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Knowledge and Attitudes Regarding the Menstrual Cycle, Oral Contraceptives, and Sport Performance: The Conceptualization and Development of a Questionnaire for Athletic Coaches

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KNOWLEDGE AND ATTITUDES REGARDING THE MENSTRUAL CYCLE, ORAL CONTRACEPTIVES, AND SPORT PERFORMANCE: THE CONCEPTUALIZATION AND DEVELOPMENT OF A QUESTIONNAIRE FOR ATHLETIC COACHES

BY

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ABSTRACT

The purpose of this study was to construct a questionnaire for athletic coaches that measures (1) general knowledge of the menstrual cycle (MC) and oral contraceptives (OC); (2) specific knowledge of athletes' MC and OC use; and (3) beliefs about the MC, OC use, and sport performance. Focus groups comprising coaches and athletes first assisted in developing items for the questionnaire. Subject matter experts from the field of gynecology further judged the quality of items on the general knowledge portion of the questionnaire. The questionnaire was completed by 207 male (n = 85) and female (n = 122) coaches of middle school, high school, and collegiate teams from across the southeastern United States. Coaches' scores on the 24-item general knowledge section of the questionnaire ranged from 8 to 83 (maximum score available = 90). Female coaches scored significantly higher than did male coaches on the overall general knowledge test, as well as on both subscales of the test (MC and OC subscale). Significant main effects were also found according to the sport coached, the age of the coach, and the ages of the athletes. An item analysis was performed on the general knowledge test to determine item difficulty, item discrimination, and internal consistency. General knowledge test items require little revision and Cronbach's coefficient alpha for the overall test is 0.94 (MC subscale, a = 0.93; OC subscale, a = 0.84). Responses to items assessing specific knowledge of athletes' MC and OC use proved difficult to measure and to interpret with a reasonable degree of validity. However, in general, female coaches had more knowledge about their athletes' MC and OC use than did male coaches. Moreover, results from a series of logistic regression analyses indicated that gender may be useful in predicting the outcome of knowledge on various items. Responses to the final section of the questionnaire (items assessing coach beliefs) suggest the salience of investigating this research area. Primarily, coaches view the MC as a source of stress for athletes, coaches believe that the MC impairs sport performance, and coaches want documentation of monthly performance change patterns. Recommendations for future research endeavors and considerations of reliability and validity are also discussed.

CHAPTER 1

A FOUNDATION FOR UNDERSTANDING THE MENSTRUAL CYCLE

Defining the Menstrual Cycle and Related Terms

The term *menstruation* describes the periodic discharge of the endometrium of the uterus (uterine lining) as menstrual blood and tissue (Stoppard, 1994; Willson, Beecham, & Carrington, 1966). This sloughing of the uterine lining, lasting approximately five days, is often referred to by women as their *period* (Steele, 1997). Menstruation, or the menstrual period, is only one of several events that occur during the longer, ongoing process known as the menstrual cycle.

The *menstrual cycle* is the interval of time marked by the first day of one period to the first day of the next period. The number of days included in that interval may be as few as 20 or as many as 45 (Diaz, Laufer, & Breech, 2006; Weideger, 1975). Earlier accounts of menstrual cycle length document 26 to 30 days as typical variation (Willson et al., 1966), whereas more recent literature cites 21 to 34 or 35 days as a typical range for estimating cycle length (Diaz et al., 2006; Steele, 1997). Despite the amount of individual variation in menstrual cycle length, an estimate of 28 days is consistently reported as the statistical average from the onset of one period of bleeding to the onset of the next period of bleeding (Lin & Barnhart, 2007; Steele, 1997; Stoppard, 1994; Weideger, 1975).

A complete scientific understanding of the mechanisms involved in the menstrual cycle requires an in-depth investigation into: (1) the anatomy of the brain and corresponding functions of brain centers; (2) the anatomy of the human female reproductive system and corresponding changes in the ovaries, uterus, cervical mucus, and blood; (3) the presence of hormones, including knowledge pertaining to amount, function, and time of release; and (4) the complex interaction of a host of additional factors that are better addressed from a

medical viewpoint. For the purposes of this paper, a brief and simplified model of the physiology and biochemistry of the menstrual cycle will be presented in order to provide a foundation for understanding subsequent discussion about concomitant changes in other physiological or systemic areas, psychological constructs, and behavioral modes of the human female.

Phases of the Menstrual Cycle

Primarily regulated by the hypothalamus and the anterior pituitary gland in the brain and maintained by feedback from the ovaries and uterus, the menstrual cycle may be elaborated upon in terms of distinct events or phases. The phases cited by practitioners and researchers differ in terminology based upon the area of the female body being investigated, however, the various terms all describe the same 28-day menstrual cycle.

When researchers focus upon the anterior pituitary gland function, the menstrual cycle is discussed in terms of the hormones released during those 28 days—follicle-stimulating hormone (FSH) and luteinizing hormone (LH). The menstrual cycle is also described based upon the cell structures developed in the ovaries (follicle and corpus luteum) as a response to the hormones secreted by the anterior pituitary gland. Both of these perspectives yield the terms *follicular phase* and *luteal phase*. If the focus is upon the output function of the ovaries, the release of hormones again allows for a distinction in phase terminology—the *estrogen* (or *estrogenic*) *phase* and the *progesterone* (or *progestational*) *phase*. Lastly, if the uterus is the primary focus of researchers, the menstrual cycle comprises phases based upon the changing endometrium—*menstrual phase*, *proliferative phase*, *ovulatory phase*, *secretory phase*, and *premenstrual phase* (Anderson, Hall, & Martin, 2000; Doria, 1999; Steele, 1997).

When represented graphically, each of these models may mark the midpoint of the cycle (day 14) to indicate the point of ovulation (release of an egg from a mature follicle). Figure 1.1 presents four graphic depictions of the menstrual cycle based upon these alternative points of focus. The first graph charts FSH and LH released by the anterior pituitary gland throughout the cycle. Secondly, ovarian hormone levels of estrogen and progesterone are charted across the 28-day cycle. The third graph depicts the activities of the ovary engaging in follicle formation, ovulation, and corpus luteum formation. Lastly, the

changing endometrium inside the uterus is drawn to indicate tissue sloughing or the degeneration of the uterine wall during the menstrual phase and then growth or the thickening of the uterine wall across latter phases. An elaboration of each phase and the accompanying roles of the anterior pituitary gland, ovaries, and uterus follow Figure 1.1.

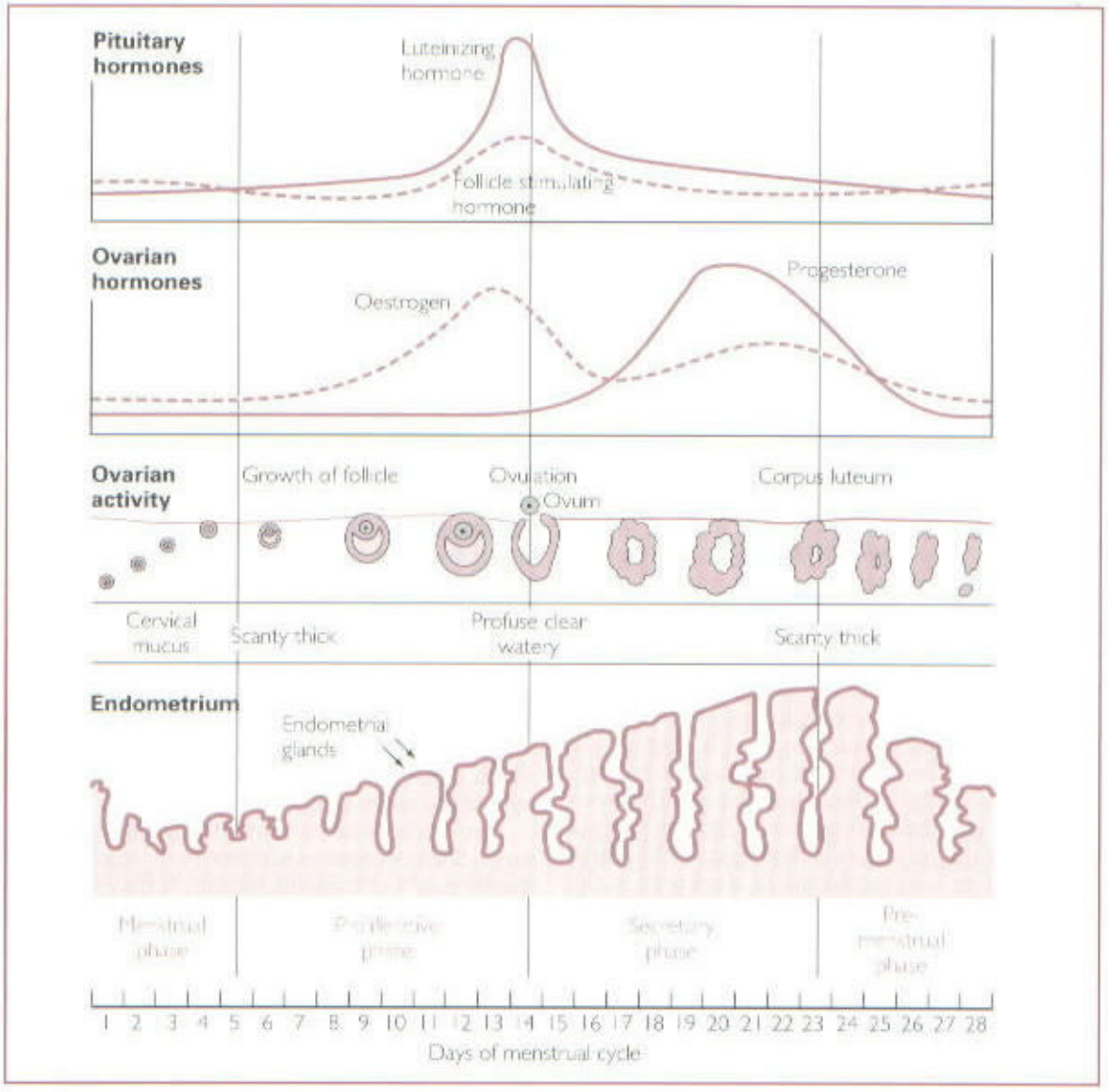


Figure 1.1. Alternative Representations of Phases of the Menstrual Cycle
(From Steele, 1997, p. 394).

Days 1 through 5 form the *menstrual phase* (also known as menstruation, period, flow, and menses) wherein the lining of the uterus disintegrates and is shed as blood, endometrial tissue, tissue fluid, and mucus (Steele, 1997). Ovarian activity is minimal and, consequently, ovarian hormonal levels of estrogen and progesterone are relatively low (Doria, 1999; Lein, 1979). When estrogen levels are low, the anterior pituitary gland facilitates the release of follicle-stimulating hormone (FSH) over luteinizing hormone (LH)—this process actually occurs late in the previous cycle and continues through most of the menstrual phase (Lein, 1979).

Days 6 through 12 mark the *proliferative*, *estrogenic*, or *follicular phase*. During this time, the FSH and LH secreted by the anterior pituitary gland stimulate the formation of fluid-filled sacs or cell clusters called follicles (Doria, 1999; Lein, 1979; Stoppard, 1994). Each follicle houses a developing ovum (egg), but only one follicle will reach full maturity (Doria, 1999; Lein, 1979). The ovaries take turns in performing this function from cycle to cycle so that one ovary is resting during every follicular phase; however, in cases where a female has only one ovary, the ovary will partake in follicle formation every cycle (Lein, 1979). FSH then prompts the follicles inside the ovary to release estrogen. Estradiol, the most active of three different estrogenic hormones, actually plays the crucial role in the menstrual cycle; however, the term estrogen is more commonly used for description (Doria, 1999; Willson et al., 1966). This estrogen release causes the uterine walls (endometrium) to thicken and blood vessels to approach the lining of the uterus (Anderson et al., 2000; Doria, 1999). The rising level of estrogen inhibits secretion of FSH while promoting a marked rise in LH. This LH surge allows for the maturity of one follicle (Lein, 1979; Stoppard, 1994).

Days 13 through 15 refer to the *ovulatory phase* of the menstrual cycle. Approximately 16-24 hours following the peak in LH—others estimate 30 hours (Steele, 1997)—the mature follicle ruptures and releases the ovum it has developed (Asso, 1983; Stoppard, 1994). Fertilization can occur within this window of time (Doria, 1999). The event known as ovulation (the actual release of the ovum) is typically placed at day 14.

Days 16 through 23 compose the *secretory*, *progestational*, or *luteal phase* wherein the empty follicle transforms its endocrine cells into a structure called a corpus luteum. This

mass of tissue secretes large amounts of progesterone and some estrogen (Doria, 1999; Lein, 1979). Progesterone maintains the thickening of the uterine walls (Asso, 1983; Steele, 1997) and causes the cells of the uterus to release other hormones and enzymes to prepare the endometrium for implantation of a fertilized ovum (Anderson et al., 2000; Doria, 1999; Stoppard, 1994).

Days 24 through 28 form the *premenstrual phase*. If a fertilized ovum is not implanted in the uterine lining, the corpus luteum degenerates and estrogen and progesterone levels decline (Doria, 1999; Lein, 1979). This drop in hormones results in spasms of the arterioles that cause a breakdown of the endometrium (Steele, 1997; Stoppard, 1994). Finally, high concentrations of prostaglandins cause the uterine muscles to contract, which sheds the lining as tissue, mucus, and blood (Asso, 1983; Lein, 1979; Stocker, 1995; Stoppard, 1994). Menstruation (bleeding) has again commenced and the female is returned to day 1 of the ongoing menstrual cycle. Figure 1.2 offers a succinct model of the hormonal changes occurring during the menstrual cycle.

It is important to understand that the patterns of hormonal changes and the days of the cycle marking various phases are simply generalizations and estimates across the female population. Oral contraceptives, for example, alter the hormonal profiles of the female menstrual cycle by inhibiting FSH and LH production (Richardson, 1992). This change in the role of pituitary hormones and the fixed levels of synthetic estrogen and progesterone provided by oral contraceptives prevents ovulation and changes the endometrium inside the uterus (Everett, 1997).

For reasons other than oral contraceptive ingestion (inadequate LH surge, for example), some women also experience anovulatory cycles wherein ovulation does not occur. The corpus luteum responsible for secreting large amounts of progesterone during the luteal phase is not formed when ovulation fails to occur; hence, the biochemical, physiological, and physical effects typically associated with the luteal phase are absent in women with anovulatory cycles (Lein, 1979).

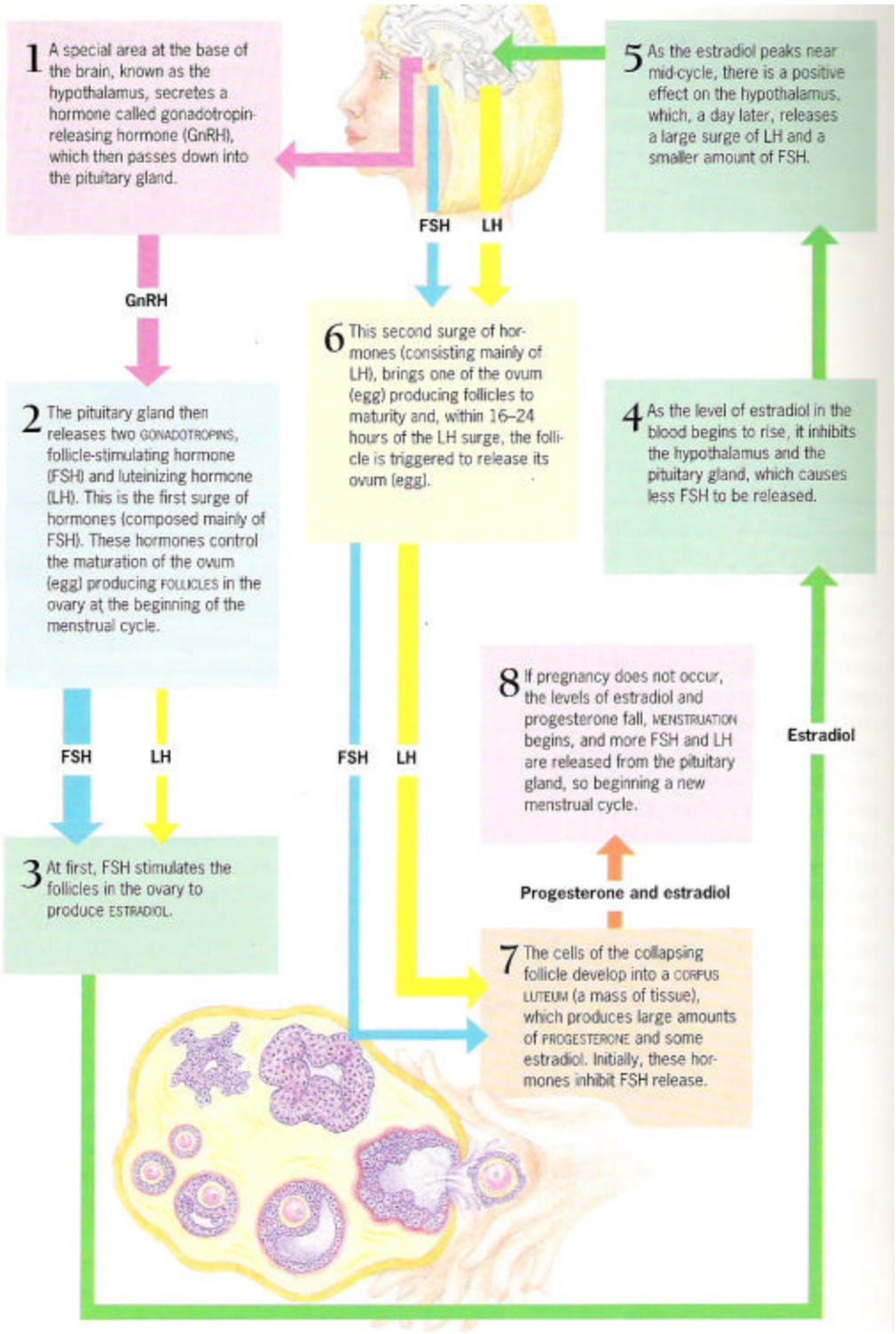


Figure 1.2. A Model of Hormonal Changes during the Menstrual Cycle
(From Stoppard, 1995, p. 88).

Understanding the menstrual cycle is further complicated by variation in cycle length across different women and within the same woman across her menstrual history. The 5-day bleeding period and 28-day complete menstrual cycle are only offered as average time frames. However, regardless of when ovulation occurs in each woman, the time from that day until the next period of bleeding seems to remain constant at 14 days (Lein, 1979). It is the first half of the cycle that bears the changes in duration of phases. Lein (1979) states that this "rather curious feature of the cycle…means that ovulation always occurs about 14 days before the beginning of the next menstrual period, no matter how long the entire cycle may be" (p. 51). A model to exemplify variation in cycle length with consistency in luteal phase length is shown in Figure 1.3. In this model, the menstrual period is assumed to last 5 days, the follicular phase includes the day of ovulation, and the luteal phase spans the day following ovulation to the last day of the premenstrual phase.

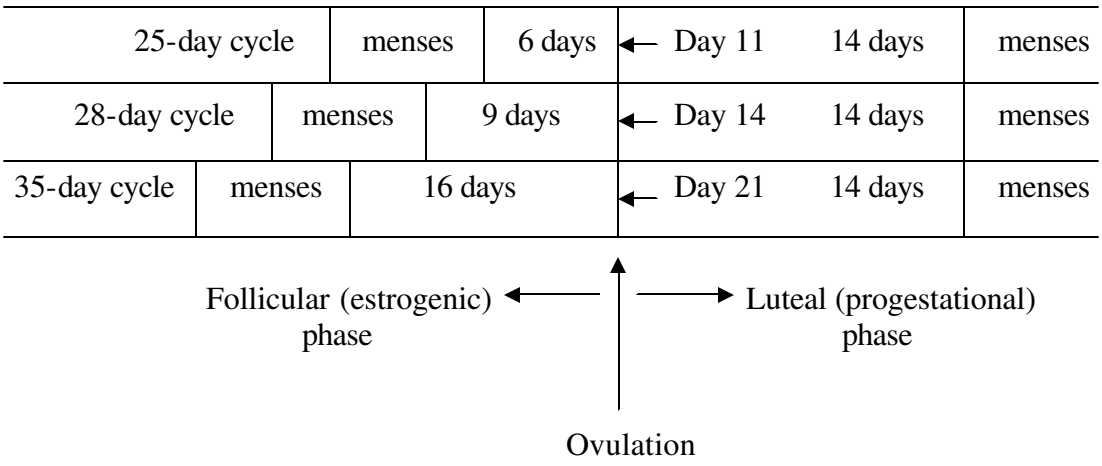


Figure 1.3. Variation in Overall Cycle Length with Constant Luteal Phase
(Adapted from Lein, 1979, p. 53).

Difficulty in understanding the menstrual cycle stems not only from the actual variation in female biochemistry and physiology, but also from the numerous ways in which these differences are described in the literature. Sommer (1992) admits that "[t]here is great

inconsistency in menstrual-cycle phase definition across different studies" (p. 41). Accordingly, the next section attempts to clarify widespread differences with a brief, albeit not exhaustive, summary of related terms.

Summary of Menstrual Terminology

As researchers, practitioners, and women, in general, utilize various phrases to describe the same events occurring within the menstrual cycle, it is important to recognize synonymous terminology in data presentation. Moreover, additional terms are used to encompass two or more specific phases of the menstrual cycle.

Research findings will be presented throughout this paper in accordance with the terminology chosen by the accompanying author(s). The span of days provided for the various phases are estimates and it will be noted when a researcher refers to the same phase terminology but subscribes to a different span of days. For example, as described earlier in this paper, days 15-28 of the average 28-day cycle pertained to the ovulatory phase (day 15), the luteal phase (days 16-23), and the premenstrual phase (days 24-28). However, for the average 28-day cycle in Figure 1.3, Lein (1979) utilizes the sole term luteal phase to encompass all of days 15-28.

To simplify the review of menstrual cycle phase research and subsequent data interpretation, Table 1.1 presents a glossary of terms for quick reference.

Table 1.1. Menstrual Cycle Glossary of Terms

Amenorrhea – The absence of menstruation.
Estrogenic Phase – Days 6-12 of the menstrual cycle. Named because primary ovarian output function is release of estrogen. Also called estrogen phase.
Eumenorrhea – A condition of regular patterns of menstrual cycle functioning.
Follicular Phase – Days 6-12 of the menstrual cycle. Named because primary pituitary gland function is release of follicle-stimulating hormone; also named because primary ovarian function is development of follicles.

Table 1.1. continued

Intermenstrual Phase – Days 6-23. Excludes the premenstrual and menstrual phases.

Luteal Phase – Days 16-23 of the menstrual cycle. Named because primary pituitary gland function is release of luteinizing hormone; also named because primary ovarian function is development of corpus luteum.

Menarche – A female's first menstrual period; the onset of menstruation.

Menses – See menstrual phase.

Menstrual Cycle – Days 1-28. The interval of time marked by the first day of one period to the first day of the next period.

Menstrual Period – See menstrual phase.

Menstrual Phase – Days 1-5 of the menstrual cycle. The lining of the uterus is discharged as blood and tissue.

Menstruation – See menstrual phase.

Oligomenorrhea – A condition of irregular patterns of menstrual cycle functioning.

Ovulation – Day 14 of the menstrual cycle. The release of an ovum from a follicle.

Ovulatory Phase – Days 13-15 of the menstrual cycle. Window of time during which ovulation occurs and fertilization of an egg is possible.

Paramenstrual Phase – Days 24-5. Includes the premenstrual and menstrual phases.

Paramenstruum – See paramenstrual phase.

Perimenstrual Phase – See paramenstrual phase.

Period – See menstrual phase.

Postmenstrual Phase – See intermenstrual phase.

Premenstrual Phase – Days 24-28 of the menstrual cycle.

Premenstruum – See premenstrual phase.

Table 1.1. continued

Progestational Phase – Days 16-23 of the menstrual cycle. Named because the primary ovarian output function is the release of progesterone. Also called progesterone phase.

Proliferative Phase – Days 6-12 of the menstrual period. Named because the glands in the endometrium are regenerated to begin thickening the uterine walls.

Secretory Phase – Days 16-23 of the menstrual period. Named because the glands in the endometrium are continuing to thicken and are being filled by hormonal secretions in preparation for the implantation of a fertilized ovum.

Changes Associated with the Menstrual Cycle

It is admittedly difficult to establish a causative link between the menstrual cycle and simultaneous changes that a female may experience over the course of 28 days. To be viewed as cyclical patterns, researchers must demonstrate that the observed changes would not otherwise occur in the same female absent of her cycle, in men, or in non-cycling females (e.g., due to amenorrhea, menopause, or surgical removal of the ovaries). Asso (1983) remarks that "[m]ost studies simply compare the same or different women at several points in the cycle" and that this "does not guarantee that the same variations do not exist independently of the cycle" (p. 31).

Despite the limitations of such studies, researchers have explored a vast array of variables and their tendency for fluctuating across the menstrual cycle. The following three sections offer a review of systemic, psychological, and behavioral changes associated with the menstrual cycle as they have been investigated within the general female population. Studies involving athletes or exploring athletic and motor coordination indices are presented in the next chapter, as they permit specific implications for sport performance.

Systemic Changes

Apart from the aforementioned physiological and biochemical changes associated with the feedback mechanisms between the brain and ovaries throughout the menstrual cycle, there are several concomitant, arguably resultant, changes that occur in other physiological or systemic domains within the female body. These include changes in: (1) pain symptoms; (2) fluid retention, body weight, and swelling; (3) carbohydrate and alcohol metabolism; (4) potassium and sodium concentration; (5) zinc and copper concentration; (6) gastrointestinal function; (7) allergic reactions; (8) asthma symptoms; (9) sensory sensitivity; and (10) body temperature.

Pain symptoms. The most commonly reported changes involve pain symptoms during the menstrual period—a condition known as dysmenorrhea. Dysmenorrhea may be classified as primary (occurring in the absence of pelvic abnormality) or as secondary (occurring with the presence of pelvic abnormality) (Willson et al., 1966). Because the presence of pelvic abnormality is a confounding factor in identifying pain symptoms and establishing symptom causation, secondary dysmenorrhea is not the focus of this discussion.

As noted earlier, during the premenstrual phase (just prior to menstruation), prostaglandins stimulate the uterine muscles to contract so that the disintegrating endometrium may be expelled. When prostaglandins are present in unusually high concentrations, the contractions of the uterus are more frequent (Anderson et al., 2000; Berger, 1988; Stoppard, 1994). Moreover, the spasms in the blood vessels intermittently restrict blood flow, causing a decrease in oxygen supply to the muscle. This series of events, similar to those inducing labor contractions, has been linked to menstrual pain (Stoppard, 1994; Wagner & Kenreigh, 1999). Gynecologist Veronica A. Ravnikar contends that "a painful period is like a mini heart attack of the uterus, where blood to the uterine muscle gets cut off" (Stocker, 1995, p. 72).

The exact causes of primary dysmenorrhea are not known, and the list of proposed hypotheses to explain potential causative factors is too extensive and complex to suit the purpose of this section—see Willson et al. (1966) for a discussion of the etiology of primary dysmenorrhea. Suffice it to say that internal events occurring over the course of a woman's menstrual cycle lead to menstrual periods that are frequently accompanied by pain.

Dysmenorrhea is often reported more specifically as lower abdominal pain, pelvic pain, cramping, backaches, headache or migraine, bladder irritability, pallor or fainting, and pain in the thigh muscles—symptoms that are occasionally accompanied by nausea, vomiting, and diarrhea (Anderson et al., 2000; Berger, 1988; Lin & Barnhart, 2007; Norris & Sullivan, 1983; Steele, 1997; Stoppard, 1994; Wagner & Kenreigh, 1999; Weideger, 1975; Willson et al., 1966). Dysmenorrhea can last for the duration of the menstrual period (Norris & Sullivan, 1983), although it more typically persists for only the first two to three days of the period (Anderson et al., 2000; Lin & Barnhart, 2007; Stoppard, 1994).

An investigation of studies reporting the incidence of dysmenorrhea yields a wide range of estimates—for example, Ylikorkala and Dawood (1978) offer an estimate of 52%, the World Health Organization (1981) estimates 60%, and Moos (1968) surmises that anywhere between 25% and 100% of women suffer from dysmenorrhea. More recently, Lin and Barnhart (2007) report that widespread estimates of dysmenorrhea prevalence range from 40% to 90% and are due to the variation in the ages of women investigated and methods of assessment.

Despite the inconsistency in estimates of prevalence, women who struggle with the pain of menstrual periods know that dysmenorrhea can be rather debilitating. Ylikorkala and Dawood (1978) recognized that, as the most frequently reported gynecologic complaint, dysmenorrhea is the leading cause for missed work hours and school days among women. Berger (1988) reported that an estimated 140 million working hours are missed each year in the United States due to dysmenorrhea, and Golub (1992) indicated that between 10% and 14% of females in their late teens and early twenties stay home from school every month because of painful periods.

While Asso (1983) maintains that there is considerable evidence to support that pain symptoms are at their worst during menstruation, pain symptoms are also reported before and after the menstrual period. The premenstrual pain experienced prior to menstruation may include dull pain in the lower abdomen, feelings of fullness, headache, breast tenderness, and fluid retention (Andrews, 1997; Asso, 1983; Lein, 1979). These symptoms resemble those listed as characteristic of dysmenorrhea, but premenstrual pain is relieved by the onset of menstruation. Dalton (1964) differentiated pain during menstruation (spasmodic

dysmenorrhea) from pain prior to menstruation (congestive dysmenorrhea) and upheld that a female would not experience both in any one menstrual cycle. The underlying theory to support this contention is an opposite imbalance in the estrogen/progesterone ratio—that is, an excess of progesterone relative to estrogen levels is believed to cause menstrual period pain (dysmenorrhea) whereas an excess of estrogen relative to progesterone levels is believed to cause premenstrual pain. Nevertheless, as with dysmenorrhea, the exact etiology of premenstrual pain is not clear.

The last category of pain symptoms occurs mid-cycle or intermenstrually (termed *Mittelschmerz*—German for *midpain*) and is associated with ovulation (Asso, 1983; Steele, 1997). As the follicle ruptures and releases the egg it has developed, a little blood may be expelled into the abdominal cavity (Lein, 1979; Steele, 1997). This blood is irritating to the abdomen and may cause the acute mid-cycle pain, although it is not known definitively and other factors may play a causative role. Other symptoms such as backache and bloating may accompany the abdominal pain (Asso, 1983) and, if follicular bleeding is excessive, pain symptoms may be so severe as to mimic acute appendicitis (Lein, 1979).

Still, a more extensive and incapacitating package of symptoms occurs in some women, leading to a clinical diagnosis of premenstrual syndrome (PMS). Because PMS not only comprises pain symptoms but also other systemic, psychological, and behavioral symptoms, it will be presented later in a section devoted exclusively to its elaboration.

Fluid retention, body weight, and swelling. Asso (1983) maintains that an increase in fluid retention is "one of the best-known and most often reported symptoms of the premenstrual phase" (p. 35). Several researchers have demonstrated this pattern among women (De Marchi, 1976; Doty, Huggins, Snyder, & Lowry, 1981; Gruba & Rohrbraugh, 1975; Janowsky, Berens, & Davis, 1973; Silbergeld, Brast, & Noble, 1971; Voda, 1980; Wilcoxon, Schrader, & Sherif, 1976) while two of these studies included men and found no pattern of fluid retention as compared to the women in these studies (Doty et al., 1981; Wilcoxon et al., 1976). Progesterone withdrawal may account for the increase in fluid retention, as women using combined oral contraceptive pills do not seem to exhibit the same cyclical variations (Asso, 1983).

Perhaps related to an increase in fluid retention is an increase in body weight and swelling of the face, breasts, hands, and feet during the premenstrual phase. This premenstrual weight gain results in an increase of approximately 1 to 5 pounds or more (Freedman, Ramcharan, Hoag, & Goldfien, 1974; Janowsky et al., 1973; Smith, 1975).

A link between weight gain and diet may also exist among menstruating women based upon changing eating habits across the menstrual cycle. In general, studies have found that protein intake is lowest during the premenstrual phase and the beginning of the menstrual phase (Abraham, Beumont, Argall, & Haywood, 1981); overall food intake is greater in the 10 days following ovulation than in the 10 days preceding ovulation (Dalvit, 1981); and cravings for sweet foods increases during the premenstrual phase (Norris & Sullivan, 1983; Smith & Sauder, 1969; Sutherland & Stewart, 1965). The increased craving for sweet foods typically results in the ingestion of large quantities of refined sugars and carbohydrates. Excessive amounts of refined sugars and carbohydrates in the bloodstream cause an increase in insulin and brain serotonin levels (Norris & Sullivan, 1983). Insulin prevents the kidneys from excreting salt while serotonin triggers the release of a brain hormone (ACTH) that stimulates the production of salt-retaining hormones in the adrenal glands. The adrenal glands will also release these salt-retaining hormones in greater amounts due to stress. As poor nutrition weakens the body's resistance to stress, sugar intake and stress may compound the hormonal effects of the adrenal glands that control salt retention by the kidneys. A diet high in refined sugars and carbohydrates, as well as in salt, that causes salt retention by the kidneys may result in fluid retention and body swelling, with an accompanying increase in body weight.

A simplified model linking sweet cravings and subsequent fluid retention, swelling, and weight gain is depicted in Figure 1.4 as a summary of the above discussion. The mediating mechanisms to account for the links from sugar/carbohydrate intake and increased insulin to weight gain are rather complex and not included in this model. For example, insulin encourages the body to store calories as fat, and excess insulin in the body may cause decreased sensitivity to insulin among cells. This leads to a lowered production of insulin receptors, causing people to become insulin resistant. Insulin resistance has been tied to stubborn obesity as well as to several other risk factors for poor health and/or death, such as

high blood pressure, diabetes, and cardiovascular disease (Weil, 2000). Since it is well-documented that indulgence in refined sugars and carbohydrates triggers excessive insulin release, and that insulin present in the body in high quantities causes irritating and even life-threatening problems, the main objectives for assessing the role of the menstrual cycle are: (1) to determine the underlying cause(s) for the occurrence of sweet cravings during the premenstrual phase; and (2) to determine the method(s) by which females can alleviate these cravings.

Women who use oral contraceptive pills tend to experience less fluctuation in weight, just as with fluid retention (Freedman et al., 1974; Moos, 1969; Paige, 1971). However, this finding is not true for all pill users—symptoms actually worsen for some women using oral contraceptive pills (Wagner & Kenreigh, 1999).

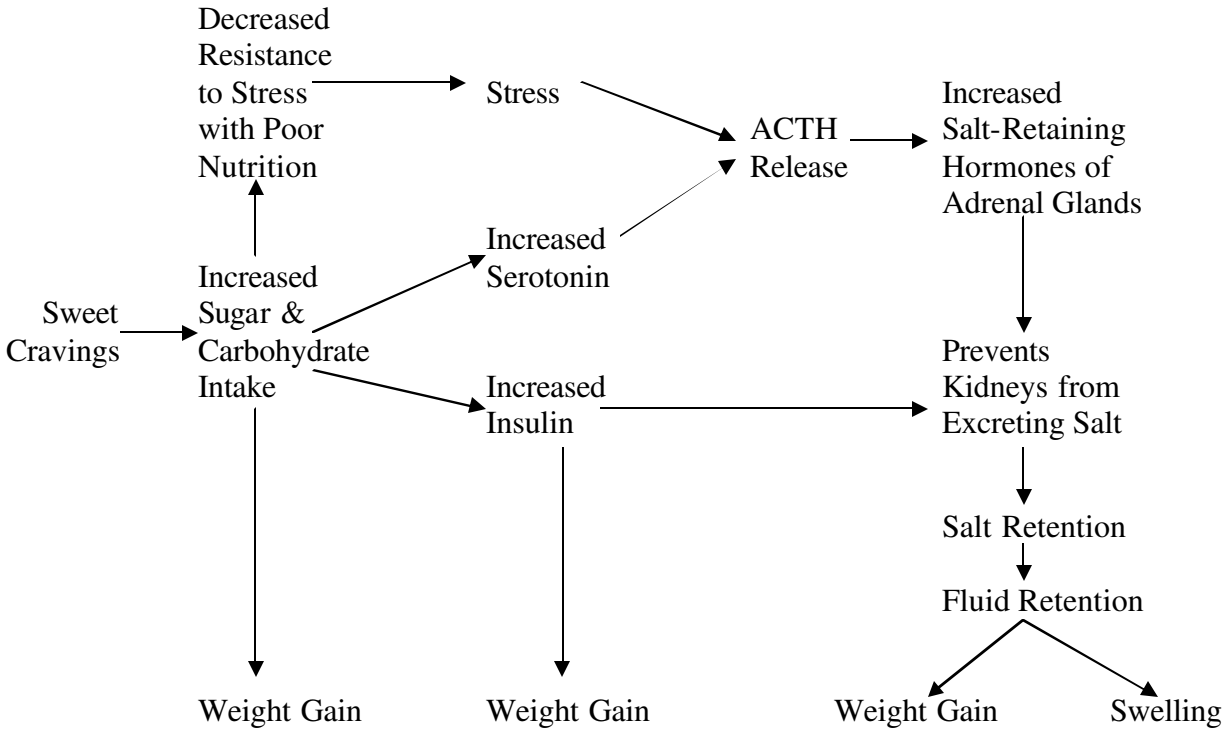


Figure 1.4. Model Linking Sweet Cravings to Fluid Retention, Swelling, and Weight Gain

Carbohydrate and alcohol metabolism It seems that the female body varies in the way it metabolizes certain substances during the course of the menstrual cycle. A study by Morton, Additon, Addison, Hunt, and Sullivan (1953) found carbohydrate tolerance to be lowest during the menstrual phase as compared to a heightened carbohydrate tolerance during the premenstrual phase. Reid and Yen (1981) contend that this may account for the premenstrual increase in cravings for sweet foods. More specifically, Morton et al. (1953) observed a hypoglycemic response to sugar tolerance tests during the premenstrual phase. This *reactive hypoglycemia* results in pathologically low blood sugar and occurs when the body overreacts to the ingestion of foods and beverages that would otherwise sharply raise blood sugar levels (refined sugars and starches, alcohol, and caffeine, for example). In some people and, apparently, in women during the premenstrual phase, the pancreas secretes so much insulin that blood sugar levels drop dramatically within a few hours and the person experiences hypoglycemia (Baumel, 2000). Hypoglycemia may be characterized by mental confusion, faintness, fatigue, dizziness, headache, spasms, yawning, blurred vision, and cold spells. Because the brain relies exclusively upon blood sugar for energy, the adrenal glands often attempt to compensate for the low blood sugar by secreting sugar-mobilizing stress hormones to prompt the liver to release more glucose. These hormones compound the negative symptoms associated with hypoglycemia by causing nervousness, trembling, palpitations, and, especially, hunger—a hunger that often lures the sufferer back to indulgence of refined sugars and carbohydrates that causes the recurrence of reactive hypoglycemia (Baumel, 2000).

