondents are by majority, white, Roman Catholic, educated, and have relatively good incomes. Whether these characteristics would alter the results to the positive is not certain. The respondents in the WHO five-country study of BOM who lived in the less developed countries tended to express more satisfaction with NFP than those in the developed countries (World Health Organization 1987).

The percent satisfaction with the use of NFP among the men and the women users in the current study is slightly lower than the (good to excellent) rated satisfaction found among the 725 female (98%) and male users (97%) of the Ovulation Method of NFP in the five-country World Health Organization study (World Health Organization 1985). However, the reported satisfaction in the current study is higher than that found in a study (Oddens 1999) with eighty-one European female ever users of NFP (72%) and a study (Boys 1988) with 424 US female users of NFP (72%). The difficulty in comparing these figures (which are close to the satisfaction rated in the MR study) is that it is unknown what type of NFP these respondents actually used. These studies did not list a breakdown of the actual NFP methods and to whether they were using a modern method and how they were taught NFP. Studies that randomly select NFP users from the general population will find that the majority who list the use of NFP are using what they think is calendar "rhythm" (Fehring and Schlidt 2001; Piccinino and Mosher 1989). In fact, they are usually are not using rhythm but some self-designed formula of counting to day 14 and maybe or maybe not avoiding intercourse on that day. A better sense of satisfaction with the use of NFP will come from couples that are taught and are using modern forms of NFP. Furthermore, "ever users" of NFP might include people who were dissatisfied with their self-designed form of rhythm and are now using some other method of family planning. NFP is more than just avoiding intercourse on days of fertility but also learning how to live with one's fertility and with one's spouse's fertility.

The majority of the couples in this current study expressed positive responses in learning to live with their fertility through NFP. Over 99 percent of the wives expressed that they learned more about their fertility, 78 percent felt it had a good effect on their communication, 72 percent expressed that it increased their self-mastery over sexual urges, 79 percent reported that it increased their sexual intimacy, and 88 percent recorded that it increased their spiritual well-being. These quantitative responses reflect the positive responses to practicing NFP that have been expressed by women NFP users in previous qualitative studies (Borkman and Shivanandan 1984; Fehring and Lawrence 1994; McCusker 1977; Tortorici 1979). The positive benefit of sex being more pleasurable with the use of NFP in the current study is also reflected in the responses by the female respondents in the European study (Oddens 1999), in which NFP users rated sexual pleasure higher than those using condoms, oral contraceptives, and the intrauterine devices and rated that NFP increased their sex drive higher than those using condoms, oral contraceptives, intrauterine devices, and sterilization. Furthermore, 100 percent of the subjects in the European study did not have concerns about health risks as compared to those using other methods of contraception.

Future studies are needed to compare users of modern methods of NFP with other methods of family planning. The positive responses to increased communication, self-mastery, fertility awareness, sexual

pleasure, and spiritual well-being expressed by the NFP users in the current study challenges other researchers to include these dynamics in future comparative studies. These positive dynamics also challenges health professionals and others who are interested in marriage and families to look further into how these dynamics might strengthen marital and family life. Future studies are needed to measure these dynamics across time, i.e., from initiation of use through at least 1 year of use and more.

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