Disrupted glucose metabolism has been linked to premenstrual syndrome (PMS) in mutually interdependent ways—blood sugar imbalances seem to exacerbate PMS symptom prevalence and severity (Abraham, 1983; Rossignol & Bonnlander, 1991) and the prevalence and severity of PMS symptoms seems to create difficulty with blood glucose control (Diabetes and Hormone Center of the Pacific, 2003). Premenstrual regulation of blood glucose levels may be especially difficult among women with Type I diabetes and, moreover, among diabetic women who suffer from PMS—glucose levels may be either too high or too low in the week preceding menstruation. Apart from the increased cravings in sweets and subsequent ingestion of sugars that may account for disruption in glucose

metabolism, some researchers implicate the hormonal effects of estrogen and progesterone on glucose imbalances. High levels of estrogen increase insulin sensitivity, causing abnormally low blood glucose levels. In contrast, high levels of progesterone create temporary insulin resistance wherein insulin is less able to bind to the receptor proteins of cells, causing abnormally high blood glucose levels (Diabetes and Hormone Center of the Pacific, 2003). The mechanisms by which the female hormones have this effect are not yet fully understood.

Like the general female population, diabetic women similarly experience lowered carbohydrate tolerance during the menstrual period. This fluctuation may be associated with more frequent diabetic comas (Southam & Gonzaga, 1965) and increased insulin requirements during menstruation (Magos & Studd, 1985; Southam & Gonzaga, 1965). Strict diet and exercise regimens are often prescribed for addressing these variations in carbohydrate metabolism associated with the menstrual cycle. Among the recommendations for dietary restriction is the limitation or avoidance of ingestion of alcohol—another substance that is metabolized differentially across the menstrual cycle and one that may often interfere with carbohydrate and hormonal metabolism.

In one study, Jones and Jones (1976) provided various doses of alcohol to male and female college students. Accounting for body weight and regardless of the dose of alcohol, women exhibited the highest blood-alcohol levels while in the premenstrual phase as compared to the intermenstrual phase and menstrual phase (when blood-alcohol levels were similar to those measured in the male college students). Women utilizing oral contraceptive pills or hormonal supplements had decreased rates of alcohol metabolism.

Norris and Sullivan (1983) also recognize a reduced tolerance for alcohol among women in the premenstrual phase—a more dangerous phenomenon for women who are inclined to drink alcohol during the premenstrual phase in response to PMS symptoms. The only explanation offered to account for the overall gender difference in alcohol metabolism is that men have a higher proportion of water to body weight than do women, leading to the dilution of alcohol and lower blood-alcohol levels in males (Asso, 1983; Golub, 1992; Jones & Jones, 1976). This hypothesis does not explain the cyclical variation in alcohol metabolism among women, especially since fluid retention is at its peak during the

premenstrual phase. Jones and Jones (1976) speculate that estrogen levels may play a role in moderating alcohol absorption and elimination in a cyclical fashion, but research is needed to demonstrate this contention.

Potassium and sodium concentration. Regulated by the kidneys, potassium is a crucial mineral necessary for muscular contraction and nerve stimulation. It requires a proper balance with another important mineral in the body—sodium (Norris & Sullivan, 1983). Insufficient concentration of potassium in the blood may cause muscle cramping while overall muscle and nerve functioning will be compromised if there is an imbalance between potassium and sodium—excess in one mineral will cause the other mineral to be excreted in the urine. A hypoglycemic condition and a diet high in sodium (salt) intake contribute to potassium loss.

Potassium is also responsible for regulating the body's water balance (Norris & Sullivan, 1983). Perhaps fluctuating potassium levels may account, in part, for changes in fluid retention, swelling, and weight gain, as cyclical variations in potassium and sodium concentrations have been observed in menstruating women. The sodium/potassium ratio is highest during the menstrual phase, when sodium levels are high and potassium levels are low; in contrast, the sodium/potassium ratio is lowest during ovulation, when sodium levels are low and potassium levels are high (De Marchi, 1976). Janowsky et al. (1973) reported earlier that the sodium/potassium ratio was elevated during the premenstrual phase, when weight gain and negative mood states are most likely to occur. Others have also recognized a relationship between sodium/potassium levels and mood changes, in both psychiatric and non-psychiatric samples of women (Bell, Christie, & Venables, 1975). Women who use diuretics to alleviate the fluid retention and weight gain associated with the premenstrual phase may experience potassium deficiency (Norris & Sullivan, 1983). Incidentally, women should know that high blood pressure, diabetes, and liver disease also contribute to potassium deficiency.

Zinc and copper concentration. Zinc is one of the most important minerals required by the body for the synthesis of proteins, growth of cells, formation of connective tissue, and metabolism of other minerals, including copper (Norris & Sullivan, 1983). A surplus of copper in the body, however, can cause zinc deficiency. Some studies have

demonstrated that copper levels are high and zinc levels are low approximately one week prior to menstruation, when depression is apparently more likely to occur. This time frame would overlap the premenstrual phase wherein women report more frequent and severe symptoms. However, it has been proposed that estrogen is responsible for increasing copper and decreasing zinc in the bloodstream. This hypothesis would not explain the high copper to zinc ratio during the premenstrual phase when estrogen levels drop dramatically. Further studies are needed to clarify patterns in zinc and copper fluctuation throughout the menstrual cycle, the underlying causes for any deficiencies, and the effects of deficient states on premenstrual and menstrual symptoms.

Gastrointestinal function. In general, women often experience altered bowel habits or bowel disturbances, like constipation, with the debilitating conditions of dysmenorrhea and PMS (Andrews, 1997; Berger, 1988; Norris & Sullivan, 1983; Steele, 1997). Constipation may be related to the fluid retention characteristic of the premenstrual phase and may cause difficulty in moving the bowels before the onset of menses (Berger, 1988). Lanson (1981) believes that fluid shifts away from the bowel passageway to the walls of the intestine, resulting in stools that are drier than normal. At the onset of menstruation, the fluid levels redress and end the bout of constipation. Sometimes, however, the internal processes attempting to normalize fluid distribution in the bowels result in loose stools for about one to two days of the menstrual period.

More specifically, Wald, Van Thiel, Hoechstetter et al. (1981) measured gastrointestinal transit time as well as estrogen and progesterone levels across the menstrual cycle. The authors found transit time to be significantly longer in the luteal phase when progesterone levels are elevated. Whether high concentration of progesterone causes variation in transit time is not known, however, a similar pattern in gastrointestinal transit time is found during pregnancy, when progesterone levels are also elevated. To date, research is rather limited in the area of gastrointestinal function and menstrual cycle variation.

Allergic reactions. Research in the area of allergies and the menstrual cycle is admittedly scarce; however, cyclical variations have been documented in the literature. Eruptions in skin allergies, including eczema, occur more frequently premenstrually and, to

some degree, during the menstrual phase (Golub, 1992; Southam & Gonzaga, 1965). Symptoms that are reported as being aggravated during menstruation may be explained by a heightened premenstrual sensitivity that is carried over into the menstrual phase (Asso, 1983). Smolensky, Reinberg, Lee, and McGovern (1974) noticed an elevated sensitivity to histamine that increased steadily from the postovulatory phase to the luteal and premenstrual phases, peaked at day one of the menstrual period, and then dropped dramatically. The magnitude of change from the peak at day one of menstruation to mid-cycle is approximately 30% (Golub, 1992). Women who used oral contraceptive pills did not exhibit any cyclical variation (Smolensky et al., 1974).

Other allergic reactions that may occur more frequently during the premenstrual phase include rhinitis (Dalton, 1979), bleeding in the nose (Dunn, 1972), and hay fever.

Asthma symptoms. Although asthma is typically considered an allergic reaction (Asso, 1983; Berger, 1988), it is included here in a separate section because, as it relates to the menstrual cycle, asthma symptom fluctuation may have origins other than allergies. Dalton (1985) maintains that approximately one-third of menstruating women suffer from premenstrual asthma attacks. She remarks that the breathing difficulties, coughing, and wheezing seem to predominate among very young menstruating women and among menstruating women over forty years of age. According to Dalton, the acute premenstrual attacks typically occur very suddenly in the middle of the night, last for a few hours to several days, and then subside with the onset of the menstrual period. Given these circumstances, she contends that the underlying mechanisms provoking the attacks may not be related to allergies. Her stance on premenstrual asthma attacks implies that a certain phase of the menstrual cycle causes the breathing difficulties in women who would not otherwise exhibit them.

Other researchers have observed cyclical patterns among asthmatic women whose symptoms are severely heightened during certain days of the month (Agarwal & Shah, 1997; Chandler, Shuldheisz, Phillips, & Muse, 1997; Eliasson, Scherzer, & DeGraff, 1986; Gibbs, Coutts, Lock, Finnegan, & White, 1984; Godbey, Wolfe, & Beavan, 1997; Hanley, 1981; Juniper, Kline, Roberts, Hargreave, & Daniel, 1987; Mirdal, Peterson, Weeke, & Vibits, 1998; Pauli, Reid, Munt, Wigle, & Forkert, 1989; Rees, 1963; Settipane & Simon, 1989;

Skobeloff, Spivey, Silverman, et al., 1996; Southam & Gonzaga, 1965). This perspective allows for the influence of the menstrual cycle to worsen and/or relieve asthma symptoms among women who would otherwise still exhibit breathing difficulties in their daily lives. For example, Dorhofer and Sigmon (2002) recognize that the menstrual cycle is being investigated, not as a causative factor, but as a "potential mitigating factor in asthma severity and attacks" and that about one-third of women already diagnosed with asthma demonstrate an "exacerbation of asthma symptoms a few days before the onset of menstruation" (p. 3).

Approximately 60% of adult asthmatics are women, but alarmingly, women suffer a disproportionate number of severe attacks, accounting for 75% of hospitalizations for asthma (Godbey et al., 1997; Skobeloff et al., 1996). Interested in the tremendous gender difference, researchers in one emergency room tracked incoming female patients who were admitted for asthma attacks (Skobeloff et al., 1996). The 28-day menstrual cycle was divided into four, 7-day phases based upon fluctuations in serum estradiol levels: (1) preovulatory phase (days 5-11); (2) periovulatory phase (days 12-18); (3) postovulatory phase (days 19-25); and (4) perimenstrual phase (days 26-4). Patients admitted during the time of investigation (n = 182) coincided with the designated menstrual intervals as follows: (1) 20% preovulatory phase; (2) 24% periovulatory phase; (3) 10% postovulatory phase; and (4) 46% perimenstrual phase. Hospital admissions were seldom among women in the postovulatory phase (days 19-25), when serum estradiol is consistently at an elevated level. In contrast, hospital admissions were most frequent among women in the perimenstrual phase (days 26-4), when serum estradiol levels drop abruptly to their lowest point after the sustained peak in the postovulatory phase. Figure 1.5 offers a graphic depiction of the pronounced peaks and valleys of estrogen and progesterone during the menstrual cycle. The phases designated by Skobeloff et al. (1996) have been included in the figure.

Skobeloff concludes that the lungs experience estrogen withdrawal in the perimenstrual phase, and that the sustained elevation of estrogen during the postovulatory phase benefits asthmatic lungs by calming the "destructive overreaction of the immune system to triggers" and by making the lungs less "twitchy" (Godbey et al., 1997, p. 28). Based on this study, the authors conclude that aggravated asthma attacks are not simply the result of fluctuating levels of high and low estrogen, but are induced by the sharp fall in

estrogen that is characteristic of the perimenstrual phase. The abrupt hormonal drop heightens the sensitivity and reactivity of the lungs with such magnitude that asthmatics fail to respond well to their usual medications and require hospitalization.

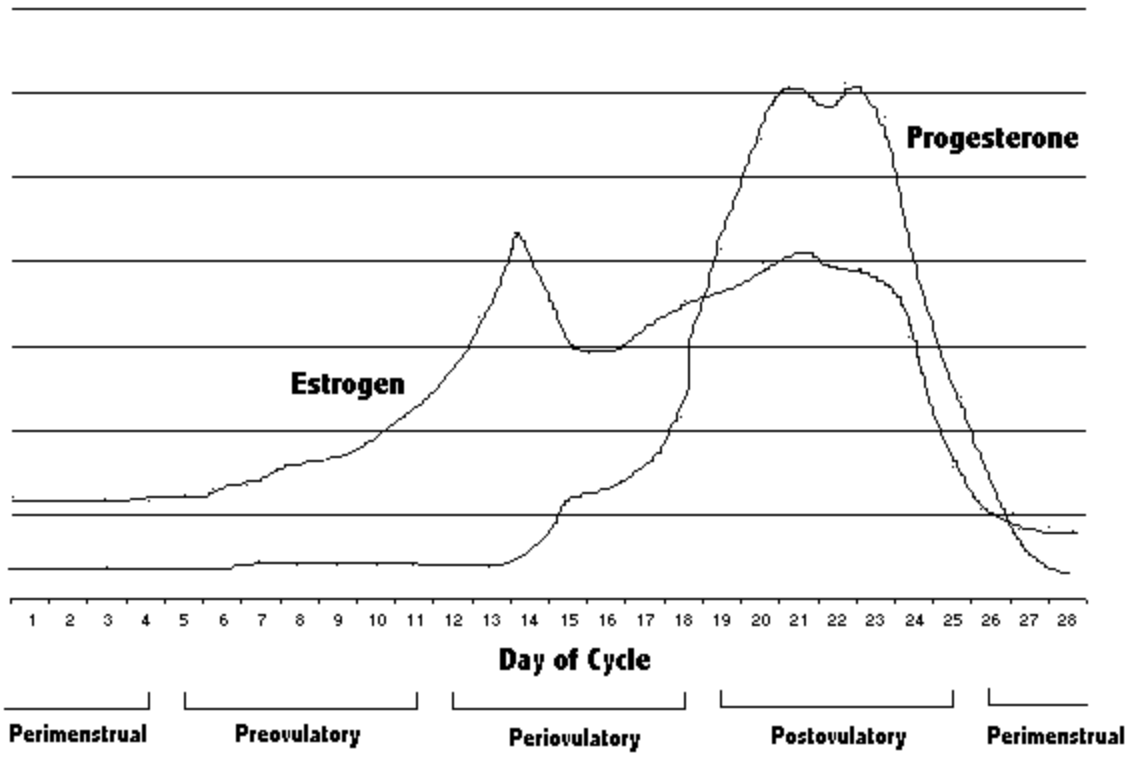


Figure 1.5. Estrogen and Progesterone Levels across the Menstrual Cycle
(Hormones are in different units per ml of plasma. Adapted from Richardson, 1992, p. 4).

Gibbs et al. (1984) do not support the estrogen-asthma connection and instead believe that the decline in progesterone (a smooth muscle relaxant) during the late luteal phase promotes bronchoconstriction and exacerbated asthma symptoms. Other investigators hypothesize that women have heightened awareness and extensive focus on bodily sensations during the premenstrual phase and, moreover, may be more likely to perceive the sensations negatively (Gibbs et al., 1984; Juniper et al., 1987; Sigmon, Fink, Rohan, & Hotovy, 1996; Dorhofer & Sigmon, 2002).

Mirdal et al. (1998) explored the idea that the psychological states of women during the premenstrual phase may play a role in aggravating asthma symptoms. Following six

months of peak air flow measurements and mood inventory scores, 40% of the asthmatic women indicated a worsening of symptoms premenstrually, and 80% of the women revealed psychological hyperreactivity (lower threshold and stronger reaction to stressors) during the premenstruum. The authors surmised that psychological factors may be associated with bronchial symptoms. In support of this contention, some women experience an objective drop in peak expiratory flow or an increase in coughing, wheezing, breathlessness, or chest tightness during the premenstrual phase, but they do not report an exacerbation of asthma symptoms premenstrually (Chandler et al., 1997; Hanley, 1981; Juniper et al., 1987).

At this time, the precise mechanisms associated with premenstrual asthma attacks are not known and further research is certainly warranted (Agarwal & Shah, 1997; Dorhofer & Sigmon, 2002). Other serious medical conditions such as epilepsy, rheumatoid arthritis, pneumonia, and migraine are also being studied for their coincidental timing with the premenstrual phase—whether the cyclical nature of these and other illnesses may be attributed to female physiology or psychology across the menstrual cycle is not yet known.

Sensory sensitivity. There is extensive documentation that the five senses are at their height of sensitivity at the time of ovulation; moreover, sensory studies that included men found no cyclical variations among them (Barris, Dawson, & Theiss, 1980; Diamond, Diamond, & Mast, 1972; Doty et al., 1981; Good, Geary, & Engen, 1976; Henkin, 1974; Mair, Bouffard, Engen, & Morton, 1978; Robinson & Short, 1977; Wong & Tong, 1974). Henkin (1974) contends that the senses are generally more acute during the follicular phase (leading to ovulation) than during the luteal phase (following ovulation). This peak in sensory sensitivity is perhaps a biological mechanism to facilitate the female's receptivity to sex and, hence, to conception (Asso, 1983; Henkin, 1974). Interestingly, women seem to also have decreased responses to pain during the time of ovulation—an additional facilitative factor for encouraging proliferation of the human race (Buzzelli, Voegelin, Procacci, & Bozza, 1968, as cited in Asso, 1983; Tedford, Warren, & Flynn, 1977).

Body temperature. Another distinct physiological mechanism that varies around ovulation is basal body temperature (temperature after waking). It remains relatively lower throughout the follicular phase, drops slightly at the time of ovulation, increases sharply the day following ovulation, and then remains relatively higher throughout the luteal phase (see

Figure 1.6). The jump in nearly 0.4 degrees F or more is believed to be moderated by progesterone. Widely employed in studies, the measurement of basal body temperature is one method for tracking the menstrual cycle and for identifying ovulation (Golub, 1992; Norris & Sullivan, 1983; Walker, 1997), although some researchers believe it is the least reliable method when used alone (Kesner, Wright, Schrader, Chin, & Krieg, 1992; Moghissi, 1992; Power, 1997). Moreover, as discussed earlier, some menstruating women experience anovulatory cycles wherein ovulation does not take place. Under these circumstances, the corpus luteum responsible for secreting large amounts of progesterone during the luteal phase is not formed (Lein, 1979). Insofar as basal body temperature is controlled by progesterone, women with anovulatory cycles would not follow the temperature pattern depicted in Figure 1.6. Other methods would then be necessary for identifying phases of the menstrual cycle.

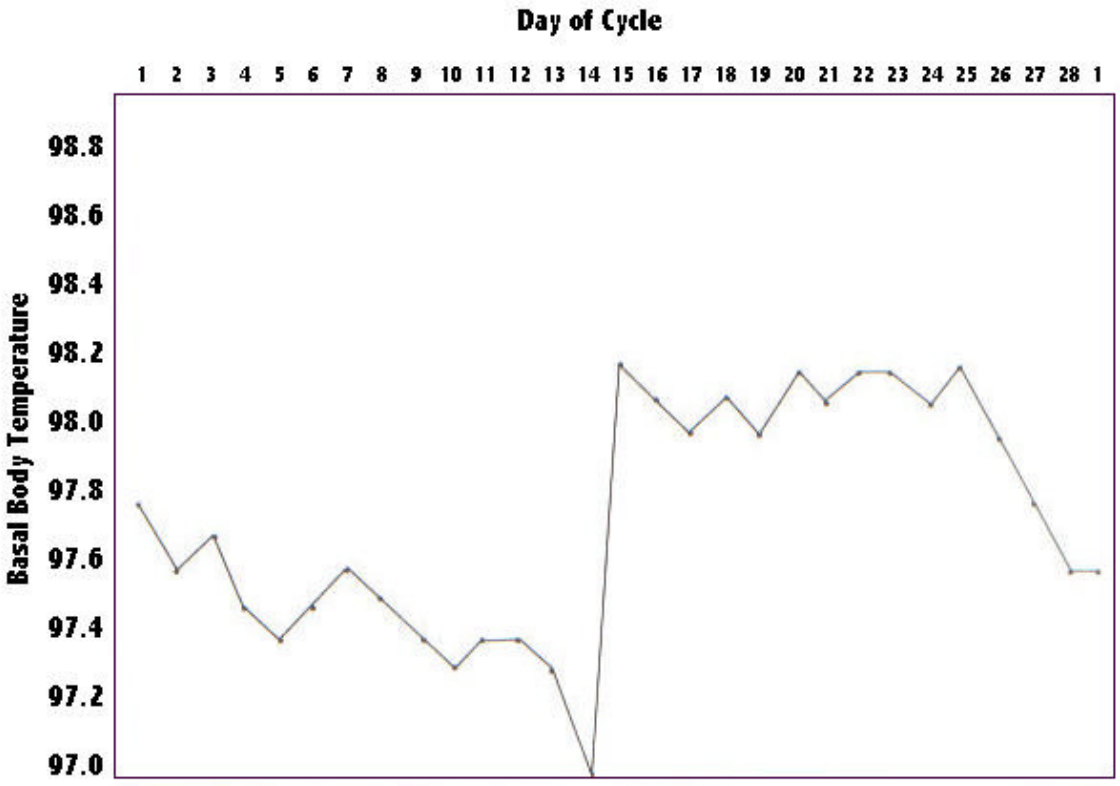


Figure 1.6. Basal Body Temperature throughout the Menstrual Cycle
(Adapted from Golub, 1992, p. 60).

Summary of systemic changes. Table 1.2 presents a summary of the systemic changes identified in the previous sections. The list acts as a quick reference for reviewing the physiological processes associated with the menstrual cycle and the potential causative factors underlying each of them.

Table 1.2. Summary of Systemic Changes during the Menstrual Cycle

Systemic Change	Potential Causative Factor(s)
Pain—Dysmenorrhea	High prostaglandin concentration Excess progesterone relative to estrogen
Pain—Premenstrual	Excess estrogen relative to progesterone
Pain—Intermenstrual	Blood in abdomen from ruptured follicle
Fluid Retention—PM	Progesterone withdrawal Increased refined sugar & carbohydrate intake Salt intake
Weight Gain—PM	Fluid retention Diet practices
Swelling—PM	Fluid retention
Blood Sugar Imbalances	High estrogen = increased insulin sensitivity = low glucose High progesterone = insulin resistance = high glucose
High Blood-Alcohol—PM	Low proportion of water to body weight
Potassium Deficiency	Hypoglycemia High salt intake
Zinc and Copper Imbalances	Estrogen increases copper and decreases zinc
Constipation—PM	Fluid retention
Increased Gastrointestinal Transit Time—LU	High concentration of progesterone

Table 1.2. continued

Systemic Change	Potential Causative Factor(s)
Increased Allergies—PM	Heightened sensitivity
Aggravated Asthma—PM	Sharp drop in serum estradiol levels Decreased progesterone = bronchoconstriction Heightened sensitivity and hyperreactivity
High Sensory Sensitivity—OV	Innate biological mechanism toward procreation
Increase Body Temperature—PO	Rising progesterone levels

LU = Luteal phase; OV = Ovulation; PM = Premenstrual phase; PO = Postovulatory phase

Psychological Changes

Psychological factors that may be inextricably linked to the physiological and systemic changes occurring in women during the menstrual cycle have been studied for decades. A wealth of research data exists to assess whether patterns occur among women in a cyclical fashion and if any observed patterns can be attributed to phases of the female menstrual cycle. Among the psychological variables frequently investigated are sexual feeling, dreaming, personality, cognition, and mood. As the factors most believed to change with the menstrual cycle, the highly scrutinized factors of cognition and mood are reviewed below.

Cognition. The psychological construct *cognition* comprises a vast array of mental processes occurring through the complex interaction of biological, sociocultural, experiential, and physical factors. Sommer (1992) manages the expansive nature of cognition with a clear and comprehensive definition. She states that cognition includes three levels of human information processing: (1) the *cognitive skills* of reasoning, problem-solving, imagining, remembering, symbolizing, perceiving, inference, planning, and natural

language understanding; (2) the *perceptual skills* of coding and interpreting sensory information; and (3) the *motor skills* that rely on the interface between sensory and action patterns (although she recognizes that the placement of motor skills under the construct of cognition may arguably be inappropriate).

Cognitive performance has been measured extensively across phases of the menstrual cycle for more than eighty years (Walker, 1997). Walker (1997) remarks that "[c]learly, psychologists have left few stones unturned in the search for a measure of cognitive function which will demonstrate a cyclical effect" (p. 89). Regrettably, much of the efforts proved futile, as many studies were flawed in methodology, especially in their assessment of menstrual cycle phases (Sommer, 1992). For example, in a review of 64 studies on complex and simple cognitive measures and the menstrual cycle, Sommer noted that 56 of them provided an estimate of menstrual cycle phase obtained simply by counts of days. Only 4 of the studies employed hormonal assays while 4 other studies utilized basal body temperature measures—a measure identified in the last section as unreliable when used alone.

Sommer's (1992) review of the literature spans studies published in English from 1950 to 1990. Her extensive search rendered studies in: (1) *complex cognition*, including critical thinking and performance on academic tasks and exams; (2) *simple cognition*, including abstract thinking, field independence or breaking set tasks, immediate and short-term memory, arithmetic, verbal and word skills, visuospatial ability, simple rote speed tasks, simple decisions, frustration tolerance and flexibility, time-interval estimation, and motor coordination; (3) *social cognition*, including the accuracy of perceiving another's emotions or behavior; and (4) *errors in judgment*, including concentration ability, general work performance, accident incidence, and criminal behavior. Few of these studies yielded any cyclical trends and, according to Sommer, "the preponderance of findings in these areas fails to support any hypothesis of an effect of the menstrual cycle upon cognition" (p. 53). Richardson (1992) concurs with Sommer, stating, "there is simply no support at all for the notion of paramenstrual cognitive debilitation" and there is "no reliable evidence…that the process of menstruation gives rise to any objective deficits in intellectual functioning" (p.

98). Even success in the completion of tasks that are known to vary in accordance with other human biorhythms (circadian rhythm, for e.g.) is not affected by the menstrual cycle.

Additional reviews of cognition and menstrual cycle research are available in the literature (see Kimura & Hampson, 1994; Richardson, 1992, 1995; Sommer, 1973, 1982; Walker, 1997). Walker (1997) avows that reviewing these studies "almost always [results] in the conclusion that, for most women, the menstrual cycle has little or no noticeable effect on cognitive function. Despite this, the belief that it must have an effect is strong, so studies continue, using ever more complex and detailed tests of ability and making headlines when non-significant findings are reported" (p. 89).

Both Sommer (1992) and Richardson (1992) allege that sociocultural beliefs and ongoing research endeavors are perpetuated by a predominating assumption that cognitive impairments occur in the premenstrual and menstrual phases of the female cycle. Documentation dating back to the 1890s indicated that girls learned that they would be sick during menstruation and, therefore, they perceived more problems during that time (Mosher, 1916). These prevailing beliefs and assumptions allow for the influence of female *expectations* upon subsequent performance. Women who associate negativity with the premenstrual, menstrual, or paramenstrual phases of their cycle might be more inclined to falter in objective performances. However, in one study, Altenhaus (1978) informed female participants that they were expected to perform poorly on a battery of cognitive tasks, based on their timing in a certain menstrual phase. While the spurious information did effect the participants' perceptions of their performances, it did not influence objective scores. Also, Munchel (1979) recognized that, although women who expect to endure performance decrements during the premenstrual phase report more premenstrual symptoms, they do not show premenstrual decrements in performance as compared to other phases of the cycle. Moreover, the women with abject expectations demonstrated no differences in performance as compared to women who did not believe that the menstrual cycle influenced performance. Sommer (1992) acknowledges that expectations influence menstrual symptom reports, but the extent to which expectations affect other psychological constructs, such as motivation, self-esteem, confidence, mood, and body image, is less clear. These constructs

are undoubtedly related to performance and may act as mediating variables in females who do exhibit performance decrements associated with the menstrual cycle.

More recently, researchers have moved beyond the assertion that the menstrual cycle affects cognitive performance and believe, instead, that cognition varies cyclically in both men and women (Gouchie & Kimura, 1991; Hampson, 1990; Hampson & Kimura, 1988, 1992; Kimura & Hampson, 1993, 1994). They maintain that the presence of two sex hormones, estrogen and testosterone, in women and men may explain variable performances on cognitive tasks. For example, results from a study by Hampson (1990) demonstrate that women perform better on "feminine" tasks (for e.g., manual dexterity, verbal fluency, verbal articulation, and perceptual speed and accuracy) when estrogen levels are high (mid-luteal phase) as compared to when estrogen levels are low (menstrual phase). Gouchie and Kimura (1991) observed an interesting negative relationship in their study—men with lower than average testosterone levels performed better on spatial and mathematics tasks ("masculine" tasks) than did men with higher than average testosterone levels. In women, however, better performance on "masculine" tasks was correlated with higher than average testosterone levels. Testosterone levels were not related to performance on "gender-neutral" tasks or performance on "feminine" tasks.

Walker (1997) recognizes that there is significant overlap in male and female performance on stereotypical masculine and feminine tasks and, thus, warns against inappropriate interpretation of findings and against making generalizations. Also, she questions the utility of such investigations if hormone-related performance differences are relatively small and unappreciable. Nevertheless, Walker believes that the studies should be replicated for elaboration of the hypotheses, but in doing so, she fears that the "potential for such findings to be used against women…will remain" (p. 91).

Mood. As with research in the area of cognition and the menstrual cycle, studies investigating mood as it relates to cyclical changes in the female are not without flaws. Studies often employ convenience sampling techniques, utilize only retrospective reports, and fail to obtain measures of symptom severity (Walker, 1997). Walker (1997) remarks that, given a woman spends 25% to 50% of her entire menstruating life in the premenstrual and menstrual phases, it is not alarming to discover that she reports feeling irritable at some

point during that span of time. Prevalence studies abound and resulting figures estimate that between 30% and 95% of women experience undesirable premenstrual mood changes—typically, tension, irritability, restlessness, anxiety, and depression (Golub, 1985; Logue & Moos, 1986, 1988; Woods, Most, & Dery, 1982). Logue and Moos (1986, 1988) estimate that between 5% and 15% of women tend toward positive moods (for e.g., increased excitement, heightened sexuality, and increased energy) once they reach the menstrual phase, while Woods et al. (1982) report that 39% of women still suffer from irritability throughout menstruation.

Heeding the inconsistency and methodological shortcomings among the bounty of mood studies, perhaps three broad generalizations about mood and the menstrual cycle are warranted: (1) any premenstrual changes in mood are predominantly negative; (2) relief from negative premenstrual mood often accompanies menstruation, although some women continue to experience negative mood through menstruation, perhaps due to painful physical symptoms; and (3) the middle of the cycle (follicular, ovulatory, and luteal phases) is generally associated with positive mood. Combination contraceptive pills seem to reduce the variation in mood across the menstrual cycle (Asso, 1983). As such, mood fluctuation has been linked to hormonal changes, although learned and environmental factors undoubtedly also play a vital role in altering mood among menstruating women.

Cyclical patterns occur similarly among women with psychiatric disturbances. Insofar as altered mood is related to hospital admissions and outpatient contact, these were found to be significantly higher during the premenstrual phase than during other phases of the menstrual cycle (Dalton, 1959; Jacobs & Charles, 1970). Remarkably, in one study, 41% of a sample of 60 depressed patients experienced a crisis-related admission the day before menstruation or on the first day of bleeding (Abramowitz, Baker, & Fleischer, 1982). A higher rate of admission among schizophrenic patients has also been documented as occurring in the paramenstrual phase (Asso, 1983). In a notable and now classic biobehavioral study, psychoanalyst Therese Benedek reviewed dream and interview information from 15 psychiatric patients while fellow colleague and endocrinologist Boris Rubenstein collected temperatures and vaginal smears from the same 15 patients to determine cycle phase and date of ovulation for 152 cycles (Benedek & Rubenstein, 1939).

On the basis of psychological data, Benedek successfully matched Rubenstein's physiological determinations for cycle phase in 2,128 out of 2,261 cycles—a 94% rate of success in prediction. Benedek noted that when her patients were in the premenstrual phase, they were fearful, fatigued, irritable, restless, severely depressed, regretful, and/or emotionally withdrawn. These symptoms are rather similar to those presented on the Menstrual Distress Questionnaire (MDQ)—a widely employed instrument used to assess pain, water retention, autonomic reactions, impaired concentration, behavior change, and negative affect related to the menstrual cycle in normal female populations. The negative affect subscale of the MDQ includes loneliness, crying, feeling sad or blue, restlessness, anxiety, mood swings, irritability, and tension (Moos, 1968). Thus, the undesirable mood changes that often accompany the premenstrual phase perhaps afflict all types of women.

Behavioral Changes

Comparable to the appeal of exploring the systemic and psychological changes that may accompany the menstrual cycle is an interest in investigating behavioral change patterns across phases of the menstrual cycle. Behavioral factors are admittedly connected to psychological factors, as behavior is moderated by how a person thinks (cognition) and feels (mood). However, these factors are included here in a separate section because they are generally overtly observable and objectively measurable. A comprehensive review of the related literature is outside the scope of this paper and so, accordingly, a number of behavioral variables that have been studied in relation to the menstrual cycle are listed below with a brief account of subsequent findings. The following includes behavioral changes in: (1) accidents; (2) aggression; (3) alcohol consumption; (4) diet and eating patterns; (5) sleep; and (6) suicide. Behavioral changes in sport performance and proneness to accidents as it relates to athletic injury are discussed in the next chapter.

Accidents. There are a few studies to suggest that accident rates (e.g., during flying or driving) are higher among women in the premenstrual or menstrual phases (Golub, 1992; Norris & Sullivan, 1983; O'Connor, Shelley, & Stern, 1974; Whitehead, 1934). The extent to which this finding may be related to physiological symptoms (such as dizziness, headache, blurred vision, and cramps), or to psychological symptoms (such as confusion, anxiety, lack of concentration, or impaired judgment) is not known.

Aggression. Women with high perimenstrual symptoms exhibit higher rates of aggression than do women with low perimenstrual symptoms, regardless of menstrual cycle phase (Dougherty, Bjork, Cherek, Moeller, & Huang, 1998; Dougherty, Bjork, Huang, & Moeller, 1997). Self-reported perimenstrual symptoms are a more consistent predictor of aggressive behavior than are plasma testosterone levels (Dougherty, Bjork, Moeller, & Swann, 1997). An earlier study found decreased aggressive behavior at ovulation as compared to during menstruation (Luschen & Pierce, 1972).

Alcohol consumption. In one study, women report more frequent alcohol consumption to relieve tension or depression and more frequent solitary drinking during menstruation (Sutker, Libet, Allain, & Randall, 1983). In another study, 8 of 14 women drank more frequently premenstrually and, although they demonstrated higher degrees of impaired social functioning and hostility/anger, they experienced less pain and physical discomfort (Mello, Mendelson, & Lex, 1990). Among 48 alcoholic women, one-third admitted to drinking more frequently during the premenstrual phase (Allen, 1996).

Diet and eating patterns. In general, overall food intake is higher during the 10 days following ovulation (luteal phase) than in the 10 days preceding ovulation (follicular phase) (Asso & Braier, 1982; Dalvit, 1981). Increased daily energy/caloric intake (approximately 101 kcal/day higher) occurs in the luteal phase as compared to the follicular phase (Li, Tsang, & Lui, 1999; Pelkman, Heinbach, & Rolls, 2000). Specifically, more carbohydrates (Li et al., 1999) and fats (Chappell & Hackney, 1997; Li et al., 1999) are consumed in the luteal phase, although one study documented higher carbohydrate intake during the follicular phase (Chappell & Hackney, 1997). There is an increase in craving for sweet foods premenstrually. Some women with premenstrual syndrome engage in binge eating during the premenstrual phase, often gaining eight to fifteen pounds (Norris & Sullivan, 1983).

Sleep. Sleep duration has been observed to be shortest at ovulation and longest during the premenstrual phase. It is also more disturbed premenstrually (Hartmann, 1966; Patkai, Johannson, & Post, 1974). Combination contraceptive pills seem to correlate with less variability in sleep across the menstrual cycle (Henderson, Nemes, Gordon, & Roos, 1970; Patkai et al., 1974).

Suicide. Suicide attempts are reported to be highest during the premenstrual phase and/or during menstruation (Baca-Garcia, Diaz-Sastre, de Leon, & Saiz-Ruiz, 2000; Norris & Sullivan, 1983; Parvathi & Venkoba, 1972; Thin, 1968; Tonks, Rack, & Rose, 1968; Wetzel & McClure, 1972). The highest volume of telephone calls to a suicide prevention center was also in the paramenstrual phase (Mandell & Mandell, 1967). In a study of post-mortem wombs of 38 female suicide victims, 34 of the suicides were committed in the latter half of the cycle (MacKinnon, MacKinnon, & Thomson, 1959).

Premenstrual Syndrome

A debilitating syndrome unique to women that comprises systemic, psychological, and behavioral changes is the premenstrual syndrome (PMS). Like the female menstrual cycle, PMS is difficult to define and explain precisely. It seems that just as much text space is devoted to outlining the problems associated with defining PMS as is dedicated to attempting to describe the syndrome itself. All of the textbooks and journal articles reviewed for information about PMS included either a section focused on methodological problems in defining PMS or included a section on what PMS is not, so as to minimize confusing it with normal menstrual pain (Andrews, 1997; Berger, 1988; Golub, 1992; Mitchell, Lentz, Woods, Lee, & Taylor, 1992; Norris & Sullivan, 1983; Parlee, 1993; Rubinow, Hoban, & Grover, 1988; Walker, 1997).

Furthering the confusion was the desire to facilitate communication between practitioners in the medical community and clinicians in the mental health community (Golub, 1992). In 1985 and 1994, the diagnostic manual of the American Psychiatric Association adopted categories to accommodate PMS, only the syndrome was renamed *late luteal phase dysphoric disorder* (LLPDD) and *premenstrual dysphoric disorder* (PMDD), respectively. Considerable disagreement arose from the inclusion of PMS as a mental disorder, and the controversy about LLPDD and PMDD served only to intensify the definition dilemma.

Mitchell et al. (1992, p. 7) propose that the difficulty in defining and identifying PMS may stem from a lack of consistency among all professional communities in:

(a) the description of symptom clusters to form a PMS typology,
(b) the definition of appropriate symptom severity levels at postmenses and premenses,
(c) the recognition of different patterns of symptom severity across the menstrual cycle, and
(d) the definition of an adequate difference between postmenses and premenses symptom severity (i.e., an adequate cycle phase difference).

Symptom Clusters and PMS Typology

Rubinow et al. (1988) agree that there is a lack of consistency in describing symptom clusters—moreover, they believe that PMS symptoms are "many and diagnostically nonspecific" (p. 29). These authors, as well as Berger (1988), indicate that over 150 symptoms have been associated with PMS; Mitchell et al. (1992) estimate over 200 symptoms. Table 1.3 offers an abbreviated list of symptoms associated with PMS.

Dr. Ronald V. Norris, founder of the first American clinic for PMS in 1981, lists the most common symptoms of PMS as "irritability, tension, headache, depression, fatigue, breast swelling and tenderness, abdominal bloating, weight gain, increased thirst or appetite, cravings for sweet or salty foods, acne, asthma, and constipation" (pp. 3-4). Similarly, the Food and Drug Administration (1982) states that PMS consists predominantly of "edema, lower abdominal pain (including cramps), breast tenderness, headache, abdominal bloating, fatigue, and the feelings of depression, irritability, tension and anxiety" (p. 199). Many of these symptoms characterize dysmenorrhea, or occur normally as systemic and psychological manifestations of the menstrual cycle, thus adding to the difficulty in distinguishing PMS from other menstrual-related symptom packages. Women do not experience all of the symptoms at once, however, the criteria for diagnosing PMS based on a selection or cluster of symptoms is not consistent.

Table 1.3 Symptoms Associated with Premenstrual Syndrome

Irritability	Increased appetite	Confusion
Headache	Dizziness or vertigo	Nausea
Migraine	Anger or temper outbursts	Breast pain
Depression	Sadness or blues	Sexual interest changes
Crying easily	Loneliness	Efficiency decreased
Anxiety	Edema of extremities	Avoids social activity
Mood swings	Pain in general	Hot flushes
Tension	Palpitations	Pelvic discomfort
Breast tenderness	Visual disturbances	Altered bowel habits
Backache	Acne or skin blemishes	Reduced coordination
Weight gain	Absenteeism from work	Muscle stiffness
Abdominal bloating	Water retention	Skin disorders
Food craving	Asthma	Faintness
Difficulty concentrating	Cold sweats	Spontaneous bruising
Fatigue	Lowered judgment	Poor work performance
Abdominal cramps	Increase alcohol intake	Poor school performance
Forgetfulness	Epilepsy	Eye diseases
Restlessness	Sickness	Need to stay at home
Insomnia	Accident prone	Abdominal swelling

(Adapted from Andrews, 1997, pp. 317-318; Golub, 1992, p. 182; Richardson, 1992, p. 19; and Walker, 1997, p. 147).

To stress the latitude in PMS diagnosis and lack of symptomatology restriction, several definitions of PMS should be considered (boldface has been added):

(a) PMS is a medical problem characterized by a **group of symptoms** that appears one to fourteen days before menstruation and disappears once menstruation actually starts (Berger, 1988, p. 2).
(b) PMS is a complex disorder…associated with a **wide range of symptoms** recurring regularly at the same phase of each menstrual cycle followed by a symptom-free phase in each cycle (Norris & Sullivan, 1983, p. 3).
(c) PMS can be characterized as a **group of psychological and somatic symptoms** that are limited to the week preceding menstruation and are relieved by the onset of menses (Golub, 1992, pp. 181-182).
(d) [PMS] consists of a **cluster of generally negative symptoms** experienced prior to menstrual flow (Sommer, 1980, p. 28).
(e) [PMS is] the **collection of symptoms** that rather commonly occur in the few days before a menstrual period (Lein, 1979, p. 129).

The number, type, and combination of symptoms necessary for diagnosing PMS is never specified in these definitions, nor elaborated upon later. Thus, it is clear that a universally accepted PMS typology does not exist and that clarity in defining PMS by symptom clusters is imperative for comparison among research efforts and standardization of medical diagnoses.

Symptom Severity and Cycle Phase Differences

Mitchell et al. (1992) support the need for consistent definitions of symptom severity levels and patterns across the menstrual cycle as well as definitions for adequate cycle phase differences in symptom severity for diagnosing PMS. Similarly, Rubinow et al. (1988, p. 31) state two main requirements for diagnosing PMS:

(a) the symptoms must display a particular temporal characteristic, i.e., appearance or substantial exacerbation in a menstrual cycle phase-specific fashion, and

(b) the premenstrual phase-specific symptom occurrence must be confirmed in a longitudinal, prospective fashion over the course of several menstrual cycles.

Accordingly, these requests have already been addressed by the National Institute of Mental Health (NIMH) at a Premenstrual Syndrome Workshop in April of 1983 (Parlee, 1993; Rubinow et al., 1988). The NIMH specified that a 30% increase in symptom severity must occur 5 days prior to menses (i.e., days 24-28 or premenstrual phase) as compared to the 5 days following menses (i.e., days 6-10 or proliferative, follicular, or postmenstrual phase) and that this increase in symptom severity must occur for at least 2 consecutive cycles. However, Mitchell et al. (1988) comment speculatively on a study published one year later by Rubinow and Roy-Byrne (1984), who utilized the 30 % change in symptom severity offered by the NIMH as a standard criterion for diagnosing PMS. Mitchell et al. regard this criterion as arbitrary and claim that this approach "lacks any empirical basis" (p. 12).

In general, a combination of high severity premenstrual symptoms with low severity postmenstrual symptoms has been labeled as a classic PMS pattern (Mitchell et al., 1988). Unfortunately, the precise definitions for high and low severity and the exact difference between premenstrual and postmenstrual severity levels appropriate for labeling a woman as suffering from PMS are not yet standardized medically.

Prevalence of PMS

Due to the lack of a standardized set of criteria useful in diagnosing PMS, the estimates of its occurrence are rather inconsistent. For example, the following are reported rates of PMS:

(a) Generally, 40% of women are affected by PMS on a regular basis, approximately 85% of women are affected by PMS occasionally, and 10-15% of women endure pain and discomfort severe enough to disrupt their normal lives (Berger, 1988).
(b) Generally, 50% of women (most frequently women in their 30s) are affected by PMS, and 10% of women endure pain and discomfort severe enough to disrupt their normal lives (USA Today, 1994).

(c) Generally, 40% of women are affected by PMS, and 5-10% of women are "so severely incapacitated that it dominates their life during this phase of the cycle" (Andrews, 1997, p. 315).

(d) Specifically, 14% of a sample of 384 15-year-olds were found to suffer from PMS (Raja, Feehan, & Stanton, 1992).

(e) Specifically, 4.6% of a sample of 217 women were affected by PMS based on the diagnostic criteria for LLPDD in the Diagnostic and Statistical Manual of Mental Disorders, third edition, revised (Rivera-Tovar & Frank, 1990).

(f) Specifically, although 60% of a sample of 58 women reported having PMS, only 16% met the criteria for PMS diagnosis and only 9% met the criteria for PMDD diagnosis (Moore, 1998).

(g) Specifically, 7.4% of a sample of 1,488 women aged 14-24 were diagnosed with PMDD; another 18.6% were near-threshold cases but failed to meet the mandatory impairment criterion (Wittchen, Becker, Lieb, & Krause, 2002).

Regardless of the precise percentage of women who may be diagnosed with PMS, millions of women around the world experience some premenstrual symptoms. Norris and Sullivan (1983) estimate that nearly 27 million American women experience some symptoms associated with PMS on a fairly regular basis and that 3 million to 7 million American women suffer from severe premenstrual symptoms. These symptoms are recognized by some as so tremendously incapacitating that PMS has successfully been used as a criminal defense, leading to acquittals or to the reduction of criminal charges (for e.g., from murder to manslaughter). Some acquittals have occurred on the grounds of insanity due to obstructed menstruation, disordered menstruation, and suppression of the menses (Norris & Sullivan, 1983). Although criminal behavior and other anomalous acts such as alcohol bingeing and suicide are extreme, the symptoms of PMS and those associated with the menstrual cycle must clearly be managed for the physiological and psychological health of all women. Management strategies recommended for coping with the menstrual cycle and premenstrual syndrome are offered in the next section.

Management of the Menstrual Cycle, Symptomatology, and PMS

Understanding how to regulate the menstrual cycle and, more importantly, how to alleviate or eliminate the unwanted symptoms associated with the menstrual cycle and premenstrual syndrome is important for two reasons: (1) partaking in management strategies should alter a woman's menstrual cycle symptomatology, thereby resulting in a great deal of individual variation among a sample of women in a research study; and (2) the subject under investigation in the next chapter is, indeed, a management strategy—physical activity. However, physical activity is not being studied as a management strategy for coping with menstrual cycle symptoms; it is being utilized as an outcome measure in the form of sport performance. Knowledge of other management techniques is imperative for treatment as covariates in a study involving athletes, the menstrual cycle, and subsequent sport performance indices. Strategies that may be employed for the management of the menstrual cycle and PMS include (Andrews, 1997):

(a) suppression of the ovarian cycle, including the use of oral contraceptive pills, a synthetic steroid—danazol, gonadotrophin-releasing hormone analogues, estrogen therapy, estradiol implants, and estradiol patches;
(b) other medical treatments, including prescriptions for diuretics, prostaglandin inhibitors, tranquilizers, antidepressants, progestogens, or progesterone and, more seriously, surgical procedures such as a hysterectomy followed by hormone replacement therapy;
(c) over-the-counter medications for pain relief, including Tylenol™, Advil™, and Midol™, or prescription drugs for pain relief;
(d) dietary changes, including limiting the intake of salt, sugar, fluids, caffeine, fat, alcohol, and tobacco;
(e) nutritional supplementation, including pyridoxine (Vitamin B_6), evening primrose oil, and vitamin and mineral therapy;

(f) stress management techniques, including breathing exercises and relaxation strategies, and minimizing stress during symptomatic times;
(g) alternative or complementary therapies, including aromatherapy, reflexology, herbal therapy, hypnosis, homeopathic therapy, and acupuncture; and
(h) psychotherapy, support groups, or self-help groups and practices such as reading books, reading leaflets from PMS clinics, and watching PMS videos.

In general, women who engage in one or more of these practices should experience a genuine decline in or lack of negative symptoms associated with the menstrual cycle and/or will *believe* that menstrual-related symptoms have subsided or disappeared. To the extent that the aforementioned systemic and psychological changes associated with the menstrual cycle and PMS may interfere with subsequent performance, the relief from such symptoms would fundamentally restore or improve performance.

The next chapter focuses upon the idea, albeit a cultural and socially constructed assumption, that menstrual-related symptom appearance and severity interferes with subsequent performance—namely, sport performance. A review of research endeavors is first presented, followed by an analysis and model of potential mediating variables to explain individual variation in sport performance as it relates to the menstrual cycle.

CHAPTER 2

THE MENSTRUAL CYCLE AND SPORT PERFORMANCE

Introduction

Based upon the preceding chapter that outlined the biochemical change processes of the menstrual cycle and discussed the accompanying alterations in female physiology, psychology, and behavior, it may follow that the menstrual cycle can affect sport performance, as well. If an ongoing biological rhythm can exact such pain and discomfort among women that 140 million work hours are lost every year to the powers of dysmenorrhea and premenstrual syndrome, then perhaps female athletes are likewise avoiding strength and conditioning workouts, injury rehabilitation sessions, exercise regimens, organized practices, and competitive events. Additionally, while factors such as pain, body weight, mood, diet, sleep, and aggression can modify sport performance, and research indicates that the menstrual cycle exerts some amount of influence over these factors, one might conclude that the menstrual cycle affects sport performance via certain mediating variables.

To many athletes, this conclusion is obvious; however, agreement about the direction of influence that the menstrual cycle has over sport performance is not as apparent. Quadagno, Faquin, Lim, Kuminka, and Moffatt (1991) assert that "many female athletes (and their coaches) are convinced that their athletic performance is impaired during certain phases of their menstrual cycle" (p. 121). Other female athletes are not inclined to agree. Early studies that examined this controversy through retrospective self-report measures exemplify the opposing views.

Zaharieva (1965) reported that 17% of a sample of 1964 Olympians believed that their sport performance was negatively affected during menstruation and 31% of female

athletes questioned by Erdelyi (1962) regarded either the premenstrual or menstrual phase as limiting to athletic performance. In a study of 104 Finnish athletes, 38% believed that their worst performances occurred during menstruation; moreover, 24% of the women admitted that they would not normally compete during their menstrual period because of pain and fatigue (Ingman, 1952). Only 8% of female athletes in the 1930 Track and Field Championships felt that their performance suffered during menstruation (Kral & Markalous, 1937). Alternatively, 29% of these track and field athletes believed that their performance improved during menstruation.

Similarly, Erdelyi (1962) reported that 13-15% of a sample of 557 female athletes maintained that their sport performance improved during the menstrual phase, and 19% of the Finnish athletes surveyed by Ingman (1952) cited their best performances during menses. Other retrospective accounts by female athletes also indicate that peak performances and major competition wins occurred during the menstrual period (Delaney, Lupton, & Toth, 1976; Ryan, 1975). Unlike these women, the athletes surveyed by Erdelyi (1962) indicated that their best performances occurred in the postmenstrual phase. Table 2.1 presents a chronological summary of early studies that focused on female athletes' beliefs that menstruation influences sport performance.

Table 2.1. Perceptions of the Effects of Menstruation on Sport Performance

Decrements	Improvements	No Changes	Reference
8%	29%	63%	Kral & Markalous (1937)
38%	19%	43%	Ingman (1952)
31%	13-15%	42-48%	Erdelyi (1962)
17%	19%	37%	Zaharieva (1965)

Although Erdelyi (1962) did speculate that the majority of poor performances may be found during the premenstrual phase and the first two days of menstruation, most of the reports from these studies identified only the menstrual phase as influencing sport performance (whether positively or negatively). A more recent study discovered that 50% of a sample of female athletes believed that premenstrual symptoms and dysmenorrhea hindered their sport performance (Wilson, Abdenour, & Keye, 1991). This finding implicates both the premenstrual phase (premenstrual symptoms) and menstrual phase (dysmenorrhea or painful periods) as potentially interacting with sport performance.

Some researchers recognized the limitations of self-report measures in assessing the effects of menstrual cycle phase upon sport performance. Brooks-Gunn, Gargiulo, and Warren (1986b) remark that the findings from the four studies cited in Table 2.1 "are likely to be confounded with beliefs about performance decrements" (p. 14). Accordingly, contemporary researchers began to assess sport performance measures objectively instead of relying upon the perceptions of female athletes. A review of this line of research follows.

Menstrual Cycle Phase Effects and Sport Performance

Studies investigating the objective effects of the menstrual cycle on sport performance are scarce and, as with earlier research efforts, resultant data are inconsistent. Six studies correlating various sport performance indices to phases of the menstrual cycle are reviewed below. Each study included observations of a sample of athletes in sport-specific events or drills (see Table 2.5 for a summary of these contemporary research findings in chronological order).

Basketball—Odom (1979)

Odom (1979) recorded the performance of eleven collegiate basketball players (ages 18 to 21 years; mean age = 19 years) on four skills tests that form an overall composite score called the Knox Basketball Test: (1) a speed dribble test that measures the amount of time required to dribble a basketball through an obstacle course of folding chairs from a starting

line to the basketball goal and back to the starting line; (2) a speed pass test that measures the amount of time required to successfully complete fifteen, two-handed chest passes against a brick wall with no more than one step in either direction for recovery of each pass; (3) a dribble shoot test that measures the amount of time required to dribble a basketball through an obstacle course of folding chairs from a starting line to the basketball goal, scoring a basket, and returning to the starting line; and (4) a penny-cup test (test is the sum of four timed trials) that measures the amount of time required to place a penny in one of three cups of various colors—subjects run eight feet from a starting line to a signal line, at which time a command of color is given to them by the investigator, and then subjects run twelve more feet to the appropriate cup and place the penny in it. The overall Knox Basketball Test, measured by the sum of these four skills tests, is considered to be a valid and reliable predictor of success in a five-player, full court basketball game.

Skills tests were administered on the first day of menses (menstruation or menstrual phase) and on the fourteenth day after the onset of menses (intermenstrual or ovulatory phase) for three complete menstrual cycles. The method for determining phase of cycle was not specified by Odom.

Group means were significantly lower (i.e., times were faster) on day fourteen than on day one across three menstrual cycles for the speed pass test, dribble shoot test, penny-cup test, and overall Knox score. Odom remarks that potential factors to explain the poorer overall performance during menstruation are weight gain (fluid retention and/or redistribution), feelings of heaviness, decreased cardiovascular and physical efficiency, and dysmenorrhea.

Although average group times indicate faster performances intermenstrually as compared to menstrually, Odom admits that "individual variation in performance was great" (p. 60) and that "the effects of the menstrual cycle on performance must still be considered specific to the individual performer" (pp. 64-65). For example, one subject was consistently faster on day one than on day fourteen across all three cycles in the speed dribble test and speed pass test. This athlete was also faster on day one as compared to day fourteen for two out of three cycles in the dribble shoot test and overall Knox score (see Table 2.2 for this subject's specific scores).

Table 2.2. One Athlete's Scores for Basketball Performance Measures*

	Cycle 1		Cycle 2		Cycle 3	
Test	**Day 1**	**Day 14**	**Day 1**	**Day 14**	**Day 1**	**Day 14**
S/D	11.6	12.0	10.8	11.7	10.6	11.4
S/P	10.8	11.2	9.2	10.2	10.5	10.8
D/S	14.2	11.8	11.4	12.5	10.8	12.3
P/C	9.5	8.9	10.2	9.1	10.2	9.1
Knox	46.1	43.9	41.6	43.5	42.1	43.9

*S/D = Speed Dribble Test; S/P = Speed Pass Test; D/S = Dribble Shoot Test; P/C = Penny-Cup Test; Knox = overall score. Times are measured in seconds. Faster times are shaded. (Adapted from Odom 1979, pp. 91, 93, 95, 97, & 99).

These findings support Odom's contention that a female's experience with the phases of her menstrual cycle is rather subjective and individualized. It may be that the symptoms of dysmenorrhea commonly associated with the day prior to menstruation and with the first two days of the menstrual period, are either absent for this female athlete, or the symptoms are perceived and reacted to differently by this female. While Odom did question the athletes about menstrual discomfort, medication for menstrual pain, regularity of cycle, and use of oral contraceptives (i.e., birth control pills), she did not correlate these variables with outcome measures to explain any individual variation in performance.

Additionally, the data for the athlete presented in Table 2.2 suggest the significance of the demands of the task upon subsequent performance. The speed dribble, speed pass, and dribble shoot tests primarily required speed and the specific basketball skills of dribbling, shooting, and passing. Aside from the athlete's single score of 14.2 seconds for the first cycle on day one of the dribble shoot test, her times were all faster menstrually than intermenstrually. This uncharacteristically high score of 14.2 seconds might be accounted for by one or more missed baskets, as the athletes were required to successfully make a

basket before maneuvering back through the folding chairs to the starting line. Hence, her score may not reflect the influence of menstruation upon speed performance, but instead may be the result of poor accuracy. Odom does not include any elaboration on the specific trials of athlete performance to explain individual variation, however, she does attempt to support group mean data with prior research findings.

Odom reports that Golub, Menduke, and Conly (1965) and Watson and Robinson (1965) measured weight fluctuation among women during the menstrual cycle and discovered that the highest weight values occurred in the menstrual phase while the lowest weight values occurred in the ovulatory phase. Odom links this weight fluctuation to speed performance and speculates that "an increase in weight, such as that during menstruation, may be a contributing factor to a reduced or poorer performance" (p. 64). Unfortunately, Odom did not measure the weight changes of the athletes she observed to correlate weight fluctuation with performance. Moreover, most researchers note the greatest weight increases during the *pre*menstrual phase (Berger, 1988; Freedman, Ramcharan, Hoag, & Goldfien, 1974; Garling & Roberts, 1980; Janowsky, Berens, & Davis, 1973; Smith, 1975)—a phase that Odom did not include in her investigation. Many women complain that the debilitating symptoms associated with the menstrual cycle are at their worst during the premenstrual phase and that menstruation offers some or complete relief from those symptoms (Asso, 1983; Berger, 1988; Golub, 1992). It would appear that the subject presented in Table 2.2 was not impaired by any weight gain during menstruation, if she indeed gained any weight during that time.

The scores observed for this athlete on the penny-cup test also suggest the role of specific skill requirements upon subsequent performance. Whereas the other three tests primarily measured the speed at which one could successfully complete various basketball skills, the penny-cup test measured the reaction time to a verbal command for a contrived, non-basketball task. The highlighted scores in Table 2.2 indicate that this athlete was consistently slower in reaction time on day one as compared to day fourteen across all three cycles (consistent with the rest of the team but inconsistent with the other three tasks for this athlete). Although studies have indicated no trends in reaction time across phases of the menstrual cycle based on group means, individual variation is still evident (Louks &

Thompson, 1968; Pierson & Lockhart, 1963). It may be that, unlike the speed dribble, speed pass, and dribble shoot tests that are tied to the physical demands of speed and coordination, the penny-cup test requires reaction time that is linked more to cognitive processing skills than to physical skills. Pierson and Lockhart (1963) alluded to this contention in their study, concluding that reaction time may vary due to inattention. The different human systems involved in speed tasks as compared to reaction time tasks may explain the contrasting cycle phase effects for the athlete presented in Table 2.2.

Despite some shortcomings in methodology and subsequent discussion about results in the study conducted by Odom, the data provide at least two important points: (1) group means that establish a pattern of performance related to the phase of the menstrual cycle may predict and explain the performance of a team of female athletes; and (2) observation of individual scores may offer a pattern of performance related to the phase of the menstrual cycle for a particular female athlete. Coaches who want to optimize the success of their teams would certainly benefit from knowing when individual peak performances are most likely to occur.

Swimming—Bale and Nelson (1985)

Bale and Nelson (1985) examined the swim times of twenty competitive team swimmers, aged 18 to 22 years. All of the participants exhibited normal menstrual cycles for three months prior to testing and none used oral contraceptive pills. The swimmers received the same preseason training and the same warm-up preparation prior to testing. Swimmers were asked to complete a 50-m swim using the stroke of their choice (provided they chose the same stroke every trial time thereafter) on four occasions across one complete cycle: (1) the first day of menstruation (menstrual phase); (2) the eighth day (preovulatory phase); (3) the twelfth to fifteenth day after cessation of menstruation; and (4) the twenty-first day (premenstrual phase).

The fastest mean swim time was on the eighth day (33.27s), followed by the fifteenth day (33.79s), then the twenty-first day (34.25s) and, finally, the slowest mean time occurred on the first day of menstruation (34.66s). In general, swim performance was better postmenstrually as compared to the premenstrual and menstrual phases when performance tended to suffer. More specifically, 17 out of 20 swimmers recorded their fastest time on the

eighth day (postmenstrual phase) while 16 out of 20 swimmers recorded their slowest time on the first day (menstrual phase).

However, to demonstrate the individual variation among performances and the disparate influence of the menstrual cycle upon performance, consider two different swimmers: (1) one swimmer seemed so affected by menstruation that over four seconds separated her times on the first and eighth days—day 1 = 40.20s vs. day 8 = 36.12s; and (2) another swimmer seemed so unaffected by the menstrual cycle that her performances across four trial times differed only by hundredths of a second—day 1 = 33.84s vs. day 8 = 33.85s vs. day 15 = 33.88s vs. day 21 = 33.87s. Oddly, both swimmers reported that they believed their swim performances were affected by the menstrual cycle. Overall, only 4 out of 20 swimmers believed that their swim performances were not affected by the menstrual cycle.

All of the swimmers complained of weight gain in the premenstrual and early menstrual phases, attributing the increase to fluid retention. A large number of the athletes also indicated experiencing other symptoms associated with dysmenorrhea: fatigue (85%), backache (80%), stomachache (65%), depression or irritability (65%), abdominal cramps (60%), bloated stomach (60%), and sore breasts (55%). Whether incidence and/or severity of negative symptoms correlated with performance times in this study is not known; the authors treated only the athletes' expectations for performance as a covariate. As a result, swim times did not vary among trials based upon the athletes' expectations for performance.

The authors encourage replication of their study but recognize that hormonal analyses are necessary to make reliable determinations of menstrual cycle phase.

Swimming—Brooks-Gunn, Gargiulo, and Warren (1986a)

Brooks-Gunn, Gargiulo, and Warren (1986a) investigated four adolescent swimmers who trained four to five hours per day for a competitive swim team. The team coach recorded best times for each athlete twice a week for ten weeks in the 100-yd freestyle event and 100-yd event of choice (not freestyle). Average performance times were observed for the entire cycle and across three phases of the cycle: (1) 4 days prior to menstruation (premenstrual phase); (2) duration of the menstrual flow (menstrual phase); and (3) 10 days following menstruation cessation (postmenstrual phase). Menstrual phase was determined by retrospective accounts from each athlete on a weekly basis.

Overall, swim times were slowest premenstrually and fastest menstrually. For the 100-yd freestyle event, premenstrual performance was 0.96 seconds slower and menstrual performance was 0.82 seconds faster than the average time; for the 100-yd event of choice, premenstrual performance was 1.32 seconds slower and menstrual performance was 0.70 seconds faster than the average time. Moreover, across all timed trials, two of the four swimmers posted their slowest time during the premenstrual phase, and three of the four swimmers posted their fastest time during the menstrual phase.

Despite the small sample size and short duration of observation, the authors cite menstrual enhancement effects, potentially mediated by fluid reduction associated with menses, self-expectancies, thermoregulation, and absence of dysmenorrhea. Interestingly, 33% of the swimmers competing in the 1964 Olympics did not even train during menstruation (Zaharieva, 1965). Perhaps the cultural restrictions and myths related to the dangers of swimming and bathing during menstruation have been waning over the past several decades. Additionally, Brooks-Gunn et al. (1986b) recognize that the tendency to avoid training during menstruation in years past may be explained by the views that tampon use was unacceptable for adolescents and unmarried females. More recently, it has been estimated that over 70% of American females ages 16 years and older use tampons (Brooks-Gunn & Ruble, 1982).

Skiing—Fomin, Pivovarova, and Voronova (1989)

Fomin, Pivovarova, and Voronova (1989) monitored the special working capacity and mental stability of 164 highly trained skiers, aged 18 to 22 years. The skiers all participated in 115 training sessions designed to develop special stamina, each session with a duration of 90 to 180 minutes and the volume of training loads equaling 1,095 km. Special working capacity for each skier was then determined through a 5-km race on a standard track and a 12.5-km race on ski rollers. Personality and reactive anxiety was also measured during the training sessions and again immediately prior to testing. Menstrual cycle phase was determined by daily measures of basal body temperature, assessment of mucus crystallization, and through the use of questionnaires and diaries. Based upon language utilized in discussing the results of the study, the menstrual cycle phases studied presumably included the: (1) menstrual phase; (2) postmenstrual phase; (3) ovulatory phase;

(4) postovulatory phase; and (5) premenstrual phase. It is neither stated on what days the skiers were tested in each phase nor *if* the skiers were tested across all phases. It may be inferred from the article that all skiers completed two tests of special working capacity and two tests of mental stability at five different times across a complete menstrual cycle. It is also not clear what outcome measures were used to assess "special working capacity" and "functional parameters" of each skier during the two races (p. 90).

Nevertheless, a discussion of the results indicated that the best performances on a 5-km skiing race and 12.5-km ski rollers race occurred in the postovulatory and postmenstrual phases. Furthermore, high state anxiety was related to phases of elevated working capacity (postovulatory and postmenstrual phases) while moderate state anxiety was related to phases of decreased working capacity (premenstrual, menstrual, and ovulatory phases). Overall, the skiers with an irregular menstrual cycle (i.e., menstrual delays of two or more months) exhibited the highest levels of anxiety. Lastly, although the menstrual phase resulted in diminished working capacity and mood deterioration, 86% of the athletes still demonstrated "complete psychological readiness to train and to participate in competitions" during this phase (p. 90).

The authors contend that the biological cycle characteristic of women poses a unique set of circumstances under which the female athlete is not always well suited to engage in strenuous training or competitive loads. Distribution of the physical training and competitive loads must therefore account for cyclical changes in female physiology and psychology. A 12-month training model for competitive skiers that accommodates the female menstrual cycle was proposed by the authors. Predictably, the greatest proportion of the work load is recommended during the postmenstrual (37-38%) and postovulatory (39-40%) phases as compared to the meager work load requirements of the menstrual (8-9%), ovulatory (6-7%), and premenstrual (7-8%) phases.

Weightlifting—Quadagno, Faquin, Lim, Kuminka, and Moffatt (1991)

Quadagno et al. (1991) investigated menstrual cycle phase effects on two distinct athletic performance indices—strength and speed. To first examine effects on strength performance, the researchers gathered twelve recreational weight lifters (mean age = 24.3 years) who trained three days a week for at least 30 minutes per day. Athletes' menstrual

cycles were tracked for three complete cycles prior to testing in order to predict menstrual cycle phase during testing. All of the females had regular menstrual cycles and none used oral contraceptives.

The weight lifters completed bench and leg press exercises (in randomized order) on three occasions across each of three complete menstrual cycles: (1) 3 to 4 days prior to menstruation (premenstrual phase); (2) days 1 or 2 of menstruation (menstrual phase); and (3) 10 to 12 days following the onset of menstruation (postmenstrual phase). Strength performance was measured by recording the number of times each athlete could press 70% of her maximum weight (maximum weight was considered the highest weight value of three presses executed prior to testing in each phase of the menstrual cycle). Analysis of the data indicated no significant differences in strength performance across phases of the menstrual cycle. Group means reported in the study by Quadagno et al. are presented in Table 2.3.

Table 2.3. Strength Performance across Phases of the Menstrual Cycle

Phase	Bench Press*	Leg Press*
Premenstrual	13.8 ± 5.8	25.8 ± 12.5
	(87.7 ± 17.4)	(185.9 ± 49.1)
Menstrual	13.9 ± 6.8	24.1 ± 8.6
	(87.6 ± 15.3)	(185.8 ± 48.7)
Postmenstrual	12.5 ± 5.6	24.4 ± 12.9
	(87.5 ± 17.7)	(182.9 ± 45.8)

*Values not enclosed in parentheses are the mean number of times ± SD that subjects could lift 70% of maximum weight. Values in parentheses are the mean maximum weight in pounds ± SD.

(Adapted from Quadagno et al. 1991, p. 123).

A particular point of interest in this study is the variation in maximum weight across the three phases of each cycle (mean values are presented in parentheses in Table 2.3). Although the average maximum weight did not vary across the three phases for the bench press task (87.7, 87.6, and 87.5 pounds for the premenstrual, menstrual, and postmenstrual phases, respectively), the average maximum weight for the leg press task did vary across the three cycles (185.9, 185.8, and 182.9 pounds for the premenstrual, menstrual, and postmenstrual phases, respectively). A two-way ANOVA indicated no significant differences in the number of times that athletes could lift 70% of their maximum weight, however, examination of group means reveals that the athletes leg pressed more weight at increased frequencies (3 additional pounds at almost 1.5 times more repetitions) during the premenstrual phase as compared to the postmenstrual phase. If the weight required to leg press had remained constant for each athlete across all phases of each cycle, the number of repetitions completed in each phase might have been more markedly different (indicating variation in muscular endurance). However, because the maximum weight values were allowed to vary across the phases of each cycle for every athlete (indicating variation in muscular strength), the number of repetitions completed would inevitably be similar across phases of the menstrual cycle. Moreover, the large standard deviations demonstrate great variation among individual scores—important data to examine when assessing the timing of individual peak performances. These group means may mask an individual athlete's tendency to suffer dramatically or to excel tremendously in one of these menstrual cycle phases.

In general, it is hypothesized that increased muscle strength and endurance occurs with elevated levels of estrogen or estradiol (Phillips, Rook, Siddle, Bruce, & Woledge, 1993; Quadagno, 2000). The highest concentration of estrogen occurs postmenstrually during the follicular phase (estrogen surge occurs around day 12), but even as estrogen levels decline through the luteal phase, the concentration is still higher as compared to the levels of estrogen during the premenstrual and menstrual phases. Some researchers have observed improvements in muscular strength when estrogen is on the rise (Phillips, Sanderson, Birch, Bruce, & Woledge, 1996; Reis, Frick, & Schmidtbleicher, 1995; Sarwar,

Beltran, & Rutherford, 1995). Others have failed to demonstrate any trends in muscular strength performance across phases of the menstrual cycle (Davies, Elford, & Jamieson, 1991; Dibrezzo, Fort, & Brown, 1991; Higgs & Robertson, 1981; Lebrun, McKenzie, Prior, & Taunton, 1995; Petrofsky, Ledonne, Rinehart, & Lind, 1976; Wirth & Lohman, 1982). Oddly, in the study by Quadagno et al. (1991), athletes pressed a lesser amount of weight, a fewer number of times during the postmenstrual phase when estrogen concentration is presumably high, than during the premenstrual phase when estrogen levels decline. Estrogen levels of the weight lifters were not measured in this study. Nonetheless, Quadagno (2000) later remarks that, "good data exist to indicate that increasing or elevated levels of estrogen are associated with increased muscle strength. Increasing levels of estrogen do not appear to increase muscle endurance as measured by repetitions" (p. 327).

Swimming—Quadagno et al. (1991)

Quadagno et al. (1991) also measured menstrual cycle phase effects on a second performance index—speed. Fifteen collegiate swimmers (mean age = 19.2 years) who trained two to three hours per day, six days per week were observed for this study. Each athlete's menstrual cycle prior to testing was tracked in order to predict the timing of the next phases. All of the females had regular menstrual cycles and none used oral contraceptives.

The swimmers completed repeated timed trials for either the 100-m or 200-m freestyle event on three occasions across three complete menstrual cycles: (1) 3 to 5 days prior to menstruation (premenstrual phase); (2) days 1 to 3 of menstruation (menstrual phase); and (3) 10 to 12 days following the onset of menstruation (postmenstrual phase). Resulting times for each athlete were then averaged across the three cycles for each phase. Analysis of the data indicated no significant differences in swim times across phases of the menstrual cycle. Group means reported in the study by Quadagno et al. are presented in Table 2.4.

Although the sample sizes were small and group mean differences were not statistically significant, swimmers and coaches may consider the menstrual phase decrements functionally significant (1.6 to 2.3 seconds lost menstrually in the 100-m event; 4.1 to 7.2 seconds lost menstrually in the 200-m event). Overall, the swimmers were slowest

during the menstrual phase for both the 100-m and 200-m events, and were fastest during the premenstrual phase for both events. (Note that these results are opposite of those found in the study by Brooks-Gunn et al., 1986a, wherein the swimmers were fastest during the menstrual phase and slowest during the premenstrual phase for both 100-yd events.) Coaches and swimmers who could control the dates of important competitive events, or swimmers who were willing to manipulate their menstrual cycles and, thus, the timing of the premenstrual and menstrual phases, would find this information valuable. Clearly, the timing for peak performances must be evaluated on an individual athlete basis.

Table 2.4. Swim Performance across Phases of the Menstrual Cycle

Phase	100-m* (n = 10)	200-m* (n = 5)
Premenstrual	68.4 ± 3.84	144.1 ± 10.6
Menstrual	70.7 ± 2.04	151.3 ± 12.8
Postmenstrual	69.1 ± 2.59	147.2 ± 11.1

*Values are the mean number of seconds ± SD.

(Adapted from Quadagno et al. 1991, p. 123).

Summary of Research Findings

Although these research findings are somewhat inconsistent, some general patterns may be distinguishable. Of the studies that incorporated the premenstrual phase for observation (recall that Odom did not include this phase) and of the studies that obtained statistically significant results, all of the data indicate that sport performance suffered premenstrually. Also, in three of the four studies that obtained significant results,

performance was diminished in the menstrual phase. Brooks-Gunn et al. (1986a) were the only researchers to observe menstrual phase enhancement effects, albeit with a sample size of only four athletes.

Curiously, in both studies by Quadagno et al. (1991) that failed to yield significant cycle-phase effects, the general trend was toward enhanced performances premenstrually, for both strength and speed measures. Overall means for strength demonstrated that more weight was pressed a greater number of times in the premenstrual phase; overall means for speed demonstrated that the slowest swim time occurred menstrually, while the fastest swim time occurred premenstrually (exactly opposite the finding of Brooks-Gunn et al.). Table 2.5 presents a summary of contemporary research findings.

The remainder of this chapter focuses upon an attempt to explain these menstrual cycle-related performance variations among athletes. Each section is devoted to a unique relationship potentially linking the menstrual cycle to sport performance.

The first section outlines studies that have investigated the effect of the menstrual cycle upon various motor performance and physical fitness indices. These performance indices, in turn, may influence overall sport performance, such as winning/losing or setting records.

The second section summarizes factors that vary based upon athletic status, particularly menstrual symptomatology, injury prevalence, and oral contraceptive use. These variables may also directly or indirectly affect overall sport performance.

Lastly, the third section highlights the individual nature of the menstrual cycle, perception, and subsequent sport performance measures. A stimulus-response model is first presented to demonstrate the mediating variables between the menstrual cycle and sport performance. Another model is then presented to describe the interaction of athlete, coach, sport, and society factors in modifying athlete perception of and response to the menstrual cycle. Subjective sport performance constructs are listed as possible areas for exploration in research concerning the menstrual cycle and its effects on variables that influence sport performance.

Table 2.5. Menstrual Cycle Phase Effects and Sport Performance: A Summary of Findings

Sample	Performance Measures	Cycle Phase Effects*	Reference
11 college basketball	speed pass, dribble shoot, penny, Knox	decrements M	Odom (1979)
20 team swimmers	50-m sprint swim	decrements PM & M	Bale & Nelson (1985)
4 adolescent swimmers	100-yd freestyle & 100-yd best event	decrements PM/improvements M	Brooks-Gunn et al. (1986a)
164 cross-country skiers	5-km & 12.5-km races	decrements PM, M, & O	Fomin et al. (1989)
12 weightlifters	bench press & leg press	no significant differences	Quadagno et al. (1991)
15 collegiate swimmers	100-m & 200-m freestyle	no significant differences	Quadagno et al. (1991)

* M = Menstrual Phase; PM = Premenstrual Phase; O = Ovulatory Phase

Menstrual Cycle Phase Effects and Motor Performance

Possible explanations for sport performance variation across the menstrual cycle stem from cycle-phase effects related to motor skills and physical fitness. Various measures of motor performance and their tendencies to fluctuate throughout phases of the menstrual cycle have been examined over the past several decades. These measures have more recently been marked as potential mediators of cycle-related sport performance effects (Brooks-Gunn et al., 1986b). This line of research is included here separately because researchers utilized nonathlete samples and/or because motor performance measures were not sport-specific events or drills. In general, these studies reflect the influence of the menstrual cycle on engagement in physical activity by the nondescript female population. Because these studies are numerous in publication, diverse in constitution, and inconsistent in outcomes, the following discussion is brief and inexplicit. The physical activity components reviewed below include: (1) aerobic performance; (2) anaerobic performance; (3) endurance; (4) heart rate; (5) perceived exertion; (6) reaction time; (7) steadiness; (8) strength performance; (9) thermoregulation; and (10) visual discrimination.

Aerobic Performance

Lebrun et al. (1995) observed lower absolute and relative VO_{2max} during the mid-luteal phase (4 to 9 days after ovulation) as compared to the early follicular phase (first 3 to 8 days of cycle), but observed no cycle-phase differences in maximum recorded minute ventilation, maximal heart rate, or maximum respiratory exchange ratio. Williams and Krahenbuhl (1997) found that: (1) ventilation was higher in the mid-luteal phase than in the early follicular phase at rest, 55% of VO_{2max}, and 80% of VO_{2max}; (2) resting VO_2 was also higher in the mid-luteal phase than in the early follicular phase; and (3) running economy (rate of oxygen consumption during a submaximal steady-state running velocity) at speeds representative of 80% VO_{2max} was lower in the mid-luteal phase than in the early follicular phase. Other researchers have indicated few definitive results regarding aerobic performance (De Souza, Maguire, Rubin, & Maresh, 1990; Dombovy, Bonekat, Williams, & Staats, 1987; Pivarnik, Marichal, Spillman, & Morrow, 1992; Schoene, Robertson, Pierson, & Peterson, 1981).

Anaerobic Performance

Parish and Jakeman (1987) reported that mean power output and peak power output during a sprint exercise were higher in the mid-follicular phase than in the mid-luteal and menstrual phases. Wearing, Yuhosz, Campbell, and Love (1972) observed poorest performances on a standing broad jump exercise during the menstrual phase. Other researchers have reported no significant differences in anaerobic performance across menstrual cycle phases for a 600-yd run (Doolittle & Engebretsen, 1972), cycle ergometer test (De Bruyn-Prevost, Masset, & Sturbois, 1984), anaerobic speed test (Lebrun et al., 1995), and force-velocity, multi-jump, and squatting jump tests (Giacomoni, Bernard, Gavarry, Altare, & Falgairette, 2000).

Endurance

Muscular endurance (ability to sustain muscular involvement or to perform several repetitions at submaximal loads) appears to increase in the luteal phase for a hand-grip exercise (Wirth & Lohman, 1982), but does not appear to change across menstrual cycle phases for bench and leg press exercises (Quadagno et al., 1991), an endurance treadmill exercise at 90% VO_{2max} (Lebrun et al., 1995), or for knee flexion and extension exercises (Dibrezzo et al., 1991).

Heart Rate

Elevated heart rates during physical activity in the luteal phase as compared to the follicular phase have been reported (Hessemer & Bruck, 1985; Pivarnik et al., 1992). More studies, however, have documented no cycle-phase differences in heart rates during physical activity (Bemben, Salm, & Salm, 1995; Higgs & Robertson, 1981; Lebrun et al., 1995).

Perceived Exertion

The following results have been documented regarding perceived exertion: (1) perceived exertion is greater after 50 minutes of physical activity in the luteal phase as compared to the follicular phase (Pivarnik et al., 1992); (2) perceived exertion is greater during physical activity in the premenstrual and menstrual phases than during mid-cycle (Higgs & Robertson, 1981); and (3) perceived exertion does not vary with menstrual cycle phase (Bemben et al., 1995; Bryner, Toffle, Ullrich, & Yeater, 1996).

Reaction Time

Complex reaction time has been observed to be slower during the premenstrual phase (Gamberale, Strindberg, & Wahlberg, 1975; Hunter, Schraer, Landers, Buskirk, & Harris, 1979; Landauer, 1974) although other studies fail to observe cycle-related effects for complex reaction time (Sommer, 1983). Reaction time in a visual discrimination task was fastest in the luteal phase, when estrogen and progesterone are sustained at high levels (Wuttke, Arnold, Becker, et al.,1976).

Steadiness

In general, arm-hand steadiness may be improved at mid-cycle compared to other phases of the menstrual cycle (Zimmerman & Parlee, 1973). More specifically, decrements in stationary hand steadiness have been noted in the premenstrual phase (Wearing, Yuhosz, Campbell, & Love, 1972).

Strength Performance

Isometric muscular strength (force exerted by a muscle or muscle group during one maximal effort) may be lower during the luteal phase than during the follicular phase as measured by voluntary force of the adductor pollicis muscle (Phillips et al., 1996), maximal hand grip (Sarwar et al., 1995), and quadriceps muscle group (Sarwar et al., 1995). Reis et al. (1995) observed increased strength and endurance of the quadriceps muscle group during times of elevated estrogen levels (i.e., in late follicular and early luteal phases). Jacobson, Lentz, and Kulling (1998) observed decreased strength performance in the premenstrual phase on a quadriceps knee extension of the dominant leg. Other researchers investigating isometric muscular strength have failed to find cycle-phase differences (Davies et al., 1991; Dibrezzo et al., 1991; Higgs & Robertson, 1981; Lebrun et al., 1995; Petrofsky et al., 1976; Quadagno et al., 1991; Wearing et al., 1972; Wirth & Lohman, 1982).

A decline in or lack of estrogen and progesterone, such as occurs with amenorrhea, menopause, and extraction of the ovaries, may relate to decreased muscular strength (Greeves, 2000; Reilly, 2000). Evidence to support the role of hormones in the regulation of muscular strength stems, in part, from the finding that hormone replacement therapy can preserve or even restore muscular strength in menopausal women.

Thermoregulation

Basal body temperature (BBT) prior to, during, and following physical activity is higher during the luteal phase than during the follicular phase (Carpenter & Nunneley, 1988; Hessemer & Bruck, 1985; Pivarnik et al., 1992). High progesterone concentrations during the luteal phase may account for the increase in BBT during physical activity (Birch, 2000). Moreover, the bodily mechanisms available to reduce BBT (i.e., chest sweating and cutaneous vasodilation) have higher thresholds in the luteal phase than in the follicular phase (Hessemer & Bruck, 1985; Pivarnik et al., 1992). Some studies have found no cycle-phase differences in threshold for the onset of sweating or total sweat loss (Carpenter & Nunneley, 1988; Frye & Kamon, 1981; Sargent & Weinman, 1966).

Visual Discrimination

Visual sensitivity may appear diminished in the premenstrual phase (Sommer, 1983; Wuttke et al., 1976) and heightened in the menstrual phase (Ward, Stone, & Sandman, 1978) when compared to other phases of the menstrual cycle. Other studies found visual sensitivity to be highest at ovulation (Barris et al., 1980; Diamond et al., 1972; Scher, Pionk, & Purcell, 1981). Brooks-Gunn et al. (1986b) believe this to be an integral part of sports participation.

Menstrual Cycle Phase Effects and Athlete Samples

Additional explanations for variation in sport performance across phases of the menstrual cycle advance from research endeavors utilizing samples of athletes. Comparisons between athlete and nonathlete samples indicate that female athletes experience a number of variables in remarkably different ways than do nonathletes, in general and in relationship to phases of the menstrual cycle. Three notable domains are examined below: (1) menstrual symptomatology; (2) injury prevalence; and (3) oral contraceptive use.

Menstrual Symptomatology

In general, athletes experience fewer and/or less severe symptoms associated with the menstrual cycle than do nonathletes. It has been stated that athletes report less premenstrual and menstrual pain (Brooks-Gunn et al., 1986b; Dale, Gerlach, & Wilhite,

1979; Klafs, 1978; Timonen & Procope, 1971), less negative affect (Choi & Salmon, 1995; Timonen & Procope, 1971), and use analgesics less frequently (Timonen & Procope, 1971) than do nonathletes.

There is a wealth of information that indicates a reduction in negative menstrual symptomatology with participation in exercise (for e.g., Aganoff & Boyle, 1994; Choi & Salmon, 1995; Gannon, Luchetta, Pardie, & Rhodes, 1989; Hightower, 1997; Israel, Sutton, & O' Brien, 1985; Mahoney & Smith, 1997; Norris & Sullivan, 1983; Prior, Vigna, Sciaretta, Alojado, & Schulzer, 1987; Steege & Blumenthal, 1993). Accordingly, physical activity is highly recommended for the relief of dysmenorrhea and premenstrual syndrome. Insofar as athletes share a profile with "exercisers," this line of research may be generalized to them.

Potentially, athletes may have a higher tolerance for pain and, thus, may be likely to report fewer or less severe pain symptoms than would nonathletes. Also regarding differences in perception, athletes may attribute the painful symptoms of the menstrual cycle (such as muscle soreness) to the inevitability of sports training and competition, instead (Brooks-Gunn et al., 1986b).

The discrepancies between athletes and nonathletes in menstrual-related pain may further be explained by the lowered levels of prostaglandins present in some athletes due to an alteration in hormonal profile (Brooks-Gunn et al., 1986b). Athletes may exhibit an unusual number of anovulatory cycles and short luteal phases, accounting for the decreased prevalence of dysmenorrhea among them. Additionally, athletes may experience lighter blood flow during the menses and/or a shorter duration of the menses, thereby leading to less debilitating symptoms or, at least, the *perception* of less debilitation related to the menstrual cycle. This phenomenon may not hold true for athletic injury.

Injury Prevalence

An alarming situation seems to exist in that female athletes suffer a higher rate of injuries than do their female nonathletic counterparts and their male athletic counterparts. In particular, female athletes sustain four to eight times the number of anterior cruciate ligament (ACL) injuries for the same sports as do male athletes (Arendt & Dick, 1995; Engstrom, Johansson, & Tornkvist, 1991; Hutchinson & Ireland, 1995; Ireland & Wall,

1990; Whiteside, 1980; Wojtys, Huston, Lindenfeld, Hewett, & Greenfield, 1998; Zelisko, Nobel, & Porter, 1982).

The fluctuating levels of estrogen and progesterone throughout the menstrual cycle may create a set of circumstances under which the female athlete is more prone to serious knee injuries, especially to ACL tears (Wojtys et al., 1998). It is believed that estrogen plays a role in soft tissue strength, muscle function, and central nervous system activity. Also, progesterone may serve as a central nervous system anesthetic, and relaxin (produced by the corpus luteum and mediated by estradiol) may drastically impair collagen tension and remodeling. The exact mechanisms by which these substances create an environment of susceptibility to injury, however, are not fully understood.

In a study of 28 women with noncontact ACL injuries (i.e., injury occurred from jumping, twisting, decelerating, etc.), it was noted that significantly more injuries than expected occurred during the ovulatory phase (days 10-14; 29% observed vs. 18% expected) and significantly less injuries than expected occurred during the follicular phase (days 1-9; 13% observed vs. 32% expected). The ovulatory phase coincides with a striking surge in estrogen concentration while the follicular phase is characterized by relatively low levels of estrogen and progesterone. Several studies have examined the relationship between estrogen and tissue structure in animals (for e.g., Booth & Tipton, 1970; Dyer, Sodek, & Heersche, 1980; Fischer, 1973; Fischer & Swain, 1977), but the cyclical effects of estrogen on connective tissue and ligaments in humans are less known.

Moller-Nielson and Hammar (1989, 1991) observed a higher rate of injuries among 86 soccer players in the premenstrual and menstrual phases than during other phases of the cycle. Moreover, athletes taking oral contraceptive pills exhibited lower injury rates across the menstrual cycle, and athletes without premenstrual symptoms exhibited lower injury rates during the premenstrual phase. Whether the higher rates of injury during the premenstrual and menstrual phases are due to negative symptomatology and whether the lower rates of injury among oral contraceptive users are due to hormonal stabilization are hypotheses that warrant further investigation.

It has also been noted that some athletes complain of leg pain associated with physical activity during the premenstrual phase (Anderson et al., 2000). It appears to occur

in women with ovulatory cycles who experience premenstrual fluid retention. Fluid retention is believed to restrict space available for muscle hypertrophy during physical activity. Oral contraceptives can alleviate the premenstrually induced leg pain by inhibiting ovulation and reducing fluid, although some athletes experience more fluid retention and greater leg pain associated with the progesterone in oral contraceptive pills. An examination of oral contraceptive use by female athletes would be necessary to discover potential causes of unwanted pain for some athletes and to recommend a strategy for alleviating unwanted pain in other athletes.

Oral Contraceptive Use

Oral contraceptive pills are America's leading form of reversible birth control (American Health Consultants, 2000; Wagner & Kenreigh, 1999). Besides preventing pregnancy, birth control pills offer a host of additional benefits to the women who use them: (1) menstrual cycle regulation for controlling and predicting cycle frequency, duration, and amount of blood loss; (2) alleviation of negative symptoms associated with dysmenorrhea and PMS; (3) reduction of iron-deficiency anemia; (4) control of acne; and (5) protection against ailments such as endometrial cancer, ovarian cancer, benign breast disease, and pelvic inflammatory disease (Wagner & Kenreigh, 1999).

An examination into the trends of contraceptive practices in the United States revealed that 59% of teenagers and 68% of women aged 20 to 24 years in 1988 used oral contraceptive pills (Piccinino & Mosher, 1998). More recently, the usage rates of oral contraceptive pills have dropped among these cohorts of women—44% of teenagers and 52% of women aged 20 to 24 years in 1995 used oral contraceptive pills. Among athletes, however, use of oral contraceptive pills may be lower than national averages. In an unpublished study of Division I collegiate athletes, only 32.4% indicated use of birth control pills (Anderson et al., 2000). Additionally, among the athletes involved in the studies reviewed earlier, only two of the eleven athletes observed by Odom (1979) and none of the athletes observed by the other researchers used oral contraceptive pills.

That athletes are wary of oral contraceptives because they impair peak performance is a "tireless rumor," according to Schelkun (1991, p. 143). She acknowledges that a connection between impaired sport performance and oral contraceptive use has not been

validated and believes, instead, that oral contraceptives may be the smartest and most convenient choice for birth control among athletes. Schelkun (1991) understands the added benefits of menstrual cycle control and symptom relief that come with oral contraceptive use and, therefore, would recommend the pill for enhanced performance. She maintains that "[o]ral contraceptives can reduce the severity of cramps, as well as the amount and length of heavy bleeding. With less pain, athletes are likely to perform better" (p. 151). Furthermore, Schelkun feels that "[m]any athletes may benefit psychologically from the regularity and predictability of oral contraceptive therapy" (p. 152).

Indeed, some female athletes agree and have been manipulating their menstrual cycles with oral contraceptive pill use to accommodate major competitive events or have been utilizing oral contraceptive pills in ways that not only prevent ovulation, but eliminate the menstrual period, as well. Some present oral contraceptives (for e.g., Norplant™ and Depo-Provera™) inadvertently block menstruation for some women who use them, but two new oral contraceptive pills that can create a reversible condition of menstrual period cessation for all users may be available soon (New Scientist, 2001). The pills contain two menstrual suppressants that block progesterone, thereby preventing the bleeding period. Until the availability of such suppressants, however, skipping the week of inactive pills in a packet of oral contraceptives and starting another week of active pills in its place will eliminate the menstrual period, as well (Sobel, 2000). As "one of medicine's best-kept secrets" (Sobel, 2000, p. 59), the practice of continual synthetic hormone exposure is currently under investigation for its potential health risks. A pill that offers only four periods a year due to repeated schedules of twelve weeks active and one week inactive (i.e., Seasonale™) should be available soon.

As noted earlier, oral contraceptives may increase fluid retention and induce leg pain in some athletes. Other documented adverse effects of oral contraceptive use include: (1) bleeding irregularities, such as spotting, breakthrough bleeding, and amenorrhea; (2) headache and migraine; (3) gastrointestinal upset, such as nausea, vomiting, cramping, and bloating; (4) breast tenderness; (5) weight gain; (6) hypertension; (7) cardiovascular and thromboembolic events; (8) acne; and (9) increased cancer risk (Wagner & Kenreigh, 1999). Like the other variables discussed in this paper, symptomatology seems to vary individually.

Potential Influences on Athlete's View of and Response to the Menstrual Cycle

From the expansive literature review presented up to this point, a few observations may be set forth regarding women who have menstrual cycles: (1) most, but not all, women experience one or more debilitating systemic changes associated with the menstrual cycle; (2) few women experience a psychological deficit in cognition throughout the menstrual cycle, but many women demonstrate cyclical mood variation; (3) some, but not all, women exhibit behavioral changes in response to the menstrual cycle; (4) few women suffer from a true diagnosis of PMS, but many women believe they suffer from PMS; (5) many women manage menstrual cycle regularity, symptomatology, and PMS with one or more of a wide variety of methods; (6) some female athletes perceive menstrual phase performance deficits, some perceive menstrual phase performance enhancements, and still other female athletes believe the menstrual cycle has no effect at all upon their sport performance; (7) some female athletes objectively perform at their best in the premenstrual phase, some perform at their best in the menstrual phase, and some during mid-cycle phases; (8) some women and female athletes experience cycle-related differences in some motor performance and physical fitness tests; (9) some female athletes report fewer or less severe menstrual cycle symptoms than do some nonathletic women; (10) some female athletes experience cycle-related injuries; and (11) some women experience positive effects associated with oral contraceptives while others experience negative effects; some women experience both.

It is clear from these investigations into the trends and patterns of female physiology, psychology, and behavior that a woman's view of and subsequent response to her menstrual cycle is rather *individualized*. Instead of continuing the search for that unique factor that varies with the menstrual cycle in a uniform way across the female population, it may be wiser to conclude that factors vary individually and then begin to assess *why* individual patterns may occur across menstrual cycle phases.

Female athletes undoubtedly have a view of their menstrual cycle, both in general and as it relates to their role as an athlete, and this view may be positive, negative, neutral, or fluctuating. Combined objective and subjective factors will help to define the athlete's view of her menstrual cycle. For example, the real and objective symptom of weight gain

associated with the menstrual phase for an athlete may combine with a subjective assessment of a displeasing body image to result in a negative view of at least menstruation, if not the entire menstrual cycle process. Then, the athlete's view of her menstrual cycle may intervene to produce a response. This response may be composed of objective factors and/or mediated by subjective variables. For example, the objective symptom of weight gain may produce an objective deficit in sport performance by impairing the speed of an athlete. Alternatively, the subjective assessment of a poor body image may result in diminished sport performance by reducing the subjective mediating variables of motivation and effort of an athlete. The key is to understand the objective and subjective mediating variables between the menstrual cycle and sport performance for each athlete. In doing so, peak performance time frames and worst performance time frames may be identified. Figure 2.1 depicts a modified stimulus-response (S-R) model indicating the potential influences on the link between the menstrual cycle (S) and sport performance (R).

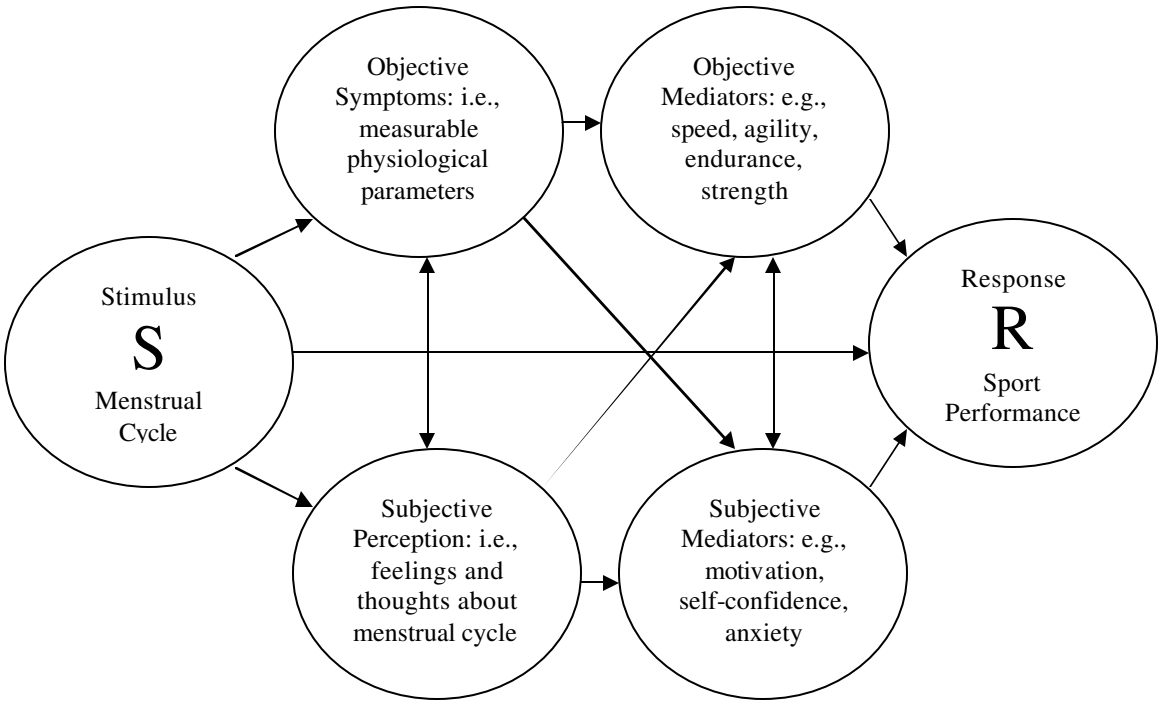


Figure 2.1. Model Linking the Menstrual Cycle to Sport Performance

Another model is presented to elaborate upon the factors that may explain individual athlete differences in menstrual cycle perception and subsequent sport performance (see Figure 2.2). This model would help to answer questions such as: (1) Why does one athlete on a basketball team either view or experience menstruation in a way that results in her best performances occurring menstrually rather than intermenstrually as the rest of her teammates?; (2) Why is one swimmer on a competitive team so unaffected by her menstrual cycle that she posts similar times across all phases of her cycle even though the rest of the team seemed to suffer menstrually?; and (3) Why do athletes swim fastest premenstrually in one study while other athletes swim slowest premenstrually in another study?

The model includes factors related to the athlete, coach, sport, and society. An elaboration of each main factor is provided below.

Athlete factors include: (1) personality factors, such as aggression, hardiness, pain tolerance, and helplessness; (2) coping style, such as diet, exercise, sleep, and oral contraceptive use; (3) personal beliefs and behaviors, such as knowing when a period is coming and sanitation preference; (4) demographic characteristics, such as current age, age at menarche, ethnicity, and body type; and (5) hereditary and familial factors, such as the nature of the cycle, how a girl was prepared for menarche, and family support.

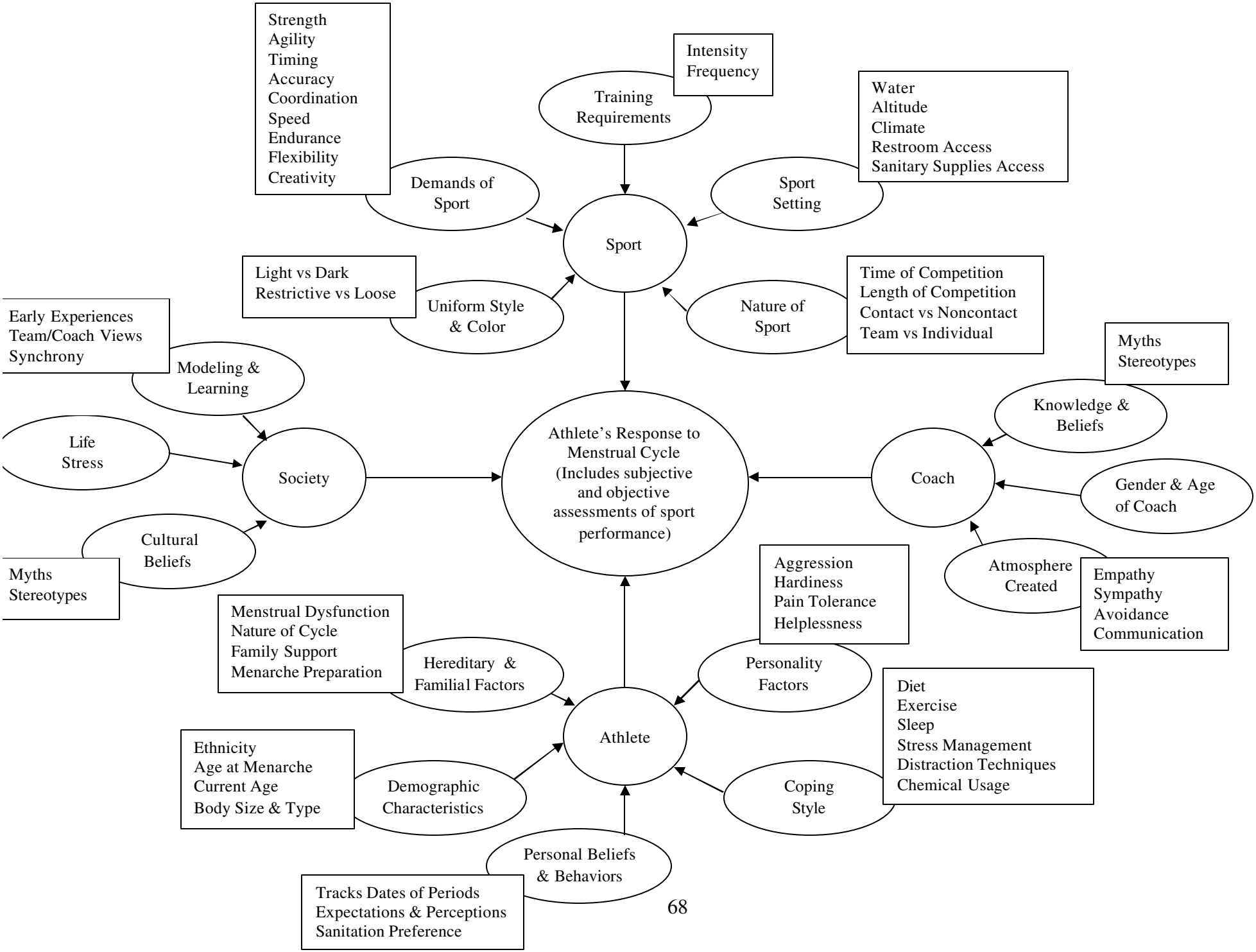
Coach factors include: (1) knowledge and beliefs; (2) gender and age; and (3) atmosphere created, such as empathy, sympathy, avoidance, and communication.

Sport factors include: (1) uniform style and color; (2) demands of the sport, such as strength, agility, and speed; (3) training requirements, including intensity and frequency; (4) sport setting, such as climate, water, altitude, and restroom access; and (5) nature of the sport, such as time and length of competition.

Society factors include: (1) modeling and learning, including early experiences, team or coach views, and menstrual synchrony; (2) life stress; and (3) cultural beliefs, including myths and stereotypes.

Figure 2.2. A Model to Explain Variation in Perception of and Response to the Menstrual Cycle

(presented on the following page)


Strength
Agility
Timing
Accuracy
Coordination
Speed
Endurance
Flexibility
Creativity
Intensity
Frequency
Training
Requirements
Water
Altitude
Climate
Restroom Access
Sanitary Supplies Access
Demands of
Sport
Sport
Setting
Sport
Light vs Dark
Restrictive vs Loose
Uniform Style
& Color
Nature of
Sport
Time of Competition
Length of Competition
Contact vs Noncontact
Team vs Individual
Early Experiences
Team/Coach Views
Synchrony
Modeling &
Learning
Myths
Stereotypes
Knowledge &
Beliefs
Life
Stress
Society
Athlete's Response to
Menstrual Cycle
(Includes subjective
and objective
assessments of sport
performance)
Coach
Gender & Age
of Coach
Cultural
Beliefs
Myths
Stereotypes
Atmosphere
Created
Empathy
Sympathy
Avoidance
Communication
Aggression
Hardiness
Pain Tolerance
Helplessness
Menstrual Dysfunction
Nature of Cycle
Family Support
Menarche Preparation
Hereditary &
Familial Factors
Personality
Factors
Diet
Exercise
Sleep
Stress Management
Distraction Techniques
Chemical Usage
Athlete
Ethnicity
Age at Menarche
Current Age
Body Size & Type
Demographic
Characteristics
Coping
Style
Personal Beliefs
& Behaviors
Tracks Dates of Periods
Expectations & Perceptions
Sanitation Preference

It is not clear how all of these variables affect menstrual cycle symptomatology, menstrual cycle perception, objective measures of sport performance, and/or subjective measures of sport performance. Several of the variables, as they relate to the menstrual cycle, have been examined by other researchers. For example, the potential for success in alleviating unwanted menstrual and PMS symptoms by using a coping style such as diet, exercise, or oral contraceptives has been investigated previously. Also, motor indices such as strength, accuracy, speed, and endurance that form the demands of a sport have been purported to fluctuate across phases of the menstrual cycle, albeit with inconsistency across samples.

Admittedly then, as a preliminary and speculative model, exploratory research is needed to identify salient factors, add missing variables, and eliminate irrelevant variables. Moreover, the potential mediating constructs to explore that might also explain sport performance variation (i.e., the subjective factors that are influenced by the menstrual cycle that may explain individual performance decrements or improvements) include: (1) body image; (2) self-esteem and confidence; (3) stress and anxiety; (4) aggression; (5) focus and concentration; (6) goal adherence; (7) attendance; (8) team cohesion; (9) motivation; (10) mood and temperament; (11) self-expectancies; and (12) injury occurrence and rehabilitation. It would be informative to know if the menstrual cycle influenced these sport-related parameters and, if so, how and to what degree. Although body image, aggression, focus and concentration, and injury occurrence have been alluded to in the literature, data are inconclusive as to whether these variables fluctuate with any consistency across phases of the menstrual cycle. As mentioned earlier, many women exhibit cyclical mood variation.

The ultimate goal is to identify the key factors for each individual athlete that trigger an appreciable performance decrement or improvement during a certain phase or phases of the menstrual cycle. Upon recognition of these factors, it would then be important to consider solutions for resolving performance decrements and consider methods for fostering performance improvements for each athlete. For example: (1) one athlete who experiences "real" pain and subsequent performance decrements during her menses might benefit from consulting a gynecologist about the use of oral contraceptives for regulating her cycle, reducing the amount of blood flow during menstruation, and alleviating many pain

symptoms associated with her cycle; (2) one athlete who uses only menstrual pads and suffers in performance due to immense anxiety about bleeding through her white or restrictive uniform might benefit from using tampons, having sanitation supplies readily available in the sport setting, having restroom facilities readily available, wearing extra garments underneath the uniform to prevent leakage, and considering the use of oral contraceptives to minimize the amount of blood flow during menses; or (3) one college freshman athlete's behavior of exhibiting helplessness and avoiding training or competition for days leading up to her period might be explained by the attitudes and beliefs of her high school coach and/or teammates who created an atmosphere of sympathy and who coddled cramping athletes—this athlete may benefit from an atmosphere of open communication wherein collegiate coaches do not tolerate helplessness and convey the knowledge that exercise actually alleviates premenstrual and menstrual pain. Accordingly, it is the role of the coach in an athlete's experience that leads the current focus for questionnaire design.

Focus on Coach Factors

The relationship that an athlete shares with the coach has the potential to be very powerful and influential in the life of an athlete (Ginsburg, 1999; Miller, 1993; Weiss, 2000). For example, Mathes and Gurney (1985) documented that full and partial scholarship athletes deemed the coach to be a more salient factor than the athletics when choosing a college to attend for sport participation. Also, when returning from a serious sport injury, athletes prefer to seek help from the coach rather than from a sport professional, counselor, or clinical psychologist (Maniar, Curry, Sommers-Flanagan, & Walsh, 2001).

Coach-athlete relationships may differ in their tone and strength, as argued by Poczwardowski, Barott, and Henschen (2002), who categorize the relationships as positive-strong, positive-weak, negative-weak, or negative-strong. This potential for coaches to have a positive as well as a negative effect on the athletes whom they coach is evident in research endeavors.

At the most reprehensible and extreme level, is the coach who misuses the tremendous power of the coach-athlete relationship by abusing athletes in sexual and/or nonsexual ways, as documented in a study of male coach abuse of teenage girls (Bowker, 1998). In perhaps a more equivocal and indirect category of coach abuse, Fender-Scarr

(1999) examined eating pathology among adolescent female gymnasts and discovered that an athlete's disordered eating behavior was significantly related to the comments a coach made about the gymnast's appearance. The author concluded that comments from a coach about weight and appearance may be internalized by an athlete and manifested as cognitive distortions about the body. In contrast to this negative presence by a coach, a study of Norwegian female elite athletes revealed that the loss of a coach could trigger disordered eating behavior (Sundgot-Borgen, 1994).

Overwhelmingly, the accounts of coach-athlete relationships in the literature are of a powerful, positive nature. For female athletes, the socializing influence of the parent that is so prominent in a child's life may transition to the socializing influence of a coach about the time of junior and senior high school (Higginson, 1985). Participants on the 1998 United States Women's Olympic Ice Hockey Team attributed their gold medal performance, in large part, to their head coach (Haberl, 2001). Team members revealed a very strong relationship with the highly effective head coach who was regarded as a fundamental source for high team cohesion, high team confidence, and subsequent peak performance.

In a study of male collegiate athletes and their most influential coach, interviews revealed that the coach-athlete relationship can fulfill various needs: (1) identification with an important adult male role model; (2) enhancement of an athlete's achievement; (3) establishment of limits upon an athlete's behavior; (4) regulation of aggression; (5) restoration of an athlete's early childhood deficits; and (6) facilitation of an athlete's need for individuation (Ginsburg, 1999). Ginsburg (1999) surmises from the interviews that coaches are caring and strong role models who offer a therapeutic relationship that can pervade the lives, values, and success of male athletes.

Many coaches embrace these relationships and view mentoring as a fundamental responsibility of their professional position (Miller, Salmela, & Kerr, 2002). Athletes undoubtedly look to their coach for social support and, in one study, athletes reported greater satisfaction with their sport when the coach provided more frequent rewarding, engaged in social support, and made decisions democratically (Weiss & Friedrichs, 1986).

Based on this line of research, it is clear that a coach has the potential to shape the thoughts, feelings, and behaviors of the athletes with whom they interact. As such, one may

speculate that a coach could influence a female athlete's objective and subjective experience with her menstrual cycle based upon the coach's current knowledge and belief system about the menstrual cycle, oral contraceptive use, and related events. Moreover, the general atmosphere or climate created by the coach may dictate the type, tone, and extent of communication about these topics and may further influence any subsequent athlete perceptions of menstrual cycle-related issues.

To date, no documentation exists that can answer the following important questions: (1) What do coaches currently know about the general female menstrual cycle and oral contraceptives?; (2) How important do coaches feel it is to have acquired this general information for understanding female athletes?; (3) What do coaches know about the menstrual cycle characteristics and oral contraceptive use of the female athletes whom they coach?; (4) How important do coaches feel it is to have acquired this specific information for understanding the female athletes whom they coach?; (5) What type of climate do coaches present for addressing issues about the menstrual cycle and oral contraceptive use among the female athletes whom they coach?; (6) What type, tone, and extent of communication regarding the menstrual cycle and oral contraceptive use occurs between coaches and the female athletes whom they coach?; (7) What do coaches believe about the influence of the menstrual cycle and oral contraceptive use upon sport performance?; (8) How do coaches feel about oral contraceptive use by the female athletes whom they coach?; (9) How do coaches feel about and react to female athletes who seem affected in sport by their menstrual cycles?; and (10) How do all of the answers to the aforementioned questions vary according to coach demographic information, including gender, age, position of employment, sport coached, longevity in coaching, marital status, ethnicity, educational level, college major, and presence of other females in household? These important questions provide the framework for formulating an appropriate assessment tool.

Consideration of Assessment Methods

When attempting to acquire information related to knowledge and attitudes, researchers must present questions to the target population. Modes of assessment appropriate here for this type of data collection include face-to-face interviews, telephone interviews, and self-administered questionnaires (Schwarz, 1997). With advantages and disadvantages associated with each of the three methods, careful consideration must be made in selecting a suitable form of measurement.

Based upon a discussion of data collection methodologies by Schwarz (1997), a brief outline of important differences among face-to-face interviews, telephone interviews, and self-administered questionnaires is presented. First, because self-administered questionnaire items are presented visually, the visual perception and reading ability of respondents must be considered. This aspect is not a required consideration in telephone interviews wherein respondents must listen to items and response choices. Both visual and auditory requirements may be present in a face-to-face interview.

Second, face-to-face interviews and telephone interviews typically constitute a precise ordering of questions and, as such, "respondents have to process the information in the temporal succession and the pace in which it is presented by the interviewer"(Schwarz, 1997, p. 38). Moreover, respondents may not return to previous questions to correct or elaborate upon them under such interviewing conditions because they either feel uncomfortable in doing so or because they fail to remember to do so. Self-administered questionnaires do not mandate a pace for item presentation and they impose less effect of strict item organization. Accordingly, respondents may monitor their answers and go back and forth between items when completing a self-administered questionnaire.

Third, the issue of time and delayed response is most salient during a telephone interview wherein silence may be misinterpreted as lack of attention or failure to respond. Time constraint tends to impede effective recall and risks dependence upon simple, rather than complex, cognitive processing. Face-to-face interviews at least permit the observation of nonverbal cues that can signify more time is necessary for a response; however, self-

administered questionnaires advance the least amount of time pressure due to the allowance for a self-imposed pace.

Fourth, the same nonverbal cues that can suggest the need for more response time in a face-to-face interview may also be important indicators of general attentiveness, comprehension, motivation, and illustration (i.e., gesturing). This informative style of communication is absent in telephone interviews and self-administered questionnaires.

Fifth, the social interaction inherent in face-to-face interviews and telephone interviews allows for clarification of confusing or misunderstood items and responses. Also, under interviewing conditions, elaboration may be elicited for vague or incomplete responses. During the completion of a self-administered questionnaire, respondents are regrettably permitted their own perception and interpretation of items and response choices due to the absence of any social facilitation.

Sixth, social interaction plays another important role in interviewing techniques by potentially biasing respondent answers while allowing for the development of rapport between respondent and interviewer. This social element is limited during telephone interviews to voice characteristics that may imply gender, age, or ethnicity. Interviewer effects are further avoided with the use of self-administered questionnaires and are typically limited to characteristics of the person dropping off and/or picking up the questionnaire and to the style and content of the cover letter.

Lastly, the three modes of assessment differ in the researcher's ability to monitor and control external distractions. In the absence of interviewer supervision, self-administered questionnaires offer the least awareness and control of diversionary influences upon the respondent.

In consideration of the differences among these assessment methods, a questionnaire design is considered the best option for meeting the objectives of the current research endeavor. The following excerpts from Orlich (1978), presented in Table 2.6, provide an acknowledgement of the general advantages and disadvantages of utilizing a questionnaire for data collection:

Table 2.6. General Advantages and Disadvantages of Questionnaire Use

General Advantages of Questionnaire Use.

1. Many individuals may be contacted at the same time.
2. A questionnaire is less expensive to administer than is using an interview technique.
3. Each selected respondent receives identical questions.
4. A written questionnaire provides a vehicle for expression without fear of embarrassment to the respondent.
5. Responses may be easily tabulated (depending on design of instrument).
6. Respondents may answer at their own convenience.
7. There is no need to select and train interviewers.
8. Interviewer biases are avoided.
9. Uniform data are gathered which allow for long-range research implications. (Adapted from Orlich, 1978, p. 4)

General Disadvantages of Questionnaire Use.

1. The investigator is prevented from learning the respondent's motivation for answering questions.
2. Respondents may be limited in providing free expression of opinions due to instrument design.
3. The collection of data from individuals who cannot read, write, or see is prevented.
4. Complex designs may result in poor responses or a lack of responses.
5. A question may have different meanings to different people.
6. There is no assurance that the intended respondent actually completes the instrument.
7. Respondents may not complete the entire instrument. (Adapted from Orlich, 1978, p. 7)

Furthermore, it must be recognized that a poorly designed questionnaire invites a host of additional disadvantages and limitations. Careful attention must be devoted to the proper methodology of questionnaire design for resultant data to have meaning.

Existing Instruments

Few assessment tools are available for the measurement of constructs related to the menstrual cycle and oral contraceptives. Moreover, the small number of inventories and questionnaires available to review for this research endeavor were deemed inappropriate for meeting the study's objectives.

For example, the Adolescent Menstrual Attitude Questionnaire (Morse, Kieren, & Bottorff, 1993) was carefully written and reviewed by experts to maintain language appropriate for adolescent age groups, not for adult age groups. More importantly, this instrument primarily assesses the attitudes of premenarcheal and postmenarcheal girls concerning the feelings they have about starting or having their own periods; it does not assess the perceptions that outside observers have about the menstrual cycle or menstruation. The general items about attitudes toward periods that are rated from "strongly agree" to "strongly disagree" (for e.g., "When girls get their periods, they should be excused from gym," or "When girls get their periods, they often feel like throwing up") are too few in number to extract to form any meaningful, smaller instrument and are not considered the best means by which to measure coach knowledge and attitudes about the menstrual cycle.

The Contraceptive Utilities, Intention, and Knowledge Scale (Condelli, 1984), grounded in theoretical components adopted from the health belief model and behavioral intention model, is suitable for adult use. However, the attitude portion of the questionnaire that measures the use of, and intention to use, contraceptives revolves primarily around contraceptives as birth control and subsequent feelings about pregnancy. Also, the knowledge portion of the questionnaire contains items related to the diaphragm, foam, condoms, IUDs, and birth control pills. The current investigation is concerned (1) only with birth control pill use, (2) for reasons other than the prevention of pregnancy.

The Contraceptive Knowledge Inventory (DelCampo, Sporakowski, & DelCampo, 1976) is also appropriate for use with adult samples but contains questions that are mostly unrelated to the objectives of the current study. For example, questions on this instrument

pertain to topics such as the rhythm method, sperm cells, mechanical contraceptive devices, tubal ligation, diaphragms, and condoms.

A Scale to Assess University Women's Attitudes About Contraceptive Acquisition and Use (Fisher, Byrne, Edmunds, et al., 1979) presents 7-point Likert scales on which a number of items related to birth control methods may be assessed. Unfortunately, the questionnaire presents "birth control methods" as a comprehensive group that comprises **all** methods of birth control, rather than dividing attitude measures into groups related to condoms, IUDs, diaphragms, pills, and so forth. Although the questionnaire could be rephrased to pertain only to birth control pills, the items are vague and superficial. For example, "Using a method of birth control is" requires a rating from "good" to "bad," and "right" to "wrong" while "Using birth control leads to major negative side effects" requires a rating from "probable" to "improbable." Little information would be obtained from coaches by rating their attitudes toward oral contraceptive use and assessing their knowledge about oral contraceptive side effects in this fashion.

Lastly, another instrument that lacks depth and specificity is the Attitude Toward Using Birth Control Pills Scale (Herold & Goodwin, 1980). This scale consists of one statement, "I think that using birth control pills is" and 14 subsequent 7-point Likert scales on which respondents place their corresponding attitude assessment. The Likert scales are all anchored with bipolar adjectives, including "good/bad," "useful/useless," "healthy/sick," "beneficial/harmful," "safe/dangerous," "positive/negative," and "calm/anxious." Completion of this instrument by coaches would not provide elaboration on the knowledge and attitudes about oral contraceptive use by athletes and how this relates to beliefs about subsequent sport performance.

In lieu of the aforementioned assessment tools, as they do not satisfy the research objectives, a new questionnaire was created for the specific use with athletic coaches.

CHAPTER 3

STATEMENT OF THE PROBLEM

Purposes

The purposes of this study were to: (1) design a questionnaire (through the use of focus groups) that assesses coaches' general knowledge of the menstrual cycle (MC) and oral contraceptives (OC), specific knowledge of athletes' MC and OC use, and attitudes toward the MC and OC use as they relate to sport performance; (2) pretest the questionnaire utilizing a sample of at least 200 male and female middle school, high school, and collegiate coaches of female sport teams; (3) complete appropriate item analyses and examine responses to items to inspect questionnaire properties; (4) conduct a posttest, follow-up focus group to elicit feedback regarding questionnaire response rates, response patterns, and areas in need of revision; (5) revise the questionnaire as necessary; and lastly, to gain initial insight into this uncharted research area, (6) provide descriptive data and comparative analyses to explore demographic variables and coach knowledge/attitudes based on pretest results with this sample of coaches.

Assumptions

It is assumed for this study that: (1) during the design and posttest phases, focus group members were heard/recorded and that their recommendations were perceived and interpreted appropriately; and (2) during the pretest phase, coaches completed the questionnaires without the aid of another person and that coaches completed the questionnaires honestly, without deliberately lying or by answering randomly.

Limitations

This study is limited according to the following: (1) construction of the questionnaire is limited to the input from the researcher and participating focus group members from Leon County and Jefferson County; (2) descriptive and comparative data are limited to participating coaches from the southeastern United States who completed the questionnaire; and (3) revisions and final drafting of the questionnaire are limited based upon results of pretesting the initial questionnaire with participating coaches from the southeastern United States and based upon the posttest feedback of participating focus group members from Leon County.

CHAPTER 4

METHOD

Subjects

Participants for this investigation were included in one of three phases during the course of this study: (1) design phase focus group, (2) pretest phase coach sample, or (3) posttest phase feedback focus group. An elaboration of participants in each group follows.

Design Phase – Focus Groups Construct the Questionnaire

Participants for the design phase of this study consisted of individuals deemed appropriate to partake in focused group discussions regarding the study objectives toward questionnaire construction (see procedures section below for a more detailed explanation of focus groups).

Focus group 1 comprised a sample of two athletic coaches of female sport teams from a Jefferson County private K-12 school (see Table 4.1 for participant characteristics). This school was selected from which to draw focus group participants because (1) nearly 85% of students in grades 9-12 participate in at least one sport on campus, (2) coaches, teachers, parents, and students together form a closely affiliated network wherein open communication is actively encouraged, (3) most of the athletic coaches share the roles of educator and parent, as well, and (4) rapport between the researcher and members of this school community has been established prior to the onset of this study.

The size of this focus group falls short of the recommended minimum for six members (Debus & Novelli, 1988), as the coaches of the girls' softball and girls' basketball teams were not accessible during the times available to other participants for focus group meetings. Additionally, one female school educator with a dual role as parent of two female athletes at this school (one premenarcheal girl and one postmenarcheal girl) was originally

available to attend this focus group session; regrettably, she was unexpectedly needed to fulfill another obligation at school during this time.

Table 4.1. Focus Group 1: Participant Characteristics

Coach 1	Gender:	Female
	Age:	36 years
	Position of Employment:	School Registrar
	Primary Sport (PS) Coached:	Head Coach of Varsity Cheerleading
	Age Range of PS Athletes:	14 to 18 years
	Number of PS Athletes on Team:	12
	Secondary Sport (SS) Coached:	Supervisor for Junior Varsity Cheerleading
	Age Range of SS Athletes:	12 to 14 years
	Number of SS Athletes on Team:	12
	Coaching Experience:	1 year
	Characteristics of Daughter(s):	athlete, 12 years of age, premenarcheal
Coach 2	Gender:	Male
	Age:	43 years
	Position of Employment:	Educator and Technology Specialist
	Primary Sport (PS) Coached:	Head Coach of Cross Country
	Age Range of PS Athletes:	11 to 17 years
	Number of PS Athletes on Team:	8
	Secondary Sport (SS) Coached:	Assistant for Girls' Basketball
	Age Range of SS Athletes:	14 to 18 years
	Number of SS Athletes on Team:	12
	Coaching Experience:	8 years
	Characteristics of Daughter(s):	athlete, 13 years of age, premenarcheal athlete, 15 years of age, postmenarcheal

Focus group 2 consisted of nine postmenarcheal female athletes from the Florida State University (all participating in NCAA sports). Sports represented by this sample of athletes included softball (n = 2), soccer (n = 2), cheerleading (n = 1), volleyball (n = 2), swimming (n = 1), and golf (n = 1). Ages of participants ranged from 19 to 22 years (mean age = 20.22 years). Table 4.2 presents participant characteristics of this focus group.

Table 4.2. Focus Group 2: Participant Characteristics

Athlete 1	Gender:	Female
	Age:	22 years
	College Grade Level:	Senior
	Primary/Current Sport (PS) Played:	Soccer
	PS Playing Experience:	16 years
	Secondary Sports (SS) Played:	Softball, Basketball
	SS Playing Experience:	11 years, 2 years
Athlete 2	Gender:	Female
	Age:	22 years
	College Grade Level:	Senior
	Primary/Current Sport (PS) Played:	Softball
	PS Playing Experience:	14 years
Athlete 3	Gender:	Female
	Age:	21 years
	College Grade Level:	Senior
	Primary/Current Sport (PS) Played:	Swimming
	PS Playing Experience:	11 years
Athlete 4	Gender:	Female
	Age:	20 years
	College Grade Level:	Junior
	Primary/Current Sport (PS) Played:	Soccer
	PS Playing Experience:	15 years
Athlete 5	Gender:	Female
	Age:	20 years
	College Grade Level:	Sophomore
	Primary/Current Sport (PS) Played:	Softball
	PS Playing Experience:	6 years
	Secondary Sports (SS) Played:	Baseball, Basketball, Volleyball, Golf
	SS Playing Experience:	12 years, 4 years, 4 years, 4 years

Table 4.2. continued

Athlete 6	Gender:	Female
	Age:	20 years
	College Grade Level:	Sophomore
	Primary/Current Sport (PS) Played:	Golf
	PS Playing Experience:	15 years
Athlete 7	Gender:	Female
	Age:	19 years
	College Grade Level:	Sophomore
	Primary/Current Sport (PS) Played:	Cheerleading
	PS Playing Experience:	13 years
Athlete 8	Gender:	Female
	Age:	19 years
	College Grade Level:	Freshman
	Primary/Current Sport (PS) Played:	Volleyball
	PS Playing Experience:	7 years
	Secondary Sports (SS) Played:	Basketball, Track and Field
	SS Playing Experience:	10 years, 2 years
Athlete 9	Gender:	Female
	Age:	19 years
	College Grade Level:	Freshman
	Primary/Current Sport (PS) Played:	Volleyball
	PS Playing Experience:	5 years
	Secondary Sports (SS) Played:	Soccer, Skiing
	SS Playing Experience:	2 years, 2 years

Pretest Phase – 207 Coaches Complete the Questionnaire

Participants for the pretest phase of this study (questionnaire completion) consisted of 207 male (n = 85) and female (n = 122) head coaches, assistant coaches, volunteer coaches, and athletic trainers of female athletic teams from public and private middle schools, high schools, colleges, and universities primarily across the southeastern United States. (The term "coach" shall henceforth encompass and mean all types of coaches and

trainers included in the sample). States represented by this sample of coaches included Florida, Georgia, South Carolina, North Carolina, Alabama, Mississippi, Tennessee, Arkansas, Kansas, and Illinois. Sports coached by this sample included basketball (n = 57), track and field (n = 16), cross country (n = 9), softball (n = 28), soccer (n = 17), volleyball (n = 26), cheerleading (n = 8), dance (n = 3), swimming and diving (n = 6), tennis (n = 10), golf (n = 11), gymnastics (n = 5), sailing (n = 1), equestrian (n = 3), field hockey (n = 3), and general/athletic training (n = 4).

Posttest Phase – Focus Group for Questionnaire Feedback

This posttest focus group consisted of five members who were participating in and/or affiliated with women's athletics (i.e., as a female athlete, coach of female athletes, and/or sport psychology consultant to female athletes); have a particular expertise in menstrual cycle or oral contraceptive issues; and/or have expertise in test construction and measurement principles. All five members (one male and four females) hold Master's degrees and were Doctoral students in a Ph.D. program in the College of Education at Florida State University at the time of this study. Ages of these participants ranged from 25 to 34 years (mean age = 28.6 years). Table 4.3 presents this focus group's participant characteristics, including a brief profile of each participant's involvement with women's athletics and/or evidence of related expertise.

Table 4.3. Focus Group 3: Participant Characteristics

Member 1	Gender:	Male
	Age:	25 years
	Education:	M.S., Current Ph.D. Student
	Women's Athletics Participation:	Not Applicable
	Women's Athletics Affiliation:	Coach, High School Varsity Basketball, 2 years
	Related Expertise:	Education, M.S. Measurement and Statistics
		Research, Menstrual Cycle/Athletes, 2 years
		Consultant, Instrument Development, 1 year

Table 4.3. continued

Member 2	Gender:	Female
	Age:	26 years
	Education:	M.A., Current Ph.D. Student
	Women's Athletics Participation:	Softball, High School, 4 years Figure Skating, Individual & Team, 6 years Luge, Junior National Team, 5 years
	Women's Athletics Affiliation:	Coach, Luge, intermittently Consultant Sport Psychology, Curling, 1 year Consultant Sport Psychology, Diving, 1 year
	Related Expertise:	Education, 4 graduate statistics/method courses Research, 4 qualitative research studies
Member 3	Gender:	Female
	Age:	27 years
	Education:	M.S., Current Ph.D. Student
	Women's Athletics Participation:	Basketball, Middle/High School, 6 years Volleyball, Middle/High School, 3 years Track, High School/College, 3 years Rowing, College, 3 years
	Women's Athletics Affiliation:	Coach, High School Varsity Basketball, 3 years Coach, High School Rowing, 3 years Consultant Sport Psychology, Swimming, 2 years
	Related Expertise:	Education, 4 graduate statistics/method courses
Member 4	Gender:	Female
	Age:	31 years
	Education:	M.S., Current Ph.D. Student
	Women's Athletics Participation:	Volleyball, 6 years Softball, 15 years Cheerleading, 12 years
	Women's Athletics Affiliation:	Coach, College Cheerleading, 2 years Judge, Cheerleading, 10 years
	Related Expertise:	Education, 2 graduate statistics/method courses

Table 4.3. continued

Member 5	Gender:	Female
	Age:	34 years
	Education:	M.S., Current Ph.D. Student
	Women's Athletics Participation:	Dance, 31 years
	Women's Athletics Affiliation:	Coach, Dance
	Related Expertise:	Education, 3 graduate statistics/method courses

Procedure

Permission to conduct each phase of this study was first obtained from the Human Subjects Review Board at Florida State University. Consent forms for both focus group study and for coach sample study were approved by the review committee. Copies of the human subjects approval letters may be found in Appendix A; copies of the approved consent forms may be found in Appendix B. Procedures for conducting each specific phase of this investigation are elaborated upon in separate sections that follow.

Design Phase – Focus Groups Construct the Questionnaire

Following the identification of research objectives and the selection of an assessment technique, a critical stage in questionnaire design is the establishment of an information base about the topics under investigation (Rea & Parker, 1992, 1997). Focused group depth interviews, or focus groups, are a principal means by which fundamental information may be gathered. Focus groups are typically composed of six to eight members (Debus & Novelli, 1988) or eight to twelve members (Rea & Parker, 1997) who are reputed to have knowledge related to the aims of the study. Between two and fourteen separate focus groups should be scheduled to meet for approximately one to two hours each, during which time the researcher moderates a roundtable discussion to elicit ideas and feedback about the proposed research study (Rea & Parker, 1997). Rea and Parker (1997) assert that "[a] thorough reconnaissance of information at this point is critical in terms of producing a focused and well-directed study" (p. 11). Considerations for the content, wording, style,

ordering, formatting, layout, and length of questionnaire items, responses, and instructions are made at this time.

Throughout the focus group discussions, attention to the research objectives must be maintained. For the purposes of this study, an instrument design was necessary to answer the following questions (outlined in an earlier section but presented here for additional review):

1. What do coaches currently know about the general female menstrual cycle and oral contraceptives?;
2. How important do coaches feel it is to have acquired this general information for understanding female athletes?;
3. What do coaches know about the menstrual cycle characteristics and oral contraceptive use of the female athletes whom they coach?;
4. How important do coaches feel it is to have acquired this specific information for understanding the female athletes whom they coach?;
5. What type of climate do coaches present for addressing issues about the menstrual cycle and oral contraceptive use among the female athletes whom they coach?;
6. What type, tone, and extent of communication regarding the menstrual cycle and oral contraceptive use occurs between coaches and the female athletes whom they coach?;
7. What do coaches believe about the influence of the menstrual cycle and oral contraceptive use upon sport performance?;
8. How do coaches feel about oral contraceptive use by the female athletes whom they coach?;
9. How do coaches feel about and react to female athletes who seem affected in sport by their menstrual cycles?; and
10. How do all of the answers to the aforementioned questions vary according to coach demographic information, including gender, age, position of employment,

sport coached, longevity in coaching, marital status, ethnicity, educational level, college major, and presence of other females in household?

Participants for the design phase of this study (recall focus group 1 comprised two coaches/parents; focus group 2 comprised nine female athletes) were approached in person to request their involvement in a focused group discussion. At this time, they were informed of the following key points regarding their participation:

1. This study aims to design a questionnaire to assess coaches' knowledge and attitudes about the menstrual cycle, oral contraceptive use, and female sport performance.
2. The focused group discussion will ideally entail the meeting of six to eight people to discuss the content and formatting of such a questionnaire.
3. Their affiliation with women's sport characterized them as appropriate for inclusion in the focus group.
4. They are not "subjects" under investigation for this study but, rather, are "experts" contributing to the design of a study component.
5. The focus group may last one to one and a half hours.
6. Participation in the focus group is voluntary and may be withdrawn at any time.

Focus group 1 met in the teachers' lounge on Jefferson County private school property during school hours for one hour and fifteen minutes. Focus group 2 met in a classroom on the campus of the Florida State University for one hour and fifteen minutes. All focus group participants were asked to read and sign an informed consent letter prior to partaking in the focused group discussion (see Appendix B for this consent form).

At the start of both focus group sessions, participants were reminded of the nature of the study and of the significance of the focus group discussion. The process of the focus group discussion was described as: (1) a rather informal discussion or conversation, (2) directed, facilitated, and mediated by the researcher, wherein (3) everyone gets a chance to offer insights and opinions independently and based upon the ideas of the researcher and

other group members. All participants were encouraged to speak openly and honestly and to draw upon their experiences as a female athlete and/or their experiences with female athletes and teams.

Group discussion for both focus groups began by (1) offering the ultimate goal of the research project (i.e., to describe the differences among coaches in knowledge and attitudes of the menstrual cycle, oral contraceptive use, and sport performance, and then to relate that information to the objective and subjective experiences of the female athletes whom they coach) and (2) asking the question, "To begin, what characteristics of coaches may explain the differences among them in knowledge and attitudes about the menstrual cycle and oral contraceptive use?" It was anticipated that, at this time, members would offer demographic variables that they believe may account for variation among coach knowledge and attitudes. These variables (such as age, gender, ethnicity, and education) would compose a biographical portion of the questionnaire and would serve as covariates for future statistical analyses of coach variability. Focus group 1 members were also asked to describe the preferred layout and formatting of items and instructions appearing on this portion of the questionnaire. (Actual results of focus group meetings are provided in the next chapter; speculative remarks here in the procedures section serve only as support for *why* certain questions were posed to focus group members.)

Both focus groups were next informed that the questionnaire was conceived to include three additional and distinct sections: (1) a test of general MC and OC knowledge; (2) a test of specific athlete-related MC and OC use knowledge (designed to tap the specific knowledge that coaches have about the athletes whom they coach); and (3) an assessment of attitudes about the MC, OC use, and their relationship to sport performance.

In addressing the first section about general knowledge, it was expected that female focus group participants would be equipped to offer insights for the content of this section based upon their personal experiences with their MC and OC. Further, focus group members who are coaches of female athletic teams would be prepared to offer material for the content of this section due to what they have learned from female athletes through their coaching experiences. Focus group 1 members were also asked to cite their preferences for the wording, formatting, and layout of items and instructions in this and all subsequent sections.

"Scripted" questions to facilitate discussion at this stage for both focus groups included, "What **general** knowledge about the MC and OC do you believe it is important for a coach to have to better understand and deal with the female athletes whom they coach?"; (to female athletes in the focus groups) "Is there **general** information you wish your coach knew to better understand your experience with the MC and OC?"; (to coaches in the focus groups) "Is there **general** information about the MC and OC you have learned from female athletes that has helped you to better understand and to deal with the female athletes whom you coached/consulted?"

The procedure for completing the second section regarding specific knowledge was identical to the previous section except scripted questions read, "What **specific** knowledge about the MC and OC do you believe it is important for a coach to have to better understand and deal with the female athletes whom they coach?"; and so forth.

The final section of the conceptualized questionnaire pertains to coaches' attitudes about the MC, OC use, and their relationship to sport performance. This section is intended to elicit, for example, whether a coach believes the MC influences sport performance (including negatively and positively); how coaches react to athletes who complain/comment about MC-related issues; what communication exists between the coach and athletes (or even parents) about the MC and OC use; how coaches feel about MC manipulation; and if coaches believe it is important to acquire general and specific information related to the MC and OC use. This information was ascertained by asking focus group members to design items that may reflect the climate or atmosphere a coach creates regarding MC and OC use issues, including their level of communication with athletes and parents, their beliefs and attitudes about the MC and OC use and toward female athletes, and their expectations of female athletes during certain times of the MC.

Focus group 1 concluded when one coach was obligated to return to employee duties on campus; focus group 2 concluded when some athletes were obligated to attend other scheduled events on campus.

Comments during focus group discussions were recorded on paper by the researcher. The questionnaire was then constructed by the researcher based primarily upon the recommendations from focus group members. The researcher, however, drafted the

multiple-choice general knowledge test items (i.e., stems, keyed responses, and distractors) with the assistance of research articles and textbooks related to the menstrual cycle and oral contraceptives. As part of a pilot study that commenced prior to this project, four nurses in an Obstetrics and Gynecology Office at a Tallahassee area hospital served as expert reviewers to judge the quality of general knowledge test items. The nurses assessed the clarity of the stems as well as the response options and ensured the accuracy of the keyed responses. Additionally, the nurses estimated the difficulty level and relevance of each item such that items considered too easy, too hard, or irrelevant were eliminated from the general knowledge portion of the questionnaire.

Pretest Phase – 207 Coaches Complete the Questionnaire

All coaches participating in this study received the same packet of materials: (1) a cover letter outlining the study topic, contact information, and significance of coaches' participation, to be retained by the participant (see Appendix C); (2) an informed consent letter to be signed and returned (see Appendix B); and (3) a 12-page questionnaire to be completed and returned (see Appendix D). The method by which each coach received and returned the identical packet of materials, however, varied somewhat. A brief account of each "mode of data collection" is provided below (see Table 5.1 in the next chapter for a frequency chart that includes this variable). Overall response rate was 28.0% (207/739).

Coach liaison. Each coach liaison was approached by the researcher in person, apprised of the study objectives, and asked to distribute the packets to the remainder of the coaching staff (coaches of females) at the school/organization of employment. Upon completion, all packets were collected by the coach liaison and picked up by the researcher. This mode of data collection relied heavily on the researcher's relationship with the coach liaison and the liaison's relationship with the coaching staff. This mode of data collection yielded 100% response rate (12/12).

Basketball coaches clinic. The founder of this 3-day basketball clinic (clinic held bi-annually in Mississippi – spring clinic in Biloxi, MS and fall clinic in Tunica, MS) was contacted via telephone to request free admittance into the clinic and free occupancy at an exhibitor's booth. Free admittance and occupancy was granted and an exhibitor's table nearest the only entrance and exit for the clinic's conference room was provided to the

researcher. Virtually all of the 300+ male and female basketball coaches in attendance at the clinic stopped by the researcher's exhibit table to ascertain the purpose behind the literature on the table. Each coach (either individually, in pairs, or in small groups) was apprised of the study objectives and the type of respondent appropriate for completing the questionnaire (i.e., male and female coaches of female athletes, middle school-aged and older, in *any* sport). Coaches who matched the criteria were provided with the packet of materials described above. Coaches completed the questionnaires at their convenience over the span of the 3-day clinic and returned them to the researcher at the exhibit table. It is important to note that coaches were constrained by tight workshop schedules during the clinic and, consequently, most coaches were unable to complete the questionnaire during the 3-day time period. Although awareness of, and interest in, these significant issues related to women's athletics seemed quite heightened among the coaches, this mode of data collection achieved only 22.94% response rate (39/170).

Principal/assistant principal liaison. The researcher met personally with each principal or assistant principal liaison, described the study objectives, and requested appropriate protocol for distribution of the questionnaires to the target coach sample on campus. For this mode of data collection, the principal/assistant principal chose to be responsible for questionnaire distribution to the coaches on campus. A specific number of questionnaires were requested to "cover" all probable coaches on staff and a return date for pick-up was agreed upon at this time. It is not known if the principal/assistant principal liaisons truly distributed all of the questionnaires. This mode of data collection relied very heavily upon the liaison's impression of the researcher's presentation and the liaison's relationship with the coaching staff on campus. Although 114 questionnaires were submitted to principal/assistant principal liaisons for distribution, one principal later admitted that lack of county permission for research precluded distribution of 20 questionnaires to the coaches on campus. Thus, a more meaningful report of response rate via this mode of data collection is 27.66% (26/94).

Mail distribution. Athletic directors of schools were contacted via email to request their allowance for the distribution of the questionnaires to coaches on campus. All athletic directors receiving and responding to the email request agreed to distribute the packets to the

coaching staff on campus, except for the Florida State University (who denied researcher personal distribution of the packets to coaches, as well). Exact return postage was included in the packages to encourage questionnaire completion and return. It is not known if the athletic directors truly distributed all of the questionnaires. Also, it is not known whether one school received their package of 20 questionnaires, due to (1) a lack of any completed questionnaires returned from this school, and (2) a lack of response from the athletic director who originally agreed to accept the package and distribute the questionnaires. Regardless, including this school, this mode of data collection yielded 26.84% response rate (62/231).

Personal meeting with coach respondent. In a select number of cases, the principal or athletic director of a school, who was originally approached by the researcher about questionnaire completion, agreed to (or preferred) that the researcher meet personally with the prospective coach respondents. Each coach was apprised of the study objectives and provided the packet of materials upon agreeing to participate in the study. Upon completion, questionnaires were picked up by the researcher. This mode of data collection achieved 100% response rate (12/12).

Athletic director/assistant athletic director liaison. The researcher met personally with each athletic director (AD) or assistant athletic director liaison, described the study objectives, and requested appropriate protocol for distribution of the questionnaires to the target coach sample on campus. For this mode of data collection, the AD/assistant AD chose to be responsible for questionnaire distribution to the coaches on campus. A specific number of questionnaires were requested to "cover" all probable coaches on staff and a return date for pick-up was agreed upon at this time. It is not known if the AD/assistant AD liaisons truly distributed all of the questionnaires. This mode of data collection relied very heavily upon the liaison's impression of the researcher's presentation and the liaison's relationship with the coaching staff on campus. Although 191 questionnaires were submitted to AD/assistant AD liaisons for distribution, one AD later admitted that lack of county permission for research precluded distribution of 5 questionnaires to the coaches on campus. Thus, a more meaningful report of response rate via this mode of data collection is 26.34% (49/186).

Secretary/administrative assistant liaison. The researcher met personally with a secretary or administrative assistant liaison (due to the unavailability of a principal and/or athletic director), described the study objectives, and requested appropriate protocol for distribution of the questionnaires to the target coach sample on campus. For this mode of data collection, the secretary chose to be responsible for questionnaire distribution to the coaches on campus (some questionnaires were simply left in coach mailboxes at the front office). A specific number of questionnaires were requested to "cover" all probable coaches on staff and a return date for pick-up was agreed upon at this time. It is not known if the secretary liaisons truly distributed all of the questionnaires. This mode of data collection relied very heavily upon the liaison's impression of the researcher's presentation and the liaison's relationship with the coaching staff on campus. This mode of data collection yielded 20.59% response rate (7/34).

When the researcher picked up the questionnaires, where appropriate, some coaches were asked to comment on the questionnaire in terms of its clarity, ease in completing, response space available, presentation, language, and so forth. Coaches were also encouraged to recommend any areas for revision. The researcher recorded coaches' feedback and ideas on paper following the posttest comments and utilized them for revision of the questionnaire. Final inspection and evaluation of the completed questionnaires (described in the "results" chapter of this paper) also identified areas in need of revision.

Posttest Phase – Focus Group for Questionnaire Feedback

Participants for the posttest focus group of this study (recall focus group 3 comprised one male coach of females who has additional expertise in testing and measurement as well as expertise in menstrual cycle research, and four female athletes who also act as coaches and/or consultants to female athletes and who have varied levels of expertise in research and statistical methodology) were addressed via email to request their involvement in a focused group discussion. At this time, they were informed of the following key points regarding their participation:

1. This study aims to redesign a questionnaire to assess coaches' knowledge and attitudes about the menstrual cycle, oral contraceptive use, and female sport performance.
2. The focused group discussion will ideally entail the meeting of six to eight people to discuss the content and formatting redesign of such a questionnaire.
3. Their affiliation with women's sport and/or their understanding of testing and measurement principles characterized them as appropriate for inclusion in the focus group.
4. They are not "subjects" under investigation for this study but, rather, are "experts" contributing to the redesign of a study component.
5. The focus group may last one to one and a half hours.
6. Participation in the focus group is voluntary and may be withdrawn at any time.

Focus group 3 met in the Sport Psychology Laboratory and Library on the campus of Florida State University for one hour and fifty-five minutes. All focus group participants were asked to read and sign an informed consent letter prior to partaking in the focused group discussion (see Appendix B for this consent form). Unlike the paper-and-pencil recording of dialogue during the pretest focus groups, this posttest focus group discussion was recorded on audiotape.

Like the design phase focus groups, participants in the feedback focus group were first reminded of the nature of the study and of the significance of the focus group discussion. The process of the focus group discussion was described as: (1) a rather informal discussion or conversation, (2) directed, facilitated, and mediated by the researcher, wherein (3) everyone gets a chance to offer insights and opinions independently and based upon the ideas of the researcher and other group members. All participants were encouraged to speak openly and honestly and to draw upon their experiences as a female athlete and/or their experiences with female athletes and teams. Members who had additional expertise in testing and measurement principles were asked to also pay close attention to methodological and statistical elements of instrument construction.

Group discussion for this focus group began by (1) offering the ultimate goal of the research project (i.e., to describe the differences among coaches in knowledge and attitudes of the menstrual cycle, oral contraceptive use, and sport performance, and then to relate that information to the objective and subjective experiences of the female athletes whom they coach) and (2) distributing the original design of the questionnaire to all focus group members. Throughout the focus group discussion, members were asked for feedback related to questionnaire response rate, content, formatting, test properties, and so forth (see "results" chapter for an elaboration of knowledge gained during this focus group session). Members were further encouraged to write notes and comments directly on the copy of the questionnaire distributed to them, and to return the questionnaire with feedback notes to the researcher at the conclusion of the focus group discussion.

Focus group 3 concluded as it was realized that the time elapsed since the commencement of the focus group discussion was approaching two hours.

Instrument

The questionnaire for coaches of female athletes, designed with the assistance of focus group discussions and distributed to 764 coaches for completion, comprises four separate sections: (1) a demographic section serving to describe each respondent and to contribute to exploration of such variables during data analysis; (2) a 24-item multiple-choice test of general knowledge related to the menstrual cycle (MC) and oral contraceptives (OC); and (3)&(4) various items to assess the specific knowledge that coaches have about the MC and OC use of the athletes whom they coach; attitudes about the MC, OC use, and sport performance; and communication style related to the MC, OC use, and sport performance. A copy of this 12-page questionnaire (version distributed to coach sample) is available in Appendix D.

CHAPTER 5

RESULTS

In this chapter, results are organized and presented according to the phase of the investigation: (1) design phase, (2) pretest phase, and (3) posttest phase. The design phase, wherein focus groups assisted in constructing questionnaire items, is further organized by presenting results from focus group 1 and focus group 2. The pretest phase, wherein 207 coaches completed the questionnaire, is further organized according to the following: (1) section 1: demographic information; (2) section 2: general knowledge of the MC and OC; (3) section 3: specific knowledge of athletes' MC and OC use; and (4) section 4: beliefs and attitudes regarding the MC and sport performance. Lastly, results from the final focus group are presented for the posttest phase of the study.

Design Phase – Focus Groups Construct the Questionnaire

Focus group 1. Several key ideas for general and specific components of questionnaire design emerged from the focus group discussion. First, coach characteristics believed to have a potential influence upon knowledge and attitudes about MC and OC issues were identified. These variables included: (1) gender; (2) age; (3) ethnicity; (4) marital status; (5) years of coaching experience; (6) educational level; (7) college major(s); (8) special training in female reproduction, the MC, or OC; (9) ages of females coached; (10) type of sport coached; and (11) presence of other females in household. Focus group participants wished to have these items appear among other demographic information, including: (1) school; (2) title of employment at school; (3) courses taught at school (if applicable); and (4) number of athletes coached.

Based on these variables, it was speculated by this group that: (1) females would know more about the MC and OC than would males; (2) younger females would know more than would older females (i.e., menopausal); (3) males who are married or who have other

females present in the household would know more than would males who are single and do not have other females present in the household; and (4) coaches who report college majors related to female studies/reproductive health, who have special training in such areas, or who teach such classes at school would know more than coaches who lack this potential for acquiring specific information. Speculation was not made concerning the direction of influence that the remaining variables would have on knowledge and attitude scores.

Furthering the development of demographic variables, focus group coaches offered suggestions for questionnaire formatting: (1) demographic items should be presented together on the first page of the questionnaire; (2) where available, demographic items should be completed by the researcher in order to save time; (3) response choices should be offered for marital status, gender, ethnicity, and educational level; (4) all other variables should be free response, including age of coach; (5) although coaches may identify with only a select number of ethnic backgrounds, all possible alternatives should be offered so as to avoid bias; and (6) a statement should be provided prior to asking about the presence of other females in the household in order to explain why the information is being asked.

Recommendations emanating from other researchers relative to questionnaire construction were considered, in addition to those generated by the focus group. Some of these are in direct contrast to others: (1) questionnaires should begin with simple closed-ended questions (such as demographic items) to ease the respondent into answering questions (Burton, 2000; Sudman & Bradburn, 1982); (2) questionnaires should present demographic items at the beginning because items not completed by respondents typically occur at the end of the questionnaire and important demographic information would be lost if these items were placed at the end of the questionnaire (Burton, 2000); (3) questionnaires should present demographic information at the end of the instrument because these items request sensitive information, thus causing a reluctance to complete the questionnaire if they are presented in the beginning of the instrument (Burton, 2000; Sudman & Bradburn, 1982); (4) questionnaires should present demographic items at the end of the instrument because completion of these items is boring and motivation to complete the instrument may be lost if these items appear at the beginning (Burton, 2000); (5) age is typically considered a sensitive issue and so it is recommended that response bands be provided in place of a free

response line (Burton, 2000), however, these coaches believed it would be more informative to have exact ages for every coach and they further believed that coaches would not be apprehensive to answer as long as confidentiality was ensured; and (6) it is recommended to write statements preceding the demographic items to explain why the information is being requested (Sudman & Bradburn, 1982), as was also recommended by these coaches for preceding the items related to the presence of other females in the household.

Focus group members did not raise the issues of the ordering or layout of demographic items. The two coaches in the group agreed that, as respondents, they would be willing to provide answers to all of the demographic items recommended for inclusion.

Attention next turned to the knowledge portion of the questionnaire wherein items testing MC and OC knowledge are presented. Fewer recommendations were made by the coaches concerning the content of items in this section, however, suggestions for formatting the knowledge section prevailed and included the following: (1) when at all possible, provide response choices for the knowledge items (i.e., write items as closed-ended questions) rather than forming items as open-ended questions (it was believed that coaches would view a multiple-choice type questionnaire as easier and less time-consuming to complete than a questionnaire that required writing in responses); (2) for every item that presents response choices, include a response choice to indicate "I am not sure," or "I am not certain," in an effort to minimize guessing (it was specified that "I don't know" **not** be used as a response choice because it would be embarrassing to choose this response and admit complete ignorance); (3) include a statement in the instructions for this section that informs respondents of the option to select "I am not sure" and direct respondents to please not guess if they are not certain of their answers; and (4) for items wherein many of the response choices are correct, provide a response choice for "other: _____," to allow respondents to write in additional answers (e.g., many of the response choices will be correct for a question such as, "What are the symptoms of PMS?"; respondents will be instructed to circle **all** of the correct answers and to write in any other answers they believe are correct answers to the question).

The last two sections of the questionnaire measure coaches' knowledge specific to the athletes whom they coach and coaches' attitudes about the MC, OC use, and sport

performance. Basic guidelines from the focus group for designing these sections of the instrument were: (1) open-ended questions are appropriate and necessary for assessment of these two constructs; (2) within the instructions for these sections, encourage coaches to indicate that an answer is not known by asking them to write in "I am not sure"; and (3) where questions in this section present a dichotomous response choice of "yes" or "no," also include a response choice for "I am not sure."

Overall, the focus group believed that the proposed topics represent important issues in coaching female athletes, but they also believed that a questionnaire of this magnitude may overwhelm coaches and result in incomplete items, careless responses, or entirely blank questionnaires. They recommended that pilot testing be done in order to determine the appropriate length of the questionnaire. They were of the opinion that it should be comprehensive enough to cover the research objectives, yet manageable enough for coaches to complete amidst their busy schedules.

Focus group 2. Focus group 2 comprised athletes exclusively. Participants in this focus group first cited gender as the leading factor accounting for coaches' knowledge and attitudes about the MC and OC. One athlete recalled her male coach's indifferent response to MC issues as, "just take something…[hand gesturing to move along]…go away," whereas another athlete admitted that her current male coaches are actually open to talking about MC issues and her female coaches wish the team would "just get through it." Another athlete's ambitious male coach addressed MC issues on her team in the beginning of each season by showing Midol®, Ibuprofen®, and tampons, while stating, "Well, my wife says…" The athletes agreed that, at younger ages, they preferred to discuss MC issues with the "moms" in the groups and, currently, they discuss these issues with female teammates and friends, when needed. The belief that the MC and OC are "female" issues is apparently steadfast.

The discussion then turned quickly to how focus group members, their teammates, and female athletes in general, experience their MC and related symptoms. One athlete expressed the opinion that the MC is "just another pain or injury" with which she must cope in her sport. Another athlete remarked that, on her team, some athletes "milk it" before or during their period and they will change their workout routine (e.g., decreasing workload, repetitions, and/or attendance). She went on to reveal, however, that most of the athletes

prefer to be on their period, especially during ACC championship events, because they believe that they perform better and get more aggressive.

One athlete lamented the end of her sport season because she now has severe cramping and vomiting associated with her MC without the high levels of activity and conditioning. Reflectively, another athlete proposed that MC symptoms "must be hereditary" and disclosed that her entire team experiences MC cramping. A teammate of hers agreed and added that, thankfully, restrooms are immediately accessible during their practices and competitions when playing in their home environment. This is not the case when their team travels to an opponent's environment and this, she admitted, creates anxiety. Another athlete quickly concurred that, in her sport, where there is virtually no access to restrooms during practices and competitions, there is anxiety. She concluded that some athletes could blame their poor performances on their period.

Another group member remarked that MC issues are a "joke on their team." She elaborated, saying that the male athletes on her team won't partner stunt with a female athlete if she admits that she is on her period—"like you have a disease." A different athlete reminded the group that her male coaches are "way open" and that at least one of the male coaches is admittedly gay—the group predicted that this is why he is so open in communication style. The group then made an easy transition to the preplanned, "scripted" discussion portion related to the knowledge section of the questionnaire. At this point, one athlete announced that "it would help if they all [male coaches] knew."

This sharp and well-spoken group of athletes effectively communicated a wealth of information related to coach knowledge (generally and specifically); coaching style and leadership; coach attitudes, beliefs, and expectations; and coach communication style surrounding MC and OC issues. What follows is an account of the highlighted responses mostly to the simple prompt question, "What *should* coaches know about the MC and OC?" (Note that gender persists as a frequent topic in the conversation.)

Athlete: Coaches should know about the effects of the MC and PMS.

Athlete: Coaches should know about the prevalence of cramps and about tampons—that some girls won't use them.

Athlete: A male coach yelled at a girl because he didn't understand these things.

Athlete: Coaches should be more aware—my [male] coach reads body language then pushes harder—he probably wants to stay away from it [MC issues]. Our team cycles together and he [coach] has no idea. We wear white shorts for uniforms sometimes and we worry about bleeding through them—we will *never* tell coach. (Two additional athletes have white shorts for uniforms on their team and agree about the worry the uniforms cause.)

Athlete: [A female coach and specific female athletes who consistently practice as a group prior to full team practices every day] cycle together, too.

Athlete: Even our gay male coach (different coach than the open communication style coach alluded to earlier) wants white bloomers—he doesn't understand.

Athlete: Coaches should know about dysmenorrhea and severity—what goes with it [the MC].

Athlete: [A group of athletes] are in competition for a spot and you don't want coach to know if you have cramps—it affects your playing time.

Athlete: (Agrees). Coaches have more stuff to worry about.

Athlete: Coaches need to know about the emotional aspects—probably more important to know.

Athlete: (Agrees). Don't jump down her throat—don't baby her though.

Athlete: If it [MC problem] happens every month, then maybe coach can recommend that the athlete go see a gynecologist for birth control pills.

Athlete: My male coach was raised with two brothers, his wife is not open, and he has two sons—he'd have no clue.

Athlete: At [another NCAA Division I University], coaches take all athletes and put them on birth control pills unless they are opposed—maybe to keep pregnancy from occurring.

Athlete: My sophomore year, I was throwing up once *every* month—it affected my play—so coach said to go see a gynecologist and get birth control pills.

Athlete: One girl got her period only two times in a year and told all the teammates.

Researcher: Who would you confide in after your teammates?

Group: 1. Friends, 2. Trainer, 3. Mom, and 4. Coach, only if it affects sport.

Athlete: When I first got birth control pills [specific brand], I got really, really sick.

Researcher: Then what do coaches need to know about OC and OC use?

Group: What are OC? What can OC be used for? What are the emotional effects of using OC? What happens when they are taken for the first time? Why would you need to change OC and what happens when you change OC?

Athlete: In my sport, we worry about weight gain related to birth control pills—coach needs to know that.

Athlete: I wish coaches were open to talk about it—we don't want them to *not* listen.

Athlete: Coaches create the climate related to *everything*—not just the MC—it is weird talking to some coaches about *anything*.

Athlete: One of my coaches will let you miss [practice] if it's not before an important competition.

Athlete: We have no coach resource to talk to—the girls on our team don't want to talk to any coach. (They are all male on this team.)

Athlete: It depends on the coach's personality, in general—how approachable they are.

Athlete: Also, how a girl is socialized through sport—you learn not to complain. (This athlete played on a male team for several years.) I only worry about it [MC] now when I'm traveling. I work out more right before I get it [period].

Athlete: Long distance running brings it [period] on for our team.

Athlete: Certain types of running cause MC cramps—mid-distance, 2-mile run, 300-yard shuttles.

The focus group discussion digressed slightly; nevertheless, the remarks that were generated continued to be very informative relative to personal beliefs and experiences. The athletes remarked that all freshman athletes attend an orientation upon entering college, part of which includes time with a nutrition consultant. Two group members recalled the nutrition consultant addressing MC and PMS issues as they relate to diet; the other athletes said this was not mentioned during their orientation.

Pretest Phase – 207 Coaches Complete the Questionnaire

Pretesting the questionnaire with a sample of coaches was completed to provide information related to questionnaire construction (e.g., response patterns, items in need of revision, and data to address score reliability and validity). For the sake of interest and exploration, however, completion of the questionnaires provided substantial information about coaches as well (i.e., information about coaches' knowledge and attitudes regarding the MC, OC, and sport). These dual topics are discussed both separately and jointly in various sections, as appropriate. Admittedly, references in this chapter to patterns arising from coaches' responses must be viewed cautiously, as they result from items on a questionnaire that have not yet received appropriate support for reliability and validity.

Section 1: Demographic information. These primarily discrete, categorical variables (only two variables were originally continuous: "number of athletes coached" and "years coaching experience") were dummy coded prior to and during data entry (e.g., "sport coached" was coded prior to data entry as follows: 1 = basketball, 2 = track and field, 3 = cross country, 4 = softball, and so forth to include all known sports encompassed by the questionnaire distribution sample; however, categories were added during data coding as unanticipated sports emerged: 13 = sailing, 14 = equestrian, and 15 = field hockey). Because the variables "number of athletes coached" and "years coaching experience" received such an array of values from the sample of 207 coaches, responses were dummy coded to reflect discrete, category ranges of 5 units each (exceptions being the first two categories of "years coaching"—several coaches had one or fewer years of coaching experience, so it was decided to retain this attribute as a "novice" category of sorts; also, it made sense to begin these category ranges with each "landmark" year—much like anniversaries—so ranges were assigned 5-9 years, 10-14 years, 15-19 years, and so forth; this made 1^{+}-4 years the other category exception that fails to include 5 units). Table 5.1 on the following pages presents the outcome of this entire dummy coding process.

All variables in this section, including their precoded values and labels, were printed on paper and taped to the wall adjacent to the computer during coding and data entry for reference, accuracy, and full inclusion. Each questionnaire was hand-scored first in bright red marker, according to the values and labels hanging on the wall. When the response on a

questionnaire did not fit into an existing value, new values and labels were written on the papers on the wall to accommodate every possible response on all questionnaires. Variables that were already coded on the questionnaire (i.e., gender, age, ethnicity, education, and marital status) retained these values and labels for data coding and entry. Additionally, a new value label "not indicated" was designated for variables where a coach failed to respond to an item (i.e., ethnicity, marital status, and college major) so that there were no missing data in the data matrix.

All data were entered into the computer data matrix from the hand-scored codes on each questionnaire and all entries into the data matrix were checked against the hand-scored codes on each questionnaire for accuracy of data entry. Additionally, descriptive statistics demonstrated that all respondents had an entry for every variable (no missing data) and that each entry was within the appropriate range of values based upon the dummy codes for each variable (inspection of minimum and maximum values). Each respondent yielded twenty variables for this demographic section of the questionnaire (see Table 5.1 for a complete list of these twenty variables—values and labels—and their corresponding frequencies).

Table 5.1. Demographic Variables: Values, Labels, and Frequencies

I. Mode of Data Collection Value and Label	Frequency	Percent
1. Coach Liaison	12	5.8
2. Basketball Coaches Clinic, Tunica, MS	39	18.8
3. Principal/Assistant Principal Liaison	26	12.6
4. Mail Distribution	62	30.0
5. Personal Meeting with Coach Respondent	12	5.8
6. Athletic Director/Assistant Athletic Director Liaison	49	23.7
7. Secretary/Administrative Assistant Liaison	7	3.4

II. School of Employment Value and Label	Frequency	Percent
1. Aucilla Christian Academy, Monticello, FL	7	3.4
2. Priceville High School, Decatur, AL	4	1.9
3. Matthew Gilbert Middle School, Jacksonville, FL	1	0.5
4. Crossroads School, Dawsonville, GA	1	0.5

Table 5.1. continued

II. School of Employment Value and Label	Frequency	Percent
5. University of North Florida, Jacksonville, FL	5	2.4
6. St. Mary's-Colgan Catholic High School, Pittsburg, KS	2	1.0
7. Freeburg School, Freeburg, IL	1	0.5
8. Williford High School, Williford, AR	1	0.5
9. Pangburn High School, Pangburn, AR	1	0.5
10. Searcy High School, Searcy, AR	4	1.9
11. Rollins College, Winter Park, FL	1	0.5
12. Cordova High School, Cordova, TN	2	1.0
13. McGehee High School, McGehee, AR	2	1.0
14. Rhea County High School, Evensville, TN	2	1.0
15. Bishop England High School, Charleston, SC	3	1.4
16. Jackson High School, Jackson, MS	2	1.0
17. Forsyth High School, Cumming, GA	1	0.5
18. Wilkinson County Middle School, Irwinton, GA	1	0.5
19. Austin High School, Decatur, AL	1	0.5
20. Tharptown Junior High School, Tharptown, AL	2	1.0
21. Independence High School, Franklin, TN	1	0.5
22. Wingfield High School, Jackson, MS	1	0.5
23. Asheville Christian Academy, Asheville, NC	2	1.0
24. Chattanooga Christian School, Chattanooga, TN	1	0.5
25. Howard Middle School, Monticello, FL	3	1.4
26. Jefferson County High School, Monticello, FL	8	3.9
27. Trousdell Gymnastics Center, Tallahassee, FL	5	2.4
28. Maclay School, Tallahassee, FL	10	4.8
29. Gardner-Webb University, Boiling Springs, NC	8	3.9
30. University of South Florida, Tampa, FL	8	3.9
31. University of North Carolina-Asheville, Asheville, NC	5	2.4
32. Western Carolina University, Cullowhee, NC	7	3.4
33. University of Florida, Gainesville, FL	4	1.9
34. Florida State University, Tallahassee, FL	2	1.0

Table 5.1. continued

II. School of Employment Value and Label	Frequency	Percent
35. Wofford College, Spartanburg, SC	2	1.0
36. Furman University, Greenville, SC	11	5.3
37. University of South Carolina, Columbia, SC	7	3.4
38. Florida State University School, Tallahassee, FL	3	1.4
39. T.C. Roberson High School, Asheville, NC	5	2.4
40. Clyde A. Erwin High School, Asheville, NC	2	1.0
41. Enka High School, Candler, NC	13	6.3
42. Hendersonville High School, Hendersonville, NC	6	2.9
43. Asheville High School, Asheville, NC	5	2.4
44. North Buncombe High School, Weaverville, NC	2	1.0
45. Asheville School, Asheville, NC	5	2.4
46. North Buncombe Middle School, Weaverville, NC	2	1.0
47. Charles D. Owen High School, Black Mountain, NC	3	1.4
48. Montreat College, Montreat, NC	10	4.8
49. Warren Wilson College, Asheville, NC	4	1.9
50. Mars Hill College, Mars Hill, NC	7	3.4
51. University of Georgia, Athens, GA	2	1.0
52. Carolina Day School, Asheville, NC	5	2.4
100. Unidentifiable or Missing School	4	1.9

III. Title of Employment at School Value and Label	Frequency	Percent
1. Coach Only	81	39.1
2. Teacher	102	49.3
3. Assistant Athletic Director	2	1.0
4. Athletic Director	3	1.4
5. Assistant Principal	0	0.0
6. Principal	4	1.9
7. Nurse	0	0.0
8. Teacher and Assistant Athletic Director	1	0.5
9. Teacher and Athletic Director	2	1.0

Table 5.1. continued

III. Title of Employment at School Value and Label	Frequency	Percent
10. Secretary/Guidance Secretary	4	1.9
11. Dean of Faculty	1	0.5
12. Athletic Trainer	4	1.9
13. Counselor	1	0.5
14. Business Manager	2	1.0

IV. Courses Taught at School Value and Label	Frequency	Percent
1. None	97	46.9
2. K-4	2	1.0
3. Physical Education (PE)	28	13.5
4. Bible	1	0.5
5. Science	16	7.7
6. Math	8	3.9
7. English	7	3.4
8. Health	2	1.0
9. Accounting/Business	4	1.9
10. Computers	0	0.0
11. Social Studies (SS)/History	6	2.9
12. Driver Education	1	0.5
13. Special Education (SE)	2	1.0
14. SE and PE	1	0.5
15. Health, PE, and Computers	1	0.5
16. Science, Health, SS, and PE	2	1.0
17. Health and PE	13	6.3
18. Aerobic Running	1	0.5
19. Driver Education and History	3	1.4
20. Spanish	2	1.0
21. Dance/Tumbling	2	1.0
22. Art	1	0.5
23. Foods	1	0.5

Table 5.1. continued

IV. Courses Taught at School Value and Label	Frequency	Percent
24. Drafting	1	0.5
25. Speech	1	0.5
26. Language Arts and SS	2	1.0
27. Math and Science	1	0.5
28. Third Grade	1	0.5

V. Sport Coached Value and Label	Frequency	Percent
1. Basketball	57	27.5
2. Track and Field	16	7.7
3. Cross Country	9	4.3
4. Softball	28	13.5
5. Soccer	17	8.2
6. Volleyball	26	12.6
7. Cheerleading	8	3.9
8. Dance	3	1.4
9. Swimming/Diving	6	2.9
10. Tennis	10	4.8
11. Golf	11	5.3
12. Gymnastics	5	2.4
13. Sailing	1	0.5
14. Equestrian	3	1.4
15. Field Hockey	3	1.4
16. Athletic Trainer	4	1.9

VI. Coach Level Value and Label	Frequency	Percent
1. Head Coach	153	73.9
2. Assistant Coach	47	22.7
3. Volunteer Coach	3	1.4
4. Student Coach	0	0.0
5. Athletic Trainer	4	1.9

Table 5.1. continued

VII. Number of Athletes Coached (originally a continuous variable)	Frequency	Percent
1. 1-5	5	2.4
2. 6-10	27	13.0
3. 11-15	84	40.6
4. 16-20	34	16.4
5. 21-25	18	8.7
6. 26-30	8	3.9
7. 31-35	7	3.4
8. 36-40	10	4.8
9. 41-45	1	0.5
10. 46-50	4	1.9
11. 51-55	0	0.0
12. 56-60	3	1.4
13. 61-65	2	1.0
14. 66-70	0	0.0
15. 71-75	4	1.9

VIII. Age Range of Athletes Value and Label	Frequency	Percent
1. Middle School Age (11-13 years)	14	6.8
2. High School Age (14-17 years)	78	37.7
3. College Age (18+ years)	82	39.6
4. Mixed Middle and High School Age (11-17 years)	33	15.9

IX. Years Coaching Experience (originally a continuous variable)	Frequency	Percent
1. 1 year or less	15	7.2
2. 1+ to 4 years	37	17.9
3. 5 to 9 years	60	29.0
4. 10 to 14 years	34	16.4
5. 15 to 19 years	21	10.1
6. 20 to 24 years	16	7.7
7. 25 to 29 years	14	6.8
8. 30 to 34 years	8	3.9

Table 5.1. continued

IX. Years Coaching Experience (originally a continuous variable)	Frequency	Percent
9. 35-39 years	1	0.5
10. 40+ years	1	0.5

X. Coach Gender Value and Label	Frequency	Percent
1. Male	85	41.1
2. Female	122	58.9

XI. Coach Age Value and Label	Frequency	Percent
1. 18-19 years	0	0.0
2. 20-24 years	25	12.1
3. 25-29 years	38	18.4
4. 30-34 years	34	16.4
5. 35-39 years	36	17.4
6. 40-44 years	20	9.7
7. 45-49 years	28	13.5
8. 50-54 years	14	6.8
9. 55-59 years	8	3.9
10. 60 or over years	4	1.9

XII. Coach Ethnicity Value and Label	Frequency	Percent
1. White / Caucasian	180	87.0
2. Black / African-American	20	9.7
3. Hispanic	3	1.4
4. Asian	0	0.0
5. Native American	0	0.0
6. Other	0	0.0
7. Not Indicated	4	1.9

XIII. Coach Education Value and Label	Frequency	Percent
1. High School	4	1.9
2. 2-year College	4	1.9

Table 5.1. continued

XIII. Coach Education Value and Label	Frequency	Percent
3. 4-year College	112	54.1
4. Master's Degree	85	41.1
5. PhD Degree	1	0.5
6. Other	1	0.5

XIV. Coach Marital Status Value and Label	Frequency	Percent
1. Single	75	36.2
2. Married	112	54.1
3. Divorced	11	5.3
4. Widowed	0	0.0
5. Other	2	1.0
6. Not Indicated	7	3.4

XV. Coach College Major Value and Label	Frequency	Percent
1. No College	4	1.9
2. Related to Research Topic	32	15.5
3. Unrelated to Research Topic	160	77.3
4. Not Indicated	11	5.3

XVI. Coach Special Training Value and Label	Frequency	Percent
1. Yes	49	23.7
2. No	158	76.3

XVII. Females Menstrual in House Value and Label	Frequency	Percent
1. Yes	130	62.8
2. No	70	33.8
3. IRB Excluded	7	3.4

XVIII. Relation of Females Menstrual Value and Label	Frequency	Percent
1. Self	36	17.4
2. Wife	36	17.4

Table 5.1. continued

XVIII. Relation of Females Menstrual Value and Label	Frequency	Percent
3. Daughter	10	4.8
4. Sister	4	1.9
5. Mother	6	2.9
6. Not Applicable	70	33.8
7. Wife and Daughter(s)	12	5.8
8. Girlfriend or Fiancée	2	1.0
9. Self and Mother	3	1.4
10. Mother and Sister	2	1.0
11. Self and Daughter	3	1.4
12. Roommate	14	6.8
13. Aunt	1	0.5
14. Mother and Daughter	1	0.5
15. IRB Excluded	7	3.4

XIX. Females Oral Contraceptives (OC) Use Value and Label	Frequency	Percent
1. Yes	100	48.3
2. No	100	48.3
3. IRB Excluded	7	3.4

XX. Relation of Females OC Value and Label[1]	Frequency	Percent
1. Self	35	16.9
2. Wife	44	21.3
3. Daughter	3	1.4
4. Sister	3	1.4
5. Mother	3	1.4
6. Not Applicable	100	48.3
7. Wife and Daughter(s)	2	1.0
10. Mother and Sister	1	0.5
12. Roommate	9	4.3
15. IRB Excluded	7	3.4

[1] Values and labels are identical here as those for variable XVIII; values #8, 9, 11, 13, and 14 were removed from this table since they had zero frequencies, so that Table 5.1 could fit and conclude on this page.

Section 2: General knowledge of the MC and OC. This section of the questionnaire contains 24 multiple-choice general knowledge test items: 12 items (#1 - #12) related to the MC and 12 items (#13 - #24) related to OC (birth control pills). Some items have only one correct response (e.g., item #1 in section 2) whereas other items have multiple correct responses (e.g., item #4 in section 2; these items that have multiple correct responses are later treated as a series of True/False items for practical purposes). Accordingly, each item's response choices were entered into the data matrix as separate variables for the purposes of test and item analysis. For example, item #1 has five possible responses from which to choose the best answer. Each possible response was entered as a separate variable such that every respondent has an entry (dummy coded value) for variables 1a, 1b, 1c, 1d, and 1e. The corresponding values and value labels (dummy codes) are as follows for every variable in this section: 1 = yes, the response was chosen by the respondent and 2 = no, the response was not chosen by the respondent. This process was completed for every respondent on each of 24 items' response choices (154 variables total[2]). Frequency of item response choice is permissible via this method of test data entry; thus, difficulty (*p*) and discrimination (*D*) values may be calculated, as well.

This general knowledge section of the questionnaire yielded three scores for each respondent: (1) general knowledge of the menstrual cycle (MC) score; (2) general knowledge of oral contraceptives (OC) score; and (3) combined or total general knowledge score (MC score + OC score). Every questionnaire was hand-scored first in bright red marker according to the following system: 1 point was awarded for each correct response chosen; 0 points were awarded for each incorrect response chosen; and 0 points were awarded for each "I am not sure" response chosen. Points awarded for correct responses were (1) added across items #1 through #12 to yield the MC knowledge score; (2) added

[2] Upon test scoring, it was discovered that response choices for items #21 and #22 were in a format inconsistent with the other item response choices. "All of the above" was not offered as a response choice for other items; instead respondents were required to choose the answer(s) they believed to best fit the item – even if that meant encircling all of the responses offered. Accordingly, "all of the above" was discarded as a variable in the data matrix (thus reducing 156 actual response choices appearing on the test to 154 meaningful response choices for scoring and consistency purposes). When the "all of the above" option was chosen by a respondent, the subject instead received "yes" entries in the 21a, 21b, and 21c and/or 22a, 22b, and 22c variable cells to accommodate proper scoring.

across items #13 through #24 to yield the OC knowledge score; and (3) added across items #1 through #24 to yield the total knowledge score (or MC score + OC score). Maximum score attainable for MC knowledge is 52; maximum score attainable for OC knowledge is 38; thus, maximum total knowledge score attainable is 90. The frequency with which each item's responses were chosen appears in Table 5.2 (correct response choices are bold-faced).

Table 5.2. General Knowledge Test Items: Response Choices Frequency Chart

1. What is the **average** duration of one complete menstrual cycle?	Frequency	Percent
a. 21 days	11	5.3
b. 28 days	174	84.1
c. 35 days	2	1.0
d. 42 days	0	0.0
e. I am not sure	19	9.2

2. What is the **average** duration of a menstrual bleeding period?	Frequency	Percent
a. 2 days	8	3.9
b. 5 days	184	88.9
c. 9 days	1	0.5
d. 13 days	0	0.0
e. I am not sure	13	6.3

3. At about what age do **most** girls begin to menstruate?	Frequency	Percent
a. age 9 years	5	2.4
b. age 12 years	172	83.1
c. age 15 years	18	8.7
d. age 18 years	0	0.0
e. I am not sure	11	5.3

Table 5.2. continued

4. Circle all of the physical changes that you believe can occur to women throughout the menstrual cycle.	Frequency	Percent
a. abdominal pain	184	88.9
b. cramping	207	100.0
c. migraine	136	65.7
d. diarrhea	102	49.3
e. fluid retention	189	91.3
f. weight gain	147	71.0
g. altered alcohol tolerance	53	25.6
h. altered zinc and potassium levels	50	24.2
i. aggravated asthma	23	11.1
j. I am not sure	1	0.5

5. Circle all of the areas that you believe can potentially be altered by the menstrual cycle.	Frequency	Percent
a. cognition	63	30.4
b. mood	203	98.1
c. aggression	153	73.9
d. alcohol consumption	40	19.3
e. diet	161	77.8
f. sleep	157	75.8
g. suicide	33	15.9
h. accident proneness	49	23.7
i. I am not sure	4	1.9

6. What does the abbreviation PMS represent?	Frequency	Percent
a. perimenstrual stage	0	0.0
b. postmenstrual shock	2	1.0
c. premenstrual syndrome	199	96.1
d. painful menstruation syndrome	3	1.4
e. I am not sure	3	1.4

Table 5.2. continued

7. Circle all of the symptoms that you believe may accompany PMS.	Frequency	Percent
a. irritability	199	96.1
b. tension	165	79.7
c. headache	163	78.7
d. depression	134	64.7
e. fatigue	153	73.9
f. breast swelling	154	74.4
g. increased appetite	120	58.0
h. constipation	78	37.7
i. abdominal bloating	172	83.1
j. anxiety	106	51.2
k. forgetfulness	48	23.2
l. insomnia	78	37.7
m. cold sweats	47	22.7
n. dizziness	62	30.0
o. nausea	120	58.0
p. I am not sure	3	1.4

8. Circle all of the methods you believe are available for alleviating symptoms of the menstrual cycle and PMS.	Frequency	Percent
a. oral contraceptives	154	74.4
b. diuretics	46	22.2
c. antidepressants	44	21.3
d. over-the-counter pain medication	158	76.3
e. dietary changes	106	51.2
f. vitamin therapy	73	35.5
g. breathing exercises	61	29.5
h. relaxation training	84	40.6
i. psychotherapy	27	13.0
j. exercise	142	68.6
k. I am not sure	26	12.6

Table 5.2. continued

9. Regarding the menstrual cycle, what **may** happen to a female who overtrains in sport or exercise?	Frequency	Percent
a. estrogen concentration may become toxic	6	2.9
b. progesterone concentration may become toxic	4	1.9
c. menstruation may stop	155	74.9
d. the anterior pituitary gland may shrink	5	2.4
e. I am not sure	52	25.1

10. What is menstrual synchrony (assume hormonal substances, like birth control pills, are **not** being used)?	Frequency	Percent
a. a condition wherein a woman gets her period on the same day of the week every cycle	13	6.3
b. a condition wherein a group of women sharing time and/or space exhibit similar menstrual cycles	88	42.5
c. a condition wherein a woman gets her period at the same time of day every cycle	2	1.0
d. a condition wherein a woman can determine her fertility every cycle	6	2.9
e. I am not sure	100	48.3

11. What is amenorrhea?	Frequency	Percent
a. a condition of the absence of menstruation	78	37.7
b. a condition of regular patterns of menstrual cycle functioning	0	0.0
c. a condition of irregular patterns of menstrual cycle functioning	6	2.9
d. a condition of painful menstruation	2	1.0
e. I am not sure	112	54.1

12. Circle the times when you believe pain can occur in a menstrual cycle.	Frequency	Percent
a. before a period	171	82.6
b. during a period	179	86.5
c. after a period	45	21.7
d. I am not sure	5	2.4

Table 5.2. continued

13. Circle all of the benefits you believe can potentially result from the use of birth control pills.	Frequency	Percent
a. menstrual cycle regulation	180	87.0
b. relief from headaches	48	23.2
c. relief from painful periods	127	61.4
d. relief from PMS	85	41.1
e. decreased menstrual blood flow	119	57.5
f. reduced risk for endometrial cancer	26	12.6
g. reduced risk for ovarian cancer	32	15.5
h. reduced risk for benign breast disease	17	8.2
i. reduced risk of pelvic inflammatory disease	13	6.3
j. reduced risk of sexually transmitted diseases	8	3.9
k. reduced acne	85	41.1
l. reduced iron-deficiency anemia	27	13.0
m. fewer ovarian cysts	24	11.6
n. fewer ectopic pregnancies	26	12.6
o. I am not sure	20	9.7

14. Circle all of the risks you believe are potentially associated with the use of birth control pills.	Frequency	Percent
a. bleeding irregularities	49	23.7
b. headache or migraine	38	18.4
c. gastrointestinal upset	33	15.9
d. breast tenderness	53	25.6
e. weight gain	148	71.5
f. blood clotting	52	25.1
g. acne	26	12.6
h. hypertension	41	19.8
i. increased risk for human papilloma virus	7	3.4
j. increased risk for cervical cancer	36	17.4
k. fatigue	24	11.6
l. I am not sure	42	20.3

Table 5.2. continued

15. How many pills are in a standard pack of birth control pills?	Frequency	Percent
a. 21	23	11.1
b. 28	155	74.9
c. 35	3	1.4
d. 42	0	0.0
e. I am not sure	26	12.6

16. How many weeks include "active" pills in a standard pack of birth control pills?	Frequency	Percent
a. 1	12	5.8
b. 2	2	1.0
c. 3	122	58.9
d. 4	22	10.6
e. I am not sure	47	22.7

17. How many weeks include "inactive" pills in a standard pack of birth control pills?	Frequency	Percent
a. 1	130	62.8
b. 2	5	2.4
c. 3	7	3.4
d. 4	1	0.5
e. I am not sure	61	29.5

18. What **may** happen when "inactive" pills are skipped and "active" pills are continuously taken in their place?	Frequency	Percent
a. menstrual periods stop	68	32.9
b. a woman becomes permanently infertile	0	0.0
c. menstrual periods occur continuously	9	4.3
d. the pill as a contraceptive becomes ineffective	34	16.4
e. I am not sure	105	50.7

19. There is medical research to support that reducing the frequency of menstruation may have health benefits.	Frequency	Percent
a. True	34	16.4
b. False	45	21.7
c. I am not sure	127	61.4

Table 5.2. continued

20. Other than pregnancy, there are currently no methods available to women for reducing the frequency of menstruation.	Frequency	Percent
a. True	20	9.7
b. False	117	56.5
c. I am not sure	69	33.3

21. What is/are the warning sign(s) that may signal the onset of pill-related problems?	Frequency	Percent
a. chest pain	23	11.1
b. yellowing of the skin	18	8.7
c. pain in the calf of the leg	26	12.6
d. none of the above	5	2.4
e. all of the above[3]	NA	NA
f. I am not sure	167	80.7

22. What medical condition(s) may make it dangerous for a woman to use the pill?	Frequency	Percent
a. high blood pressure	130	62.8
b. smoking	127	61.4
c. diabetes	94	45.4
d. none of the above	7	3.4
e. all of the above[3]	NA	NA
f. I am not sure	53	25.6

23. Birth control pills are not available over the counter in the United States – a qualified individual must prescribe them.	Frequency	Percent
a. True	197	95.2
b. False	4	1.9
c. I am not sure	6	2.9

24. Many women consider using birth control pills for reasons other than preventing pregnancy.	Frequency	Percent
a. True	192	92.8
b. False	8	3.9
c. I am not sure	7	3.4

[3] To reiterate, the "all of the above" response option was discarded as a variable because it was inconsistent in test formatting and it did not make sense for scoring purposes; thus, a logical conversion was made for any respondent who chose this "all of the above" option – the respondent was instead considered as having chosen 21a, 21b, and 21c and/or 22a, 22b, and 22c in order to receive the proper amount of points.

Test properties–item analysis. An item analysis was conducted for the multiple-choice, general MC and OC knowledge portion of the questionnaire to examine internal reliability and to identify items/distractors in need of revision. Where internal consistency assesses the relationship between performance on an individual item and performance on an entire test, examining the performance of low and high scorers on each item (i.e., by calculating the discrimination index, *D*) through item analysis is appropriate.

Table 5.3 presents the results of the item analysis. Items having only one correct response option were treated as regular multiple-choice items, wherein the item analysis was completed across all response options and, accordingly, data for the item appear together in one table. However, items having more than one correct response option were treated as a series of True/False items, wherein the item analysis was completed for each, individual response choice to an item (the respondent either encircled the response choice on the test, defined by "yes," or the respondent did not encircle the response choice on the test, defined by "no") and, accordingly, data appear separately in tables for each response option.

The item analysis was performed utilizing the upper third of the sample in terms of total knowledge score (n = 66 or 32% of 207, total knowledge score range = 49-83 raw points or 54-92% of items correct) and the lower third of the sample in terms of total knowledge score (n = 66 or 32% of 207, total knowledge score range = 8-34 raw points or 9-38% of items correct). Table 5.3 presents item analysis results according to the following:

1. Frequencies of item response option selection by this sample of 207 coaches are presented in tables as percentages(numbers). The **correct** response option for every item and its corresponding data appear in **boldface type**.
2. A difficulty index and discrimination index were calculated for each item as follows:

   Difficulty index $p = (U_p + L_p)/(U + L)$
   Discrimination index $D = (U_p - L_p)/U$, where:
   U_p = number of respondents in upper group answering correctly
   L_p = number of respondents in lower group answering correctly
   U = number of respondents in upper group
   L = number of respondents in lower group
   In this case, where the upper and lower third groups were made the same, $U = L$.

3. **Acceptable** *p* and *D* values for each item appear in **boldface type** and are based upon recommendations from the literature according to the criteria below. Considerations for test revisions will be made based, in part, on this information:

Optimal $p = 0.50$, acceptable $p = 0.30$-0.80
Drop items $p = 0$–0.30, too hard
Drop items $p = 0.80$-1.0, too easy
Optimal $D = 0.40$, acceptable $D = 0.30$
Optimal Distractor $D = -0.20$, acceptable $D = 0$

Table 5.3. Test Item Analysis—Response Frequencies, *p* Values, and *D* Values

Item #1	A	**B**	C	D	E	*p*	*D*
Upper	4.5(3)	**93.9(62)**	0.0	0.0	1.5(1)		
Lower	7.6(5)	**68.2(45)**	3.0(2)	0.0	19.7(13)		
All Coaches	5.3(11)	**84.1(174)**	1.0(2)	0.0	9.2(19)	0.8106	0.2576

Item #2	A	**B**	C	D	E	*p*	*D*
Upper	0.0	**98.5(65)**	1.5(1)	0.0	0.0		
Lower	7.6(5)	**72.7(48)**	0.0	0.0	18.2(12)		
All Coaches	3.9(8)	**88.9(184)**	0.5(1)	0.0	6.3(13)	0.8561	0.2576

Item #3	A	**B**	C	D	E	*p*	*D*
Upper	0.0	**92.4(61)**	7.6(5)	0.0	0.0		
Lower	3.0(2)	**71.2(47)**	15.2(10)	0.0	9.1(6)		
All Coaches	2.4(5)	**83.1(172)**	8.7(18)	0.0	5.3(11)	0.8182	0.2121

Item #4a	**Yes**	No	*p*	*D*
Upper	**98.5(65)**	1.5(1)		
Lower	**72.7(48)**	27.3(18)		
All Coaches	**88.9(184)**	11.1(23)	0.8561	0.2576

Item #4b	**Yes**	No	*p*	*D*
Upper	**100.0(66)**	0.0		
Lower	**100.0(66)**	0.0		
All Coaches	**100.0(207)**	0.0	1.0000	0.0000

Table 5.3. continued

Item #4c	**Yes**	No	*p*	*D*
Upper	**95.5(63)**	4.5(3)		
Lower	**34.8(23)**	65.2(43)		
All Coaches	**65.7(136)**	34.3(71)	**0.6515**	**0.6061**

Item #4g	**Yes**	No	*p*	*D*
Upper	**47.0(31)**	53.0(35)		
Lower	**10.6(7)**	89.4(59)		
All Coaches	**25.6(53)**	74.44(154)	0.2879	**0.3636**

Item #4d	**Yes**	No	*p*	*D*
Upper	**84.8(56)**	15.2(10)		
Lower	**13.6(9)**	86.4(57)		
All Coaches	**49.3(102)**	50.7(105)	**0.4924**	**0.7121**

Item #4h	**Yes**	No	*p*	*D*
Upper	**47.0(31)**	53.0(35)		
Lower	**10.6(7)**	89.4(59)		
All Coaches	**24.2(50)**	75.8(157)	0.2879	**0.3636**

Item #4e	**Yes**	No	*p*	*D*
Upper	**100.0(66)**	0.0		
Lower	**78.8(52)**	21.2(14)		
All Coaches	**91.3(189)**	8.7(18)	0.8939	0.2121

Item #4i	**Yes**	No	*p*	*D*
Upper	**25.8(17)**	74.2(49)		
Lower	**3.0(2)**	97.0(64)		
All Coaches	**11.1(23)**	88.9(184)	0.1439	0.2273

Item #4f	**Yes**	No	*p*	*D*
Upper	**93.9(62)**	6.1(4)		
Lower	**43.9(29)**	56.1(37)		
All Coaches	**71.0(147)**	29.0(60)	**0.6894**	**0.5000**

Item #5a	**Yes**	No	*p*	*D*
Upper	**59.1(39)**	40.9(27)		
Lower	**12.1(8)**	87.9(58)		
All Coaches	**30.4(63)**	69.6(144)	**0.3561**	**0.4697**

Table 5.3. continued

Item #5b	**Yes**	No	*p*	*D*
Upper	**100.0(66)**	0.0		
Lower	**93.9(62)**	6.1(4)		
All Coaches	**98.1(203)**	1.9(4)	0.9697	0.0606

Item #5e	**Yes**	No	*p*	*D*
Upper	**93.9(62)**	6.1(4)		
Lower	**59.1(39)**	40.9(27)		
All Coaches	**77.8(161)**	22.2(46)	**0.7652**	**0.3485**

Item #5c	**Yes**	No	*p*	*D*
Upper	**92.4(61)**	7.6(5)		
Lower	**51.5(34)**	48.5(32)		
All Coaches	**73.9(153)**	26.1(54)	**0.7197**	**0.4091**

Item #5f	**Yes**	No	*p*	*D*
Upper	**97.0(64)**	3.0(2)		
Lower	**47.0(31)**	53.0(35)		
All Coaches	**75.8(157)**	24.2(50)	**0.7197**	**0.5000**

Item #5d	**Yes**	No	*p*	*D*
Upper	**42.4(28)**	57.6(38)		
Lower	**7.6(5)**	92.4(61)		
All Coaches	**19.3(40)**	80.7(167)	0.2500	**0.3485**

Item #5g	**Yes**	No	*p*	*D*
Upper	**40.9(27)**	59.1(39)		
Lower	**1.5(1)**	98.5(65)		
All Coaches	**15.9(33)**	84.1(174)	0.2121	**0.3939**

Item #5h	**Yes**	No	*p*	*D*
Upper	**48.5(32)**	51.5(34)		
Lower	**7.6(5)**	92.4(61)		
All Coaches	**23.7(49)**	76.3(158)	0.2803	**0.4091**

Table 5.3. continued

Item #6	A	B	**C**	D	E	*p*	*D*
Upper	0.0	0.0	**100.0(66)**	0.0	0.0		
Lower	0.0	3.0(2)	**89.4(59)**	4.5(3)	3.0(2)		
All Coaches	0.0	1.0(2)	**96.1(199)**	1.4(3)	1.4(3)	0.9470	0.1061

Item #7a	**Yes**	No	*p*	*D*
Upper	**100.0(66)**	0.0		
Lower	**95.5(63)**	4.5(3)		
All Coaches	**96.1(199)**	3.9(8)	0.9773	0.0455

Item #7b	**Yes**	No	*p*	*D*
Upper	**95.5(63)**	4.5(3)		
Lower	**57.6(38)**	42.4(28)		
All Coaches	**79.7(165)**	20.3(42)	**0.7652**	**0.3788**

Item #7c	**Yes**	No	*p*	*D*
Upper	**100.0(66)**	0.0		
Lower	**59.1(39)**	40.9(27)		
All Coaches	**78.7(163)**	21.3(44)	**0.7955**	**0.4091**

Item #7d	**Yes**	No	*p*	*D*
Upper	**93.9(62)**	6.1(4)		
Lower	**40.9(27)**	59.1(39)		
All Coaches	**64.7(134)**	35.3(73)	**0.6742**	**0.5303**

Item #7e	**Yes**	No	*p*	*D*
Upper	**97.0(64)**	3.0(2)		
Lower	**54.5(36)**	45.5(30)		
All Coaches	**73.9(153)**	26.1(54)	**0.7576**	**0.4242**

Item #7f	**Yes**	No	*p*	*D*
Upper	**97.0(64)**	3.0(2)		
Lower	**43.9(29)**	56.1(37)		
All Coaches	**74.4(154)**	25.6(53)	**0.7045**	**0.5303**

Table 5.3. continued

Item #7g	**Yes**	No	*p*	*D*
Upper	**89.4(59)**	10.6(7)		
Lower	**19.7(13)**	80.3(53)		
All Coaches	**58.0(120)**	42.0(87)	**0.5455**	**0.6970**

Item #7k	**Yes**	No	*p*	*D*
Upper	**51.5(34)**	48.5(32)		
Lower	**6.1(4)**	93.9(62)		
All Coaches	**23.2(48)**	76.8(159)	0.2879	**0.4545**

Item #7h	**Yes**	No	*p*	*D*
Upper	**77.3(51)**	22.7(15)		
Lower	**4.5(3)**	95.5(63)		
All Coaches	**37.7(78)**	62.3(129)	**0.4091**	**0.7273**

Item #7l	**Yes**	No	*p*	*D*
Upper	**75.8(50)**	24.2(16)		
Lower	**16.7(11)**	83.3(55)		
All Coaches	**37.7(78)**	62.3(129)	**0.4621**	**0.5909**

Item #7i	**Yes**	No	*p*	*D*
Upper	**98.5(65)**	1.5(1)		
Lower	**60.6(40)**	39.4(26)		
All Coaches	**83.1(172)**	16.9(35)	**0.7955**	**0.3788**

Item #7m	**Yes**	No	*p*	*D*
Upper	**50.0(33)**	50.0(33)		
Lower	**9.1(6)**	90.9(60)		
All Coaches	**22.7(47)**	77.3(160)	0.2955	**0.4091**

Item #7j	**Yes**	No	*p*	*D*
Upper	**77.3(51)**	22.7(15)		
Lower	**28.8(19)**	71.2(47)		
All Coaches	**51.2(106)**	48.8(101)	**0.5303**	**0.4848**

Item #7n	**Yes**	No	*p*	*D*
Upper	**56.1(37)**	43.9(29)		
Lower	**10.6(7)**	89.4(59)		
All Coaches	**30.0(62)**	70.0(145)	**0.3333**	**0.4545**

Table 5.3. continued

Item #7o	**Yes**	No	*p*	*D*
Upper	**75.8(50)**	24.2(16)		
Lower	**25.8(17)**	74.2(49)		
All Coaches	**58.0(120)**	42.0(87)	**0.5076**	**0.5000**

Item #8d	**Yes**	No	*p*	*D*
Upper	**92.4(61)**	7.6(5)		
Lower	**47.0(31)**	53.0(35)		
All Coaches	**76.3(158)**	23.7(49)	**0.6970**	**0.4545**

Item #8a	**Yes**	No	*p*	*D*
Upper	**100.0(66)**	0.0		
Lower	**40.9(27)**	59.1(39)		
All Coaches	**74.4(154)**	25.6(53)	**0.7045**	**0.5909**

Item #8e	**Yes**	No	*p*	*D*
Upper	**84.8(56)**	15.2(10)		
Lower	**22.7(15)**	77.3(51)		
All Coaches	**51.2(106)**	48.8(101)	**0.5379**	**0.6212**

Item #8b	**Yes**	No	*p*	*D*
Upper	**48.5(32)**	51.5(34)		
Lower	**3.0(2)**	97.0(64)		
All Coaches	**22.2(46)**	77.8(161)	0.2576	**0.4545**

Item #8f	**Yes**	No	*p*	*D*
Upper	**69.7(46)**	30.3(20)		
Lower	**9.1(6)**	90.9(60)		
All Coaches	**35.3(73)**	64.7(134)	**0.3939**	**0.6061**

Item #8c	**Yes**	No	*p*	*D*
Upper	**53.0(35)**	47.0(31)		
Lower	**4.5(3)**	95.5(63)		
All Coaches	**21.3(44)**	78.7(163)	0.2879	**0.4848**

Item #8g	**Yes**	No	*p*	*D*
Upper	**69.7(46)**	30.3(20)		
Lower	**6.1(4)**	93.9(62)		
All Coaches	**29.5(61)**	70.5(146)	**0.3788**	**0.6364**

Table 5.3. continued

Item #8h	**Yes**	No	*p*	*D*
Upper	**75.8(50)**	24.2(16)		
Lower	**12.1(8)**	87.9(58)		
All Coaches	**40.6(84)**	59.4(123)	**0.4394**	**0.6364**

Item #8i	**Yes**	No	*p*	*D*
Upper	**36.4(24)**	63.6(42)		
Lower	**3.0(2)**	97.0(64)		
All Coaches	**13.0(27)**	87.0(180)	0.1970	**0.3333**

Item #8j	**Yes**	No	*p*	*D*
Upper	**97.0(64)**	3.0(2)		
Lower	**33.3(22)**	66.7(44)		
All Coaches	**68.6(142)**	31.4(65)	**0.6515**	**0.6364**

Item #9	A	B	**C**	D	E	*p*	*D*
Upper	6.1(4)	6.1(4)	**89.4(59)**	7.6(5)	10.6(7)		
Lower	3.0(2)	0.0	**53.0(35)**	0.0	47.0(31)		
All Coaches	2.9(6)	1.9(4)	**74.9(155)**	2.4(5)	25.1(52)	**0.7121**	**0.3636**

Item #10	A	**B**	C	D	E	*p*	*D*
Upper	3.0(2)	**75.8(50)**	3.0(2)	1.5(1)	18.2(12)		
Lower	7.6(5)	**18.2(12)**	0.0	0.0	72.7(48)		
All Coaches	6.3(13)	**42.5(88)**	1.0(2)	2.9(6)	48.3(100)	**0.4697**	**0.5758**

Table 5.3. continued

Item #11	**A**	B	C	D	E	*p*	*D*
Upper	**50.0(33)**	0.0	6.1(4)	1.5(1)	42.4(28)		
Lower	**18.2(12)**	0.0	0.0	0.0	77.3(51)		
All Coaches	**37.7(78)**	0.0	2.9(6)	1.0(2)	54.1(112)	**0.3409**	**0.3182**

Item #12a	**Yes**	No	*p*	*D*
Upper	**95.5(63)**	4.5(3)		
Lower	**65.2(43)**	34.8(23)		
All Coaches	**82.6(171)**	17.4(36)	0.8030	**0.3030**

Item #13a	**Yes**	No	*p*	*D*
Upper	**98.5(65)**	1.5(1)		
Lower	**66.7(44)**	33.3(22)		
All Coaches	**87.0(180)**	13.0(27)	0.8258	**0.3182**

Item #12b	**Yes**	No	*p*	*D*
Upper	**97.0(64)**	3.0(2)		
Lower	**75.8(50)**	24.2(16)		
All Coaches	**86.5(179)**	13.5(28)	0.8636	0.2121

Item #13b	**Yes**	No	*p*	*D*
Upper	**37.9(25)**	62.1(41)		
Lower	**7.6(5)**	92.4(61)		
All Coaches	**23.2(48)**	76.8(159)	0.2273	**0.3030**

Item #12c	**Yes**	No	*p*	*D*
Upper	**34.8(23)**	65.2(43)		
Lower	**13.6(9)**	86.4(57)		
All Coaches	**21.7(45)**	78.3(162)	0.2424	0.2121

Item #13c	**Yes**	No	*p*	*D*
Upper	**87.9(58)**	12.1(8)		
Lower	**25.8(17)**	74.2(49)		
All Coaches	**61.4(127)**	38.6(80)	**0.5682**	**0.6212**

Table 5.3. continued

Item #13d	**Yes**	No	*p*	*D*
Upper	**74.2(49)**	25.8(17)		
Lower	**18.2(12)**	81.8(54)		
All Coaches	**41.1(85)**	58.9(122)	**0.4621**	**0.5606**

Item #13e	**Yes**	No	*p*	*D*
Upper	**78.8(52)**	21.2(14)		
Lower	**30.3(20)**	69.7(46)		
All Coaches	**57.5(119)**	42.5(88)	**0.5455**	**0.4848**

Item #13f	**Yes**	No	*p*	*D*
Upper	**31.8(21)**	68.2(45)		
Lower	**0.0**	100.0(66)		
All Coaches	**12.6(26)**	87.4(181)	0.1591	**0.3182**

Item #13g	**Yes**	No	*p*	*D*
Upper	**31.8(21)**	68.2(45)		
Lower	**1.5(1)**	98.5(65)		
All Coaches	**15.5(32)**	84.5(175)	0.1667	**0.3030**

Item #13h	**Yes**	No	*p*	*D*
Upper	**19.7(13)**	80.3(53)		
Lower	**0.0**	100.0(66)		
All Coaches	**8.2(17)**	91.8(190)	0.0985	0.1970

Item #13i	**Yes**	No	*p*	*D*
Upper	**19.7(13)**	80.3(53)		
Lower	**0.0**	100.0(66)		
All Coaches	**6.3(13)**	93.7(194)	0.0985	0.1970

Item #13j	Yes	**No**	*p*	*D*
Upper	6.1(4)	**93.9(62)**		
Lower	0.0	**100.0(66)**		
All Coaches	3.9(8)	**96.1(199)**	0.9697	-0.0606

Item #13k	**Yes**	No	*p*	*D*
Upper	**72.7(48)**	27.3(18)		
Lower	**15.2(10)**	84.8(56)		
All Coaches	**41.1(85)**	58.9(122)	**0.4394**	**0.5758**

Table 5.3. continued

Item #13l	**Yes**	No	*p*	*D*
Upper	**31.8(21)**	68.2(45)		
Lower	**1.5(1)**	98.5(65)		
All Coaches	**13.0(27)**	87.0(180)	0.1667	**0.3333**

Item #13m	**Yes**	No	*p*	*D*
Upper	**27.3(18)**	72.7(48)		
Lower	**0.0**	100.0(66)		
All Coaches	**11.6(24)**	88.4(183)	0.1364	0.1970

Item #13n	**Yes**	No	*p*	*D*
Upper	**22.7(15)**	77.3(51)		
Lower	**9.1(6)**	90.9(60)		
All Coaches	**12.6(26)**	87.4(181)	0.1591	0.1364

Item #14a	**Yes**	No	*p*	*D*
Upper	**33.3(22)**	66.7(44)		
Lower	**12.1(8)**	87.9(58)		
All Coaches	**23.7(49)**	76.3(158)	0.2273	0.2121

Item #14b	**Yes**	No	*p*	*D*
Upper	**33.3(22)**	66.7(44)		
Lower	**9.1(6)**	90.9(60)		
All Coaches	**18.4(38)**	81.6(169)	0.2121	0.2424

Item #14c	**Yes**	No	*p*	*D*
Upper	**25.8(17)**	74.2(49)		
Lower	**7.6(5)**	92.4(61)		
All Coaches	**15.9(33)**	84.1(174)	0.1667	0.1818

Item #14d	**Yes**	No	*p*	*D*
Upper	**42.4(28)**	57.6(38)		
Lower	**6.1(4)**	93.9(62)		
All Coaches	**25.6(53)**	74.4(154)	0.2424	**0.3636**

Item #14e	**Yes**	No	*p*	*D*
Upper	**86.4(57)**	13.6(9)		
Lower	**47.0(31)**	53.0(35)		
All Coaches	**71.5(148)**	28.5(59)	**0.6667**	**0.3939**

Table 5.3. continued

Item #14f	**Yes**	No	*p*	*D*
Upper	**34.8(23)**	65.2(43)		
Lower	**4.5(3)**	95.5(63)		
All Coaches	**25.1(52)**	74.9(155)	0.1970	**0.3030**

Item #14i	**Yes**	No	*p*	*D*
Upper	**4.5(3)**	95.5(63)		
Lower	**4.5(3)**	95.5(63)		
All Coaches	**3.4(7)**	96.6(200)	0.0455	0

Item #14g	**Yes**	No	*p*	*D*
Upper	**18.2(12)**	81.8(54)		
Lower	**16.7(11)**	83.3(55)		
All Coaches	**12.6(26)**	87.4(181)	0.1742	0.0152

Item #14j	**Yes**	No	*p*	*D*
Upper	**22.7(15)**	77.3(51)		
Lower	**6.1(4)**	93.9(62)		
All Coaches	**17.4(36)**	82.6(171)	0.1439	0.1667

Item #14h	**Yes**	No	*p*	*D*
Upper	**30.3(20)**	69.7(46)		
Lower	**9.1(6)**	90.9(60)		
All Coaches	**19.8(41)**	80.2(166)	0.1970	0.2121

Item #14k	**Yes**	No	*p*	*D*
Upper	**21.2(14)**	78.8(52)		
Lower	**4.5(3)**	95.5(63)		
All Coaches	**11.6(24)**	88.4(183)	0.1288	0.1667

Item #15	A	**B**	C	D	E	*p*	*D*
Upper	12.1(8)	**87.9(58)**	0.0	0.0	3.0(2)		
Lower	9.1(6)	**65.2(43)**	0.0	0.0	22.7(15)		
All Coaches	11.1(23)	**74.9(155)**	1.4(3)	0.0	12.6(26)	**0.7652**	0.2273

Table 5.3. continued

Item #16	A	B	**C**	D	E	*p*	*D*
Upper	0.0	1.5(1)	**78.8(52)**	9.1(6)	10.6(7)		
Lower	10.6(7)	1.5(1)	**39.4(26)**	10.6(7)	34.8(23)		
All Coaches	5.8(12)	1.0(2)	**58.9(122)**	10.6(22)	22.7(47)	**0.5909**	**0.3939**

Item #17	**A**	B	C	D	E	*p*	*D*
Upper	**81.8(54)**	3.0(2)	0.0	1.5(1)	13.6(9)		
Lower	**43.9(29)**	4.5(3)	6.1(4)	0.0	45.5(30)		
All Coaches	**62.8(130)**	2.4(5)	3.4(7)	0.5(1)	29.5(61)	**0.6288**	**0.3788**

Item #18	**A**	B	C	D	E	*p*	*D*
Upper	**48.5(32)**	0.0	6.1(4)	22.7(15)	31.8(21)		
Lower	**16.7(11)**	0.0	0.0	21.2(14)	65.2(43)		
All Coaches	**32.9(68)**	0.0	4.3(9)	16.4(34)	50.7(105)	**0.3258**	**0.3182**

Item #19	**A**	B	C	*p*	*D*
Upper	**22.7(15)**	30.3(20)	47.0(31)		
Lower	**19.7(13)**	7.6(5)	71.2(47)		
All Coaches	**16.4(34)**	21.7(45)	61.4(127)	0.2121	0.0303

Item #20	A	**B**	C	*p*	*D*
Upper	13.6(9)	**68.2(45)**	18.2(12)		
Lower	9.1(6)	**36.4(24)**	53.0(35)		
All Coaches	9.7(20)	**56.5(117)**	33.3(69)	**0.5227**	**0.3182**

Table 5.3. continued

Item #21a	**Yes**	No	*p*	*D*
Upper	**22.7(15)**	77.3(51)		
Lower	**3.0(2)**	97.0(64)		
All Coaches	**11.1(23)**	88.9(184)	0.1288	0.1970

Item #21b	**Yes**	No	*p*	*D*
Upper	**18.2(12)**	81.8(54)		
Lower	**0.0**	100.0(66)		
All Coaches	**8.7(18)**	91.3(189)	0.0909	0.1818

Item #21c	**Yes**	No	*p*	*D*
Upper	**30.3(20)**	69.7(46)		
Lower	**0.0**	100.0(66)		
All Coaches	**12.6(26)**	87.4(181)	0.1515	**0.3030**

Item #21d	Yes	**No**	*p*	*D*
Upper	1.5(1)	**98.5(65)**		
Lower	0.0	**100.0(66)**		
All Coaches	2.4(5)	**97.6(202)**	0.9924	-0.0152

Item #22a	**Yes**	No	*p*	*D*
Upper	**77.3(51)**	22.7(15)		
Lower	**43.9(29)**	56.1(37)		
All Coaches	**62.8(130)**	37.2(77)	**0.6061**	**0.3333**

Item #22b	**Yes**	No	*p*	*D*
Upper	**86.4(57)**	13.6(9)		
Lower	**33.3(22)**	66.7(44)		
All Coaches	**61.4(127)**	38.6(80)	**0.5985**	**0.5303**

Item #22c	**Yes**	No	*p*	*D*
Upper	**57.6(38)**	42.4(28)		
Lower	**28.8(19)**	71.2(47)		
All Coaches	**45.4(94)**	54.6(113)	**0.4318**	0.2879

Item #22d	Yes	**No**	*p*	*D*
Upper	0.0	**100.0(66)**		
Lower	0.0	**100.0(66)**		
All Coaches	3.4(7)	**96.6(200)**	1.0000	0

Table 5.3. continued

Item #23	**A**	B	C	*p*	*D*
Upper	**100.0(66)**	0.0	0.0		
Lower	**84.8(56)**	6.1(4)	9.1(6)		
All Coaches	**95.2(197)**	1.9(4)	2.9(6)	0.9242	0.1515

Item #24	**A**	B	C	*p*	*D*
Upper	**100.0(66)**	0.0	0.0		
Lower	**84.8(56)**	10.6(7)	4.5(3)		
All Coaches	**92.8(192)**	3.9(8)	3.4(7)	0.9242	0.1515

Internal consistency was also measured using Cronbach's coefficient alpha (a). To allow for the calculation of a, the cells in the data matrix were recoded in the following ways: (1) the original value of 2 = no, the respondent did not choose the response, was recoded to 0 = incorrect; and (2) items #13j, #21d, and #22d were reverse scored because choosing the response (originally, 1 = yes) was an incorrect answer; thus, 1 = yes was recoded as 0 = incorrect, and 2 = no was recoded as 1 = correct. Due to the treatment of many multiple-choice items as a series of True/False items, the 12 original items on the MC test resulted in 52 distinct items and the 12 original items on the OC test resulted in 41 distinct items (total items on test for the purposes of analysis = 93). One item (#4b) was dropped during the calculation of a because there was zero variance (i.e., all of the coaches responded correctly). The items demonstrated high internal consistency: MC test items, a = 0.93; OC test items, a = 0.84; and total test items, a = 0.94.

Comparative data analyses. As stated previously, although the purpose of this study was to design an assessment tool for coaches and to examine the instrument's properties through pretesting the questionnaire, coaches' responses were explored through comparative data analyses to gain a fundamental understanding of coaches' knowledge. Additionally, observation of expected patterns of correlations may assist in providing evidence for the

external aspect of Messick's (1995) conceptualization of construct validity (this will be discussed further in Chapter 6).

Accordingly, tests of mean differences were conducted for eight expectations of patterns (as formulated based on previous research and/or with the assistance of focus group work). The results are presented separately for each expectation. All of the following analyses were completed using SPSS.

Expectation #1: *Female coaches will score higher on a test related to the menstrual cycle (MC) and oral contraceptives (OC) than will male coaches.* This expectation was supported, as one-way ANOVAs indicated significant differences between gender groups in MC knowledge score ($F = 19.03$ with $df = (1, 205)$, $p < 0.000$); OC knowledge score ($F = 38.10$ with $df = (1, 205)$, $p < 0.000$); and total knowledge score ($F = 31.31$ with $df = (1, 205)$, $p < 0.000$). Means and standard deviations for MC knowledge score, OC knowledge score, and total knowledge score across both gender groups are presented in Table 5.4 (note that reported knowledge test scores in all following tables are percentages on a scale of 0% to 100% of correct responses chosen, unless otherwise noted).

Table 5.4. Means and Standard Deviations for Knowledge Scores by Gender

Gender	N	MC *m*	MC *sd*	OC *m*	OC *sd*	Total *m*	Total *sd*
Male	85	49.82*	19.60	27.62*	13.71	40.44*	15.07
Female	122	61.27*	17.83	40.10*	14.72	52.33*	15.02

* Mean score differences are statistically significant, $p < 0.000$

Expectation #2: *Younger (post-menarcheal and pre-menopausal) female coaches will score higher on a test related to the MC and OC than will older (menopausal and post-menopausal) female coaches.* This expectation was not supported, as one-way ANOVAs indicated no significant differences among age groups in MC knowledge score ($F = 1.47$ with $df = (7, 114)$, $p = 0.19$); OC knowledge score ($F =$

0.96 with *df* = (7, 114), *p* = 0.47); and total knowledge score (*F* = 1.27 with *df* = (7, 114), *p* = 0.27). Moreover, the coaches in the 50-54 year age group (average age for menopause onset) scored higher on both the MC and OC test (and, thus, overall) than did the coaches in all other age groups. Means and standard deviations for MC knowledge score, OC knowledge score, and total knowledge score for females across age groups are presented in Table 5.5.

Table 5.5. Means and Standard Deviations for Knowledge Scores of Females by Age

Age Group	N	MC *m*	MC *sd*	OC *m*	OC *sd*	Total *m*	Total *sd*
20-24	25	60.38	21.02	44.11	14.28	53.51	17.18
25-29	28	59.55	18.23	39.00	14.68	50.87	15.61
30-34	23	59.45	14.07	39.24	12.82	50.92	12.16
35-39	14	61.40	16.12	39.10	13.96	51.98	14.38
40-44	13	65.24	17.16	39.07	16.64	54.19	14.62
45-49	9	53.85	16.87	31.58	12.69	44.44	12.47
50-54	6	80.77	19.76	46.93	18.56	66.48	19.16
55-59	4	63.46	8.88	43.42	22.79	55.00	4.49

Expectation #3: *Male coaches who are married will score higher on a test related to the MC and OC than will male coaches who are single.* This expectation was not supported, as one-way ANOVAs indicated no significant differences among marital status groups in MC knowledge score (*F* = 1.28 with *df* = (3, 81), *p* = 0.29); OC knowledge score (*F* = 2.14 with *df* = (3, 81), *p* = 0.10); and total knowledge score (*F* = 1.46 with *df* = (3, 81), *p* = 0.23). Means and standard deviations for MC knowledge score, OC knowledge score, and total knowledge score for males across marital status groups are presented in Table 5.6. Inspection of these mean scores reveals that single male coaches did generally score lower on both the MC portion and OC portion of the knowledge test than did the married and divorced male

coaches (who were once married and presumably lived with their female spouses at that time).

Table 5.6. Means and Standard Deviations for Knowledge Scores of Males by Marital Status

Marital Status	N	MC *m*	MC *sd*	OC *m*	OC *sd*	Total *m*	Total *sd*
Single	13	45.41	19.18	22.67	13.27	35.81	14.35
Married	63	51.47	19.69	27.69	12.80	41.43	14.67
Divorced	5	53.08	18.87	40.53	22.38	47.78	20.15
Not Indicated	4	34.13	17.72	26.32	11.16	30.83	14.64

Still, if the male divorced coaches (n = 5) are included in the male married coaches group (n = 63) and the male "not indicated" coaches group (n = 4) is dropped from the analysis for practical purposes, one-way ANOVAs indicated no significant differences between these two marital status groups in MC knowledge score (F = 1.10 with df = (1, 79), p = 0.30); OC knowledge score (F = 2.04 with df = (1, 79), p = 0.16); and total knowledge score (F = 1.81 with df = (1, 79), p = 0.18). Means and standard deviations of these revised male marital status groups for MC knowledge score, OC knowledge score, and total knowledge score are presented in Table 5.7.

Table 5.7. Means and Standard Deviations for Knowledge Scores of Males (Revised Marital)

Marital Status	N	MC *m*	MC *sd*	OC *m*	OC *sd*	Total *m*	Total *sd*
Single	13	45.41	19.18	22.67	13.27	35.81	14.35
Married	68	51.58	19.50	28.64	13.88	41.90	15.04

Expectation #4: *Male coaches who have a female(s) present in the home who is(are) of menstrual age will score higher on a test related to the MC than will coaches who*

do not have a female(s) present in the home who is(are) of menstrual age. This expectation was not supported, as one-way ANOVAs indicated no significant differences between MC-female present in household groups in MC knowledge score ($F = 3.04$ with $df = (2, 82)$, $p = 0.053$); and, incidentally, in OC knowledge score ($F = 1.14$ with $df = (2, 82)$, $p = 0.32$); and total knowledge score ($F = 1.04$ with $df = (2, 82)$, $p = 0.36$). In general, however, males who reported having a female present in the household who is of menstrual age scored higher on all test measures than did males who reported having no females present in the household of menstrual age. Means and standard deviations for MC knowledge score, OC knowledge score, and total knowledge score for males across MC-female present in household groups are presented in Table 5.8.

Table 5.8. Means and Standard Deviations for Knowledge Scores of Males by MC-Female

MC-Female	N	MC *m*	MC *sd*	OC *m*	OC *sd*	Total *m*	Total *sd*
Yes	60	51.28*	20.11	28.03	13.29	37.32	13.94
No	23	43.81*	16.78	27.80	15.01	33.35	12.78

* Mean score difference is of practical significance, $p = 0.053$

Expectation #5: Male coaches who have a female(s) present in the home who is(are) using OC will score higher on a test related to OC than will coaches who do not have a female(s) present in the home who is(are) using OC. This expectation was not supported, as one-way ANOVAs indicated no significant differences between OC-female present in household groups in OC knowledge score ($F = 1.17$ with $df = (2, 82)$, $p = 0.32$); or, incidentally, in total knowledge score ($F = 1.30$ with $df = (2, 82)$, $p = 0.28$). Interestingly, OC-female present in household status was significantly related to MC knowledge score ($F = 3.37$ with $df = (2, 82)$, $p = 0.04$). Males who reported having a female present in the household who uses OC scored significantly higher on the MC knowledge portion of the test than did males who reported having no females present in the household who use OC. In general, males who reported

having a female present in the household who uses OC also scored higher in OC knowledge and total knowledge than did males who reported having no females present in the household using OC. Means and standard deviations for MC knowledge score, OC knowledge score, and total knowledge score for males across OC-female present in household groups are presented in Table 5.9.

Table 5.9. Means and Standard Deviations for Knowledge Scores of Males by OC-Female

OC-Female	N	MC *m*	MC *sd*	OC *m*	OC *sd*	Total *m*	Total *sd*
Yes	49	52.32*	18.92	28.25	10.16	37.94	12.08
No	34	44.74*	19.57	27.55	17.76	33.74	15.54

* Mean score difference is statistically significant, $p = 0.04$

It is important to note that out of 60 males who reported having a female present in the household of menstrual age, 44 of them (73.3%) indicated also having a female present in the household who uses OC. Responses to these two items on the demographic portion of the questionnaire were significantly correlated for all coaches ($n = 207$, Spearman's *rho* = 0.61, $p < 0.000$) as well as for male coaches ($n = 85$, Spearman's *rho* = 0.52, $p < 0.000$), such that coaches who responded in the affirmative to one item were likely to respond in the affirmative to the second item. This assists in explaining why results for hypotheses #4 and #5 are so similar.

Expectation #6: *Coaches who report a college major related to the MC or OC will score higher on a test related to the MC and OC than will coaches who report a college major unrelated to the MC or OC.* College majors regarded as related to knowledge of the MC and/or OC included subjects wherein a candidate would have received explicit training regarding the physical and biochemical mechanisms of an animal organism, including humans (e.g., health education; kinesiology; biology; and pre-medical or medical majors). College majors regarded as unrelated to knowledge of the MC and/or OC included subjects wherein a candidate would have received

little training (e.g., basic peripheral, core courses required of all college students) or no training regarding the physical and biochemical mechanisms of animal organisms (e.g., education degrees in elementary ages, physical education, special education, math, and English; business; psychology; sociology; philosophy; history and political science; Spanish; and administration degrees in education, leadership, sport, or recreation). This expectation was not supported, as one-way ANOVAs indicated no significant differences among college major relatedness groups in MC knowledge score ($F = 3.57$ with $df = (1, 190)$, $p = 0.06$); OC knowledge score ($F = 0.02$ with $df = (1, 190)$, $p = 0.88$); and total knowledge score ($F = 1.53$ with $df = (1, 190)$, $p = 0.22$). (Note that $n = 192$ for this analysis, as 4 coaches reported no college and 11 coaches failed to indicate a college major even though they reported receiving a college degree.) Not only are mean knowledge scores not significantly different from each other, but mean differences generally occurred in an opposite, unexpected direction; in general, coaches who reported a related college major scored *lower* in MC knowledge score and in total knowledge score than did coaches who reported an unrelated college major. When all 207 coaches are included in the analysis, mean differences are likewise not statistically significant for MC knowledge score ($F = 1.44$ with $df = (3, 203)$, $p = 0.23$); OC knowledge score ($F = 1.28$ with $df = (3, 203)$, $p = 0.28$); and total knowledge score ($F = 1.12$ with $df = (3, 203)$, $p = 0.34$). Means and standard deviations for MC knowledge score, OC knowledge score, and total knowledge score for coaches across all college major relatedness groups are presented in Table 5.10.

Table 5.10. Means and Standard Deviations for Knowledge Scores by College Major

College Major	N	MC *m*	MC *sd*	OC *m*	OC *sd*	Total *m*	Total *sd*
No College	4	53.37	15.96	36.18	4.49	46.11	9.27
Related	32	50.96	17.60	35.86	16.02	44.58	15.24
Unrelated	160	58.06	19.74	35.38	15.75	48.49	16.49
Not Indicated	11	52.27	18.50	26.08	11.97	41.21	13.68

Expectation #7: *Coaches who teach courses related to the MC or OC will score higher on a test related to the MC and OC than will coaches who teach courses unrelated to the MC and OC.* (Note that only 110 of 207 coaches also teach a class at their respective institution where they coach; the remaining 97 coaches only coach at their institution). Courses related to knowledge of the MC and/or OC included only health for this sample of coaches; all remaining courses were unrelated to knowledge of the MC and/or OC (e.g., bible, English, driver education, Spanish, special education, and social studies). This expectation was not supported, as one-way ANOVAs indicated no significant differences between course relatedness groups in MC knowledge score ($F = 3.16$ with $df = (1, 108)$, $p = 0.08$); OC knowledge score ($F = 0.07$ with $df = (1, 108)$, $p = 0.80$); and total knowledge score ($F = 1.20$ with $df = (1, 108)$, $p = 0.28$). Not only are mean knowledge scores not significantly different from each other, but mean differences generally occurred in an opposite, unexpected direction; in general, coaches who reported teaching a related course scored *lower* in MC knowledge score and in total knowledge score than did coaches who reported teaching an unrelated course. Additionally, mean knowledge scores were not significantly different from each other when including the group of coaches who only coach at their respective institution ($n = 97$), as indicated by one-way ANOVAs for MC knowledge score ($F = 1.92$ with $df = (2, 204)$, $p = 0.15$); OC knowledge score ($F = 0.05$ with $df = (2, 204)$, $p = 0.95$); and total knowledge score ($F = 0.76$ with $df = (2, 204)$, $p = 0.47$). Means and standard deviations for MC knowledge

score, OC knowledge score, and total knowledge score for coaches across course relatedness groups are presented in Table 5.11.

Table 5.11. Means and Standard Deviations for Knowledge Scores by Course Relatedness

Course Taught	N	MC *m*	MC *sd*	OC *m*	OC *sd*	Total *m*	Total *sd*
Related	18	49.15	19.07	35.82	14.75	43.52	16.57
Unrelated	92	58.65	21.04	34.67	17.55	48.53	17.97
None	97	55.97	17.51	35.11	13.71	47.16	14.07

Expectation #8: *Coaches who report participation in special training related to the MC or OC will score higher on a test related to the MC and OC than will coaches who report no special training related to the MC or OC.* This expectation was not supported, as one-way ANOVAs indicated no significant differences between special training response groups in MC knowledge score ($F = 0.09$ with $df = (1, 205)$, $p = 0.77$); OC knowledge score ($F = 1.21$ with $df = (1, 205)$, $p = 0.27$); and total knowledge score ($F = 0.06$ with $df = (1, 205)$, $p = 0.81$). Means and standard deviations for MC knowledge score, OC knowledge score, and total knowledge score for coaches between special training response groups are presented in Table 5.12.

Table 5.12. Means and Standard Deviations for Knowledge Scores by Special Training

Special Training	N	MC *m*	MC *sd*	OC *m*	OC *sd*	Total *m*	Total *sd*
Yes	49	55.85	16.85	37.11	14.66	47.94	14.08
No	158	56.79	20.14	34.31	15.80	47.30	16.72

However, college major relatedness was significantly correlated to special training response, such that coaches who reported having a related college major also

reported receiving special training in the MC and/or OC (Spearman's *rho* = 0.42, $p <$ 0 .000). Because this information most likely reflects or complements the college training received, it is redundant information from coaches reporting a related college major. Accordingly, mean knowledge differences were examined between special training response groups for coaches who reported an *un*related college major (n = 160). Although these coaches who reported receiving special training did generally score higher than did coaches who reported receiving no special training on all knowledge measures, these mean differences were not statistically significant, as indicated by one-way ANOVAs for MC knowledge score (F = 0.17 with df = (1, 158), p = 0.68); OC knowledge score (F = 0.36 with df = (1, 158), p = 0.55); and total knowledge score (F = 0.28 with df = (1, 158), p = 0.60). Means and standard deviations for MC knowledge score, OC knowledge score, and total knowledge score for this subgroup of coaches (*un*related college majors only) between special training response groups are presented in Table 5.13.

Table 5.13. Means and Standard Deviations for Knowledge Scores (Revised Special Training)

Special Training	N	MC *m*	MC *sd*	OC *m*	OC *sd*	Total *m*	Total *sd*
Yes	24	59.62	16.08	37.17	12.81	50.14	13.10
No	136	57.79	20.35	35.06	16.23	48.19	17.04

Section 3: Specific knowledge of athletes' MC and OC use. This section of the questionnaire contains 21 items—some are free response items and some are multiple-choice items. Directions for completing this section of the questionnaire instruct coaches that "[t]he following questions pertain specifically to the athletes whom you coach." Six items relate to the existence and onset of athletes' menses (#1 - #6); three items relate to athletes' OC use (#7 - #9); four items relate to coaches' beliefs about athletes' OC use (#10 - #13); four items relate to coaches' behavior on behalf of their beliefs about athletes' OC use (#14 - #17); two items relate to existence and prevalence of athletes' PMS (#18 - #19); one

item relates to athletes' strategies for coping with MC and PMS symptoms (#20); and one item relates to athletes' descriptive phrases for menstruation (#21). For the purposes of scoring, analyzing, and interpreting responses to these items, and in an effort to appropriately describe coaches' specific knowledge of their athletes, it is recognized that items related to coach beliefs and behaviors (#10 - #17) included in this section are misplaced. Results for these items will still be included in this section in an effort to remain consistent with the order of items presented in the questionnaire, and recommendations for questionnaire revisions will be elaborated upon in Chapter 6.

Coaches' responses to items in Section 3 of the questionnaire were entered into a data matrix using dummy codes, except for coaches' responses to items #11, #13, #15, and #17. (The four items that were not dummy coded for analysis ask coaches, "Why or why not?" Responses to these open-ended items were varied and complex; therefore, these data were treated qualitatively through content analysis.) Dummy coded responses were explored across levels of categorical variables and across test scores of interest for each quantitative item in this section. Pearson's chi-square test statistic ($?^2$) was computed to detect differences among cells in contingency tables, and one-way ANOVAs were performed to compare the mean scores of the general knowledge tests (MC, OC, and total scores) across groups. Additionally, where appropriate, a logistic regression was performed using select variables to predict knowledge or belief outcomes (a variable was chosen for inclusion in a regression model if it differed significantly across knowledge or belief groups). All statistical analyses were completed using SPSS.

Item #1: How many athletes on your team do you know, for certain, have begun their menstrual cycles? If a coach responded by writing in a number, then the response was coded with a 1 = Knowledge; if a coach responded by writing "I am not sure," or "I don't know," then the response was coded with a 2 = No Knowledge. Nearly 73% of coaches reported having knowledge that one or more of their athletes have begun their MC. An analysis of contingency table cells indicates that the proportion of coaches in the "Knowledge" group differs significantly from the proportion of coaches in the "No Knowledge" group based on coaches' gender, $?^2$ (1, N = 207) = 17.11, $p < 0.001$, and coaches' age, $?^2$ (8, N = 207) =

16.17, $p = 0.040$. Additionally, mean scores on the OC test differed significantly between the two knowledge groups, $F = 7.56$ with $df = (1, 205)$, $p = 0.006$. In general, female coaches and younger coaches (aged 20-34 years) were more likely to have knowledge related to this item, and coaches in the "Knowledge" group scored higher on the OC test than did coaches in the "No Knowledge" group. Table 5.14 presents frequencies and percentages for each of the coach knowledge groups according to levels of coach variables and the general knowledge test.

Table 5.14. Frequencies and Percentages of Coach MC Knowledge Groups – Item #1

		Knowledge n = 151 (72.9%)		No Knowledge n = 56 (27.1%)	
Variable	Level	Frequency	Percent	Frequency	Percent
Coach Gender*	Male	49	32.5%	36	64.3%
	Female	102	67.5%	20	35.7%
Coach Age*	20-24	21	13.9%	4	7.1%
	25-29	32	21.2%	6	10.7%
	30-34	26	17.2%	8	14.3%
	35-39	24	15.9%	12	21.4%
	40-44	11	7.3%	9	16.1%
	45-49	20	13.2%	8	14.3%
	50-54	12	7.9%	2	3.6%
	55-59	4	2.6%	4	2.6%
	60 and over	1	0.7%	3	5.4%
Ages Coached	Middle	8	5.3%	6	10.7%
	High	56	37.1%	22	39.3%
	Mixed M/H	27	17.9%	6	10.7%
	College	60	39.7%	22	39.3%
Mean Test Score	MC	--	57.0%	--	55.4%
	OC*	--	36.8%	--	30.2%
	Total	--	48.5%	--	44.7%

* Contingency table cell values and/or mean test scores are significantly different; $p < 0.05$.

A logistic regression analysis using the "ENTER" method was performed on the outcome of "Knowledge" using three predictor variables: coach gender, coach age, and OC test score. A test of the full model with all three predictor variables against a constant-only model was significant, $?^2$ (10, N = 207) = 30.00, $p < 0.001$, indicating that the predictors, as a set, reliably distinguished between "Knowledge" and "No Knowledge" groups. The variance explained by the three predictors was 19.6% (Nagelkerke $R^2 = 0.196$). Prediction success was better for the "Knowledge" group at 97.4% than for the "No Knowledge" group at 23.2% (overall prediction success rate = 77.3%). According to the Wald criterion, only coach gender significantly predicted knowledge, $z = 8.25$, with $df = 1$, $p = 0.004$.

Item #2: How do you know this information? Responses to this item were all dummy coded into the data matrix. As unique responses emerged during scoring, a new dummy code was assigned. Of the 151 coaches who indicated having knowledge that one or more of their athletes had begun their MC, 147 coaches (97.4%) provided responses to this item. Some coaches listed more than one way in which they acquired the specific knowledge assessed by item #1. Accordingly, 147 coaches provided 173 responses across 10 unique categories. Table 5.15 presents the 10 ways in which coaches acquire the knowledge that one or more of their athletes have begun their MC, and the frequencies with which they were reported.

Table 5.15. Ways Coaches Acquire Specific Knowledge of Athletes' MC – Item #2

Method of Acquiring Information	Frequency	Percent*
Athletes Informed the Coach	91	61.9%
Coach Assumed Based on Athlete's Age	27	18.4%
Health Forms / Physicals	19	12.9%
Athletes Request Supplies from Coach	12	8.2%
Parents of Athletes Informed the Coach	8	5.4%
Coach Asked the Athletic Trainer	5	3.4%
Coach Hears Athletes Complain	4	2.7%
Coach Observes Borrowing of Supplies	4	2.7%

Table 5.15. continued

Method of Acquiring Information	Frequency	Percent*
Athlete Started Menses On-Site	2	1.4%
Coach Asked Athletes	1	0.7%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/147 * 100. Due to multiple responses from coaches, percentages will not add up to 100.0%.

Item #3: How many athletes on your team do you know, for certain, have not begun their menstrual cycles? If a coach responded by writing in a number, then the response was coded with a 1 = Knowledge; if a coach responded by writing "I am not sure," or "I don't know," then the response was coded with a 2 = No Knowledge. Additionally, if a coach indicated in item #1 that *all* of their athletes have begun their MC, then the coach's response to item #3 was coded with a 1 = Knowledge. Approximately 55% of coaches reported knowing if any of their athletes have *not* begun their MC. An analysis of contingency table cells indicates that the proportion of coaches in the "Knowledge" group differs significantly from the proportion of coaches in the "No Knowledge" group based on coaches' age, $?^2$ (8, N = 207) = 15.85, p = 0.045. Additionally, mean scores on the OC and total test differed significantly between the two knowledge groups, F = 11.00 with df = (1, 205), p = 0.001 and F = 5.54 with df = (1, 205), p = 0.019, respectively. In general, coaches aged 20-29 years or aged 45-54 years were more likely to have knowledge related to this item, and coaches in the "Knowledge" group scored higher on the OC and total test than did coaches in the "No Knowledge" group. Female coaches also tended to be more likely to have knowledge related to this item, although Pearson's chi-square test was not statistically significant, $?^2$ (1, N = 207) = 3.74, p = 0.053. Table 5.16 presents frequencies and percentages for each of the coach knowledge groups according to levels of coach variables and the general knowledge test.

Table 5.16. Frequencies and Percentages of Coach MC Knowledge Groups – Item #3

		Knowledge n = 114 (55.1%)		No Knowledge n = 93 (44.9%)	
Variable	Level	Frequency	Percent	Frequency	Percent
Coach Gender	Male	40	35.1%	45	48.4%
	Female	74	64.9%	48	51.6%
Coach Age*	20-24	16	14.0%	9	9.7%
	25-29	24	21.1%	14	15.1%
	30-34	17	14.9%	17	18.3%
	35-39	18	15.8%	18	19.4%
	40-44	7	6.1%	13	14.0%
	45-49	17	14.9%	11	11.8%
	50-54	12	10.5%	2	2.2%
	55-59	2	1.8%	6	6.5%
	60 and over	1	0.9%	3	3.2%
Ages Coached	Middle	6	5.3%	8	8.6%
	High	37	32.5%	41	44.1%
	Mixed M/H	17	14.9%	16	17.2%
	College	54	47.4%	28	30.1%
Mean Test Score	MC	--	58.3%	--	54.4%
	OC*	--	38.1%	--	31.1%
	Total*	--	49.8%	--	44.6%

* Contingency table cell values and/or mean test scores are significantly different; $p < 0.05$.

A logistic regression analysis using the "ENTER" method was performed on the outcome of "Knowledge" using two predictor variables: coach age and OC test score. A test of the full model with both predictor variables against a constant-only model was significant, $?^2$ (9, N = 207) = 27.62, p = 0.001, indicating that the predictors, as a set, reliably distinguished between "Knowledge" and "No Knowledge" groups. The variance explained by the two predictors was 16.7% (Nagelkerke R^2 = 0.167). Prediction success was better for the "Knowledge" group at 72.8% than for the "No Knowledge" group at 52.7% (overall prediction success rate = 63.8%). According to the Wald criterion, only OC test score significantly predicted knowledge, z = 10.07, with df = 1, p = 0.002.

Item #4: How do you know this information? Responses to this item were all dummy coded into the data matrix. As unique responses emerged during scoring, a new dummy code was assigned. Of the 114 coaches who indicated knowing if any of their athletes have *not* begun their MC, 68 coaches (59.6%) provided responses to this item. Some coaches listed more than one way in which they acquired the specific knowledge assessed by item #3. Accordingly, 68 coaches provided 71 responses across 8 unique categories. Table 5.17 presents the 8 ways in which coaches acquire the knowledge that athletes have *not* begun their MC, and the frequencies with which they were reported.

Table 5.17. Ways Coaches Acquire Specific Knowledge of Athletes' MC – Item #4

Method of Acquiring Information	Frequency	Percent*
Athletes Informed the Coach	35	51.5%
Coach Assumed Based on Athlete's Age	14	22.1%
Health Forms / Physicals	13	19.1%
Parents of Athletes Informed the Coach	4	5.9%
No Discussion of Absence of MC	2	2.9%
Coach Asked the Athletic Trainer	1	1.5%
Coach Has a Daughter on the Team	1	1.5%
Coach Asked Athletes	1	1.5%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/68 * 100. Due to multiple responses from coaches, percentages will not add up to 100.0%.

Item #5: Of the athletes who have begun their menstrual cycles, do you know when any of them are menstruating (i.e., on their "period")? If a coach responded by encircling the "Yes" option, then the response was coded with a 1 = Knowledge; if a coach responded by encircling the "No" or "I am not sure" option, then the response was coded with a 2 = No Knowledge. Approximately 50% of coaches reported knowing when athletes menstruate. An analysis of contingency table cells indicates that the proportion of coaches in the "Knowledge" group differs significantly from the proportion of coaches in the "No Knowledge" group based on coaches' gender, $?^2$ (1, N = 207) = 19.70, $p < 0.001$ and coaches' age, $?^2$ (8, N = 207) = 16.81, $p = 0.032$. Additionally, mean scores on the OC test differed significantly between the two knowledge groups, $F = 6.12$ with $df = (1, 205)$, $p =$

0.014. In general, female coaches and younger coaches (aged 20-39 years) were more likely to have knowledge related to this item, and coaches in the "Knowledge" group scored higher on the OC test than did coaches in the "No Knowledge" group. Table 5.18 presents frequencies and percentages for each of the coach knowledge groups according to levels of coach variables and the general knowledge test.

Table 5.18. Frequencies and Percentages of Coach MC Knowledge Groups – Item #5

		Knowledge n = 104 (50.2%)		No Knowledge n = 103 (49.8%)	
Variable	Level	Frequency	Percent	Frequency	Percent
Coach Gender*	Male	27	26.0%	58	56.3%
	Female	77	74.0%	45	43.7%
Coach Age*	20-24	16	15.4%	9	8.7%
	25-29	21	20.2%	17	16.5%
	30-34	20	19.2%	14	13.6%
	35-39	21	20.2%	15	14.6%
	40-44	8	7.7%	12	11.7%
	45-49	9	8.7%	19	18.4%
	50-54	7	6.7%	7	6.8%
	55-59	0	0.0%	8	7.8%
	60 and over	2	1.9%	2	1.9%
Ages Coached	Middle	3	2.9%	11	10.7%
	High	41	39.4%	37	35.9%
	Mixed M/H	17	16.3%	16	15.5%
	College	43	41.3%	39	37.9%
Mean Test Score	MC	--	58.2%	--	54.9%
	OC*	--	37.6%	--	32.3%
	Total	--	49.5%	--	45.4%

* Contingency table cell values and/or mean test scores are significantly different; $p < 0.05$.

A logistic regression analysis using the "ENTER" method was performed on the outcome of "Knowledge" using three predictor variables: coach gender, coach age, and OC test score. A test of the full model with all three predictor variables against a constant-only

model was significant, $?^2$ (10, N = 207) = 38.67, $p < 0.001$, indicating that the predictors, as a set, reliably distinguished between "Knowledge" and "No Knowledge" groups. The variance explained by the three predictors was 22.7% (Nagelkerke $R^2 = 0.227$). Prediction success was better for the "Knowledge" group at 73.1% than for the "No Knowledge" group at 59.2% (overall prediction success rate = 66.2%). According to the Wald criterion, only coach gender significantly predicted knowledge, $z = 14.20$, with $df = 1$, $p < 0.001$.

Item #6: If yes, how do you know this information? Responses to this item were all dummy coded into the data matrix. As unique responses emerged during scoring, a new dummy code was assigned. Of the 104 coaches who indicated having knowledge of when their athletes menstruate, 104 coaches (100%) provided responses to this item. Some coaches listed more than one way in which they acquired the specific knowledge assessed by item #5. Accordingly, 104 coaches provided 128 responses across 14 unique categories. Table 5.19 presents the 14 ways in which coaches acquire the knowledge about when athletes menstruate, and the frequencies with which they were reported.

Table 5.19. Ways Coaches Acquire Specific Knowledge of Athletes' MC – Item #6

Method of Acquiring Information	Frequency	Percent*
Athletes Informed the Coach	89	85.6%
Athletes Request Supplies/Meds from Coach	15	14.4%
Coach Observes Athletes' Mood Swings	8	7.7%
Coach Observes Changes in Ability	3	2.9%
Coach Observes Changes in Attitude	2	1.9%
Coach Observes Menstrual Synchrony	2	1.9%
Coach Has a Daughter on the Team	2	1.9%
Other Athletes Informed the Coach	2	1.9%
Parents of Athletes Informed the Coach	1	1.0%
Coach Observes Lack of Concentration	1	1.0%
Coach Asked the Athletic Trainer	1	1.0%
Coach Observes More Restroom Visits	1	1.0%
Athletes Request More Breaks	1	1.0%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/104 * 100. Due to multiple responses from coaches, percentages will not add up to 100.0%.

Item #7: Are any of the athletes using oral contraceptives (i.e., birth control pills)?

Responses to this item were coded according to the response choices offered on the questionnaire: 1 = Yes; 2 = No; and 3 = I am not sure. Seventy coaches (33.8%) reported knowing that one or more of their athletes used OC; 8 coaches (3.9%) reported knowing that none of their athletes used OC; and 129 coaches (62.3%) reported not knowing if any of their athletes used OC. For the purposes of analysis in this section, the coaches who responded "No" to this item are considered to have specific knowledge of their athletes (although limitations to this item's ability to measure specific knowledge will be discussed further in Chapter 6). Combining the "Yes" and "No" groups of coaches yields 78 coaches (37.7%) in the "Knowledge" group and 129 coaches (62.3%) in the "No Knowledge" group. An analysis of contingency table cells indicates that the proportion of coaches in the "Knowledge" group differs significantly from the proportion of coaches in the "No Knowledge" group based on coaches' gender, $?^2$ (1, N = 207) = 16.73, $p < 0.001$, coaches' age, $?^2$ (8, N = 207) = 19.40, $p = 0.013$, and ages of athletes, $?^2$ (1, N = 207) = 17.48, $p = 0.001$. Additionally, mean scores on the OC test differed significantly between the two knowledge groups, $F = 5.24$ with $df = (1, 205)$, $p = 0.023$. In general, female coaches, coaches aged 20-29 years, coaches aged 35-39 years, and coaches of college-aged athletes were more likely to have knowledge related to this item, and coaches in the "Knowledge" group scored higher on the OC test than did coaches in the "No Knowledge" group. Table 5.20 presents frequencies and percentages for each of the coach knowledge groups according to levels of coach variables and the general knowledge test.

Table 5.20. Frequencies and Percentages of Coach OC Knowledge Groups – Item #7

		Knowledge n = 78 (37.7%)		No Knowledge n = 129 (62.3%)	
Variable	Level	Frequency	Percent	Frequency	Percent
Coach Gender*	Male	18	23.1%	67	51.9%
	Female	60	76.9%	62	48.1%
Coach Age*	20-24	10	12.8%	15	11.6%
	25-29	23	29.5%	15	11.6%

Table 5.20. continued

		Knowledge n = 78 (37.7%)		No Knowledge n = 129 (62.3%)	
Variable	Level	Frequency	Percent	Frequency	Percent
Coach Age*	30-34	12	15.4%	22	17.1%
	35-39	16	20.5%	20	15.5%
	40-44	5	6.4%	15	11.6%
	45-49	8	10.3%	20	15.5%
	50-54	4	5.1%	10	7.8%
	55-59	0	0.0%	8	6.2%
	60 and over	0	0.0%	4	3.1%
Ages Coached*	Middle	3	3.8%	11	8.5%
	High	20	25.6%	58	45.0%
	Mixed M/H	10	12.8%	23	17.8%
	College	45	57.7%	37	28.7%
Mean Test Score	MC	--	59.1%	--	55.1%
	OC*	--	38.1%	--	33.1%
	Total	--	50.2%	--	45.8%

* Contingency table cell values and/or mean test scores are significantly different; $p < 0.05$.

A logistic regression analysis using the "ENTER" method was performed on the outcome of "Knowledge" using four predictor variables: coach gender, coach age, athlete age, and OC test score. A test of the full model with all four predictor variables against a constant-only model was significant, $?^2$ (13, N = 207) = 48.59, $p < 0.001$, indicating that the predictors, as a set, reliably distinguished between "Knowledge" and "No Knowledge" groups. The variance explained by the four predictors was 28.5% (Nagelkerke $R^2 = 0.285$). Prediction success was better for the "No Knowledge" group at 83.7% than for the "Knowledge" group at 57.7% (overall prediction success rate = 73.9%). According to the Wald criterion, knowledge was significantly predicted by coach gender, $z = 8.54$, with $df = 1$, $p = 0.004$, and by athlete age, $z = 9.16$, with $df = 3$, $p = 0.027$.

Item #8. If yes, how many athletes on your team use oral contraceptives? If a coach responded by writing in a number, then the response was coded with a 1 = Knowledge; if a

coach left the item blank (and answered "Yes" to item #7) or responded by writing "I am not sure," or "I don't know," then the response was coded with a 2 = No Knowledge. Because 70 coaches indicated in item #7 that they know at least one of their athletes uses OC, it would be expected that 70 coaches would be able to respond to item #8 with a number. However, only 38 of 70 coaches (54.3%) responded to this item by writing in a number. For the purposes of analysis in this section, the coaches who responded "No" to item #7 are, again, considered to have specific knowledge of their athletes in this case (although limitations to this item's ability to measure specific knowledge will be discussed further in Chapter 6). If a coach selected "No" to item #7 (n = 8), then it may follow that the coach would write in the number "0" for item #8 had it been phrased differently. Combining these two groups of coaches yields 46 coaches (22.2%) in the "Knowledge" group and 161 coaches (77.8%) in the "No Knowledge" group. An analysis of contingency table cells indicates that the proportion of coaches in the "Knowledge" group differs significantly from the proportion of coaches in the "No Knowledge" group based on coaches' gender, $?^2$ (1, N = 207) = 7.19, p = 0.007, and coaches' age, $?^2$ (8, N = 207) = 20.76, p = 0.008. Additionally, mean scores on the MC, OC, and total tests differed significantly between the two knowledge groups, F = 4.58 with df = (1, 205), p = 0.033, F = 13.63 with df = (1, 205), p <0.001, and F = 8.95 with df = (1, 205), p = 0.003, respectively. In general, female coaches, coaches aged 20-29 years, and coaches aged 35-44 years were more likely to have knowledge related to this item, and coaches in the "Knowledge" group scored higher on the MC, OC, and total tests than did coaches in the "No Knowledge" group. Table 5.21 presents frequencies and percentages for each of the coach knowledge groups according to levels of coach variables and the general knowledge test.

Table 5.21. Frequencies and Percentages of Coach OC Knowledge Groups – Item #8

		Knowledge n = 46 (22.2%)		No Knowledge n = 161 (77.8%)	
Variable	Level	Frequency	Percent	Frequency	Percent
Coach Gender*	Male	11	23.9%	74	46.0%
	Female	35	76.1%	87	54.0%

Table 5.21. continued

		Knowledge n = 46 (22.2%)		No Knowledge n = 161 (77.8%)	
Variable	Level	Frequency	Percent	Frequency	Percent
Coach Age*	20-24	7	15.2%	18	11.2%
	25-29	11	23.9%	27	16.8%
	30-34	6	13.0%	28	17.4%
	35-39	15	32.6%	21	13.0%
	40-44	5	10.9%	15	9.3%
	45-49	1	2.2%	27	16.8%
	50-54	1	2.2%	13	8.1%
	55-59	0	0.0%	8	5.0%
	60 and over	0	0.0%	4	2.5%
Ages Coached	Middle	2	4.3%	12	7.5%
	High	13	28.3%	65	40.4%
	Mixed M/H	7	15.2%	26	16.1%
	College	24	52.2%	58	36.0%
Mean Test Score	MC*	--	61.9%	--	55.0%
	OC*	--	42.2%	--	32.9%
	Total*	--	53.6%	--	45.7%

* Contingency table cell values and/or mean test scores are significantly different; $p < 0.05$.

A logistic regression analysis using the "ENTER" method was performed on the outcome of "Knowledge" using four predictor variables: coach gender, coach age, MC test score, and OC test score. A test of the full model with all four predictor variables against a constant-only model was significant, $?^2$ (11, $N = 207$) = 38.90, $p < 0.001$, indicating that the predictors, as a set, reliably distinguished between "Knowledge" and "No Knowledge" groups. The variance explained by the four predictors was 26.2% (Nagelkerke $R^2 = 0.262$). Prediction success was better for the "No Knowledge" group at 97.5% than for the "Knowledge" group at 21.7% (overall prediction success rate = 80.7%). According to the Wald criterion, only OC test score significantly predicted knowledge, $z = 6.35$, with $df = 1$, $p = 0.012$.

Item #9: Please circle all of the reasons why the athletes are using oral contraceptives. This multiple-choice item presents a series of 7 response options: (a) prevent pregnancy; (b) minimize menstrual blood flow; (c) alleviate cramping/pain; (d) regulate menstrual cycle; (e) reduce acne; (f) others, please specify; and (g) I am not sure. Responses to this item were all dummy coded into the data matrix. As unique responses emerged during scoring, a new dummy code was assigned. Of the 70 coaches who reported that athletes on their teams use OC (i.e., answered "Yes" to item #7), 66 coaches (94.3%) reported having knowledge of the reasons why their athletes use OC. Many coaches chose more than one response option for this item. Accordingly, 66 coaches provided 201 responses across 6 unique categories. Table 5.22 presents the 6 reasons coaches believe that their athletes use OC, and the frequencies with which they were reported.

Table 5.22. Reasons Coaches Believe Athletes Use OC – Item #9

Reason	Frequency	Percent*
Prevent Pregnancy	59	89.4%
Regulate Menstrual Cycle	52	78.8%
Alleviate Cramping/Pain	41	62.1%
Minimize Menstrual Blood Flow	32	48.5%
Reduce Acne	16	24.2%
Required with Accutane® Prescription	1	1.5%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/66 * 100. Due to multiple responses from coaches, percentages will not add up to 100.0%.

Item #10: Do you believe oral contraceptives can benefit your athletes? Responses to this item were coded according to the response choices offered on the questionnaire: 1 = Yes; 2 = No; and 3 = I am not sure. Ninety-five coaches (45.9%) reported believing that OC can benefit their athletes; 18 coaches (8.7%) reported believing that OC cannot benefit their athletes; 88 coaches (42.5%) indicated uncertainty to this item; and 6 coaches (2.9%) did not respond to this item. An analysis of contingency table cells indicates that the proportions of coaches across belief groups differ significantly based on coaches' gender, $?^2$ (2, N = 201) = 13.53, p = 0.001, coaches' age, $?^2$ (16, N = 201) = 43.69, p < 0.001, and ages of athletes $?^2$ (6, N = 201) = 35.12, p < 0.001. Additionally, mean scores on the MC, OC, and total tests differed significantly across the three belief groups, F = 7.46 with df = (2, 198), p = 0.001, F

= 15.26 with $df = (2, 198)$, $p < 0.001$, and $F = 12.33$ with $df = (2, 198)$, $p < 0.001$, respectively. Post hoc comparisons indicated that coaches in the "Not Sure" belief group scored significantly lower on all three components of the general knowledge test than did coaches in the "Benefit" and "No Benefit" belief groups. In general, male coaches were more likely to report uncertainty to this item, and coaches of college-aged athletes were more likely to report the belief that OC can benefit their athletes. Table 5.23 presents frequencies and percentages for each of the three coach belief groups according to levels of coach variables and the general knowledge test.

A logistic regression analysis using the "ENTER" method was performed on the outcome of "Benefit Belief" using five predictor variables: coach gender, coach age, athlete age, MC test score, and OC test score (only responses from coaches who committed to a belief for this item were utilized in the regression analysis, thus, $n = 113$). A test of the full model with all five predictor variables against a constant-only model was significant, $?^2$ (13, $N = 113$) = 47.81, $p < 0.001$, indicating that the predictors, as a set, reliably distinguished between "Benefit Belief" and "No Benefit Belief" groups. The variance explained by the five predictors was 59.1% (Nagelkerke $R^2 = 0.591$). Prediction success was better for the "Benefit Belief" group at 96.8% than for the "No Benefit Belief" group at 66.7% (overall prediction success rate = 92.0%). According to the Wald criterion, benefit belief was significantly predicted by coach gender, $z = 4.42$, with $df = 1$, $p = 0.036$, and by athlete age, $z = 11.77$, with $df = 3$, $p = 0.008$.

Item #11: Why or why not? Responses to this item were entered into a data matrix that was separate from all quantitative and dummy coded data. All qualitative responses were entered exactly as they appeared on the questionnaire. The dummy coded data from item #10 were then copied and pasted into this separate data matrix to allow for sorting—responses were sorted by "Yes," "No," and "Not Sure." This allowed for description across the subgroups of coaches—that is, to describe why 95 coaches believe OC can benefit their athletes; why 18 coaches believe that OC cannot benefit their athletes; and why 88 coaches are uncertain about their beliefs. (Unfortunately, based upon the phrasing of this item, most coaches who chose "I am not sure" for item #10, did not respond to item #11. This item's limitations will be discussed further in Chapter 6).

Table 5.23. Frequencies and Percentages of Coach OC Belief Groups – Item #10

		OC Benefit Belief n = 95 (45.9%)		OC No Benefit Belief n = 18 (8.7%)		Not Sure n = 88 (42.5%)	
Variable	Level	Frequency	Percent	Frequency	Percent	Frequency	Percent
Coach Gender*	Male	33	34.7%	3	16.7%	49	55.7%
	Female	62	65.3%	15	83.3%	39	44.3%
Coach Age*	20-24	13	13.7%	3	16.7%	9	10.2%
	25-29	27	28.4%	1	5.6%	10	11.4%
	30-34	12	12.6%	2	11.1%	18	20.5%
	35-39	16	16.8%	2	11.1%	18	20.5%
	40-44	6	6.3%	6	33.3%	5	5.7%
	45-49	14	14.7%	0	0.0%	14	15.9%
	50-54	5	5.3%	0	0.0%	6	6.8%
	55-59	0	0.0%	0	0.0%	8	9.1%
	60 and over	2	2.1%	0	0.0%	2	2.3%
Ages Coached*	Middle	6	6.3%	2	11.1%	3	3.4%
	High	25	26.3%	6	33.3%	44	50.0%
	Mixed M/H	11	11.6%	9	50.0%	13	14.8%
	College	53	55.8%	1	5.6%	28	31.8%
Mean Test Score	MC*	--	59.6%	--	64.4%	--	50.6%
	OC*	--	39.6%	--	40.6%	--	28.3%
	Total*	--	51.2%	--	54.3%	--	41.2%

* Contingency table cell values and/or mean test scores are significantly different; $p < 0.05$.

Following the sorting of all responses, content was analyzed through a cut-and-paste technique (directly in the computer data matrix) for each of the three coach subgroups. For example, the 95 coaches who responded "Yes" to item #10 were examined as an independent group. First, verbal content that described a single, distinct idea was cut and pasted into the top cell of a new column. Second, as duplicate or highly similar responses were identified, those content segments were cut and pasted into cells within the column of the same theme. Third, as unique responses were identified, those content segments were cut and pasted into the top cell of another column. Lastly, the process was continued until all verbal segments were sorted into columns of similar thematic content (i.e., themes were distinct *across* columns, but similar *within* columns). All steps were repeated with the remaining subgroups of coaches. This type of content analysis was performed in an identical fashion on the responses for items #13, #15, and #17 in this section.

Table 5.24 presents results from the content analysis of responses to item #11 from coaches who answered "Yes" to item #10—these coaches (n = 95) believe that OC can benefit their athletes. Many coaches listed more than one reason in item #11 to explain their response to item #10. Accordingly, 95 coaches provided 122 responses across 22 unique categories. Five comments were not included in this table because they were too vague (e.g., "decrease lots of symptoms incurred during their period" and "help with cycle"). Table 5.25 and Table 5.26 present results from the content analysis of responses to item #11 from coaches who answered "No" and "I am not sure" to item #10, respectively. Not all of these coaches provided responses to item #11.

Table 5.24. Reasons Coaches Believe OC Benefit Athletes – Item #11

Reason	Frequency	Percent*
Regulate Menstrual Cycle	36	37.9%
Prevent Pregnancy	28	29.5%
Alleviate Pain	13	13.7%
Alleviate Cramping	10	10.5%
Minimize Menstrual Blood Flow	5	5.3%
Reduce Symptoms of PMS	3	3.2%
Reduce Acne	2	2.1%

Table 5.24. continued

Reason	Frequency	Percent*
Help to Monitor/Expect Period	2	2.1%
For the Reasons Listed in #9	2	2.1%
Prevent Injury/ACL Injury	2	2.1%
Needed for Medical Reasons	2	2.1%
Increase Focus (from Reduced Pain)	2	2.1%
Reduce Bloating	1	1.1%
Prevent Occurrence of MC	1	1.1%
Mitigate Risks of Female Triad	1	1.1%
Reduce Migraines	1	1.1%
Shorten Periods	1	1.1%
Increase Attendance at Practice	1	1.1%
Improve Performance	1	1.1%
Increase Happiness	1	1.1%
Make Athlete More Comfortable	1	1.1%
Per Doctors/Trainers	1	1.1%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/95 * 100. Due to multiple responses from coaches, percentages will not add up to 100.0%.

Table 5.25. Reasons Coaches Believe OC Cannot Benefit Athletes – Item #11

Reason	Frequency	Percent*
Athletes are Too Young (10-15 years)	5	27.8%
Encourages Sexual Activity	3	16.7%
Sexually Careless and Contract STD	1	5.6%
Alternatives with Less Effect on Body	1	5.6%
Toxin Build-Up with Prolonged Use	1	5.6%
No Research to Support OC Benefits	1	5.6%
Not Natural	1	5.6%
Bodies are Not Ready	1	5.6%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/18 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

Table 5.26. Reasons Coaches are Uncertain if OC Benefit Athletes – Item #11

Reason	Frequency	Percent*
Lack of Information	3	3.4%
May Help To Reduce Pain	3	3.4%
Yes/No—Under Certain Conditions	1	1.1%
Doctor's Decision	1	1.1%
Information Supporting Both Sides	1	1.1%
Coach's Personal Experience with OC	1	1.1%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/88 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

Item #12: Do you believe oral contraceptives can harm your athletes? Responses to this item were coded according to the response choices offered on the questionnaire: 1 = Yes; 2 = No; and 3 = I am not sure. Fifty-nine coaches (28.5%) reported believing that OC can harm their athletes; 45 coaches (21.7%) reported believing that OC cannot harm their athletes; 100 coaches (48.3%) indicated uncertainty to this item; and 3 coaches (1.4%) did not respond to this item. An analysis of contingency table cells indicates that the proportions of coaches across belief groups differ significantly based on coaches' gender, $?^2$ (2, N = 204) = 15.42, $p < 0.001$, and coaches' age, $?^2$ (16, N = 204) = 28.06, $p = 0.031$. Additionally, mean scores on the MC, OC, and total tests differed significantly across the three belief groups, $F = 6.62$ with $df = (2, 201)$, $p = 0.002$, $F = 16.22$ with $df = (2, 201)$, $p < 0.001$, and $F = 11.68$ with $df = (2, 201)$, $p < 0.001$, respectively. Post hoc comparisons indicated that coaches in the "Not Sure" belief group scored significantly lower on all three components of the general knowledge test than did coaches in the "Harm" belief group; coaches in the "Not Sure" belief group also scored significantly lower on the OC and total tests than did coaches in the "No Harm" belief group. In general, male coaches were more likely to report uncertainty to this item, and coaches were less likely to believe "No Harm" with increased age. Table 5.27 presents frequencies and percentages for each of the three coach belief groups according to levels of coach variables and the general knowledge test.

Table 5.27. Frequencies and Percentages of Coach OC Belief Groups – Item #12

		OC Harm Belief n = 59 (28.5%)		OC No Harm Belief n = 45 (21.7%)		Not Sure n = 100 (48.3%)	
Variable	Level	Frequency	Percent	Frequency	Percent	Frequency	Percent
Coach Gender*	Male	22	37.3%	9	20.0%	54	54.0%
	Female	37	62.7%	36	80.0%	46	46.0%
Coach Age*	20-24	4	6.8%	13	28.9%	8	8.0%
	25-29	9	15.3%	11	24.4%	18	18.0%
	30-34	9	15.3%	3	6.7%	22	22.0%
	35-39	13	22.0%	7	15.6%	16	16.0%
	40-44	8	13.6%	4	8.9%	5	5.0%
	45-49	9	15.3%	3	6.7%	16	16.0%
	50-54	5	8.5%	2	4.4%	7	7.0%
	55-59	2	3.4%	1	2.2%	5	5.0%
	60 and over	0	0.0%	1	2.2%	3	3.0%
Ages Coached	Middle	5	8.5%	3	6.7%	6	6.0%
	High	21	35.6%	9	20.0%	45	45.0%
	Mixed M/H	13	22.0%	10	22.2%	10	10.0%
	College	20	33.9%	23	51.1%	39	39.0%
Mean Test Score	MC*	--	63.4%	--	57.8%	--	52.2%
	OC*	--	42.0%	--	38.9%	--	29.2%
	Total*	--	54.4%	--	49.8%	--	42.5%

* Contingency table cell values and/or mean test scores are significantly different; $p < 0.05$.

A logistic regression analysis using the "ENTER" method was performed on the outcome of "Harm Belief" using four predictor variables: coach gender, coach age, MC test score, and OC test score (only responses from coaches who committed to a belief for this item were utilized in the regression analysis, thus, $n = 104$). A test of the full model with all four predictor variables against a constant-only model was significant, $?^2$ (11, $N = 104$) = 23.69, $p = 0.014$, indicating that the predictors, as a set, reliably distinguished between "Harm Belief" and "No Harm Belief" groups. The variance explained by the four predictors was 27.3% (Nagelkerke $R^2 = 0.273$). Prediction success was better for the "Harm Belief" group at 78.0% than for the "No Harm Belief" group at 60.0% (overall prediction success rate = 70.2%).

Item #13: Why or why not? Table 5.28 presents results from the content analysis of responses to item #13 from coaches who answered "Yes" to item #12—these coaches (n = 59) believe that OC can harm their athletes. Because the responses from coaches who answered "No" to item #12 shared very little themed content (other than references to doctors), the 20 responses from these coaches are simply presented in their entirety in Table 5.29. Results from the content analysis of responses to item #13 from coaches who answered "I am not sure" to item #12, are presented in Table 5.30. Not all coaches provided responses to item #13.

Table 5.28. Reasons Coaches Believe OC Harm Athletes – Item #13

Reason	Frequency	Percent*
Encourage Sexual Activity	6	10.2%
Weight Gain	6	10.2%
False Sense of Security Regarding Sex	5	8.5%
Unspecified Side Effect/Risk/Problem	5	8.5%
Increased Risk of STD	3	5.1%
Adverse Effects with Prolonged Use	3	5.1%
Increased Risk for Cancer	3	5.1%
High Blood Pressure	2	3.4%
Hormonal Alterations are Harmful	2	3.4%

Table 5.28. continued

Reason	Frequency	Percent*
If OC Not Taken Properly	2	3.4%
If OC Abused	2	3.4%
Any Drug/Chemical Causes Problems	2	3.4%
Not Natural/Natural is Better	2	3.4%
If Athlete Forgets to Take OC	1	1.7%
Mood Swings	1	1.7%
Increase Blood Clots	1	1.7%
Circulation	1	1.7%
If Body Doesn't Take Well to Them	1	1.7%
Some Athletes are Smokers	1	1.7%
Bleeding	1	1.7%
Bloating	1	1.7%
Feeling Heavy	1	1.7%
Depends on What OC is Used	1	1.7%
Depends on Athlete	1	1.7%
May Cause Strokes	1	1.7%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/59 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

Table 5.29. Reasons Coaches Believe OC Cannot Harm Athletes – Item #13

Reason
These women are well informed and seeing doctors yearly to continue their birth control prescriptions. They talk about problems and do not jump to conclusions.
Because their doctor must prescribe the medication for them.
Don't know of any drawbacks if prescribed by a doctor.
Maintain regular doctor's visits for check-ups.
I have been prescribed them as an athlete, my doctor had no worries.
There is over 50 years of research that is documented to give doctors information needed to determine if an individual should use birth control (oral).
I don't see where it benefits just athletes.
It helps you and less cramps.
I don't think they would have an effect on their performance.
No—not unless they use it wrong. So a lack of education on contraceptives can harm the athletes.
There is not anything about oral contraceptives that make them dangerous.
Do not know of any.
I know many athletes that take the pill and they are not harmed.
As long as taken correctly.
If they don't use correctly.
I've never seen any bad side effects.

Table 5.29. continued

Reason
Too much history.
I think for most women they are safe.
It has never hurt them in the past.
They are healthy individuals—the risk to benefit ratio seems small.

Table 5.30. Reasons Coaches are Uncertain if OC Harm Athletes – Item #13

Reason	Frequency	Percent*
Lack of Information/Not My Area	4	4.0%
Unknown Long-Term Effects	2	2.0%
Rely on the Advice of Professionals	1	1.0%
Prefer No Drugs to Alter Performance	1	1.0%
Information Supporting Both Sides	1	1.0%
Always the Risk of Cancer	1	1.0%
Skin Reaction Due to Sun and OC	1	1.0%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/100 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

Item #14: Have you ever encouraged the use of oral contraceptives by your athletes?

Responses to this item were coded according to the response choices offered on the questionnaire: 1 = Yes; and 2 = No. Thirteen coaches (6.3%) reported encouraging OC use by their athletes; 193 coaches (93.2%) reported not encouraging OC use by their athletes; and 1 coach (0.5%) did not respond to this item. An analysis of contingency table cells indicates that the proportions of coaches between encouragement groups differ significantly based on ages of athletes, $?^2$ (3, N = 206) = 8.96, p = 0.030. Mean scores on the MC, OC, and total tests did not differ significantly between the two encouragement groups. In general, coaches who encourage OC use by their athletes are female coaches and coaches of college-aged athletes. Table 5.31 presents frequencies and percentages for each of the coach encourage groups according to levels of coach variables and the general knowledge test.

Table 5.31. Frequencies and Percentages of Coach OC Encourage Groups – Item #14

		Encourage n = 13 (6.3%)		Not Encourage n = 193 (93.2%)	
Variable	Level	Frequency	Percent	Frequency	Percent
Coach Gender	Male	3	23.1%	82	42.5%
	Female	10	76.9%	111	57.5%
Coach Age	20-24	1	7.7%	24	12.4%
	25-29	3	23.1%	35	18.1%
	30-34	1	7.7%	33	17.1%
	35-39	3	23.1%	32	16.6%
	40-44	2	15.4%	18	9.3%
	45-49	3	23.1%	25	13.0%
	50-54	0	0.0%	14	7.3%
	55-59	0	0.0%	8	4.1%
	60 and over	0	0.0%	4	2.1%
Ages Coached*	Middle	0	0.0%	14	7.3%
	High	3	23.1%	75	38.9%
	Mixed M/H	0	0.0%	33	17.1%
	College	10	76.9%	71	36.8%
Mean Test Score	MC	--	58.3%	--	56.4%
	OC	--	35.0%	--	34.9%
	Total	--	48.5%	--	47.3%

* Contingency table cell values and/or mean test scores are significantly different; $p < 0.05$.

Item #15: Why or why not? Table 5.32 presents results from the content analysis of responses to item #15 from coaches who answered "Yes" to item #14—these coaches (n = 13) have encouraged the use of OC by their athletes. Table 5.33 presents results from the content analysis of responses to item #15 from coaches who answered "No" to item #14. Not all coaches provided responses to item #15.

Some of the resulting themes in Table 5.33 may seem to overlap in meaning, but because multiple coaches responded with the very same words, identical responses were retained in their own unique categories. For example, "it is not my place," "it is not my job," and "it is none of my business" all imply that the ownership of encouraging OC use is

outside of the person completing the questionnaire. However, it should not be inferred that coaches stating, "it is not my place" mean that "it is not my place, as part of my job." Perhaps these coaches believe that it is not their place as a human being, as a male, as a spiritual being, as a non-parent, or as a non-expert. Based upon the responses from coaches, there is no way to determine further meaning. Additionally, it should not be inferred that coaches stating, "it is not my place" mean that "it is not my place and it is none of my business." Perhaps these coaches believe the issue is within their scope of business, but it is still not their place to encourage OC use.

Table 5.32. Reasons Coaches Encourage OC Use by Athletes – Item #15

Reason	Frequency	Percent*
Prevent Pregnancy/For Sexually Active	5	38.5%
Regulate Athletes' Periods	3	23.1%
Reduce Stress with MC Issues	2	15.4%
Help w/ Severe Cycles/Cases of PMS	2	15.4%
Reduce Pain	1	7.7%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/13 * 100. Due to rounding, percentages will not add up to 100.0%.

Table 5.33. Reasons Coaches Do Not Encourage OC Use by Athletes – Item #15

Reason	Frequency	Percent*
It is Not My Place	21	10.9%
It is a Personal Issue	13	6.7%
I Refer to Doctor/Trainer/Clinic/Nurse	13	6.7%
It is a Parental Issue/Responsibility	8	4.1%
It is None of My Business	7	3.6%
The Issue Has Never Arisen	6	3.1%
We Do Not Discuss this Issue	6	3.1%
I Have Never Been Asked	6	3.1%
It is Not My Job/Duty/Role	5	2.6%
There Has Never Been the Need	4	2.1%
I Would Discuss if I Was Asked	4	2.1%
My Athletes are Young/Too Young	3	1.6%

Table 5.33. continued

Reason	Frequency	Percent*
Not Expert/Qualified to Give Advice	2	1.0%
It is Not Appropriate	2	1.0%
Crosses the Line/Dangerous Line	2	1.0%
I Encourage Abstinence	2	1.0%
Conflict of Interest	1	0.5%
Don't Know Any Reason to Advocate	1	0.5%
It is Sometimes a Religious Issue	1	0.5%
Athletes are Already Using Them	1	0.5%
Athletes Have Already Figured It Out	1	0.5%
I Don't Use Them	1	0.5%
Don't Encourage Them to Use Anything	1	0.5%
Discuss OC Relative to Safe Sex Only	1	0.5%
It is Not Morally Correct	1	0.5%
I Do Not Have a Strong Opinion	1	0.5%
Not Right to Promote Sexual Activity	1	0.5%
Have Not Encouraged as of Now	1	0.5%
Opening a Can of Worms	1	0.5%
For [Risk] Reasons Listed Above	1	0.5%
Frowned Upon at Christian School	1	0.5%
Issue is Role of My Female Assistant	1	0.5%
I'm a Male	1	0.5%
Not an Area of Comfort!	1	0.5%
It is Not a Coach's Right	1	0.5%
Lack of Knowledge	1	0.5%
I Will Lose My Job!	1	0.5%
Fear of Parental Confrontation	1	0.5%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/193 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

Item #16: Have you ever discouraged the use of oral contraceptives by your athletes?

Responses to this item were coded according to the response choices offered on the questionnaire: 1 = Yes; and 2 = No. Two coaches (1.0%) reported discouraging OC use by their athletes; 204 coaches (98.6%) reported not discouraging OC use by their athletes; and 1

coach (0.5%) did not respond to this item. The sample size here is too small for an appropriate analysis, thus contingency table cells are offered for descriptive purposes only. Table 5.34 presents frequencies and percentages for each of the coach discourage groups according to levels of coach variables and the general knowledge test.

Table 5.34. Frequencies and Percentages of Coach OC Discourage Groups – Item #16

		Discourage n = 2 (1.0%)		Not Discourage n = 204 (98.6%)	
Variable	Level	Frequency	Percent	Frequency	Percent
Coach Gender	Male	1	50.0%	84	41.2%
	Female	1	50.0%	120	58.8%
Coach Age	20-24	0	0.0%	25	12.3%
	25-29	0	0.0%	38	18.6%
	30-34	0	0.0%	34	16.7%
	35-39	0	0.0%	35	17.2%
	40-44	1	50.0%	19	9.3%
	45-49	1	50.0%	27	13.2%
	50-54	0	0.0%	14	6.9%
	55-59	0	0.0%	8	3.9%
	60 and over	0	0.0%	4	2.0%
Ages Coached	Middle	0	0.0%	14	6.9%
	High	1	50.0%	77	37.7%
	Mixed M/H	0	0.0%	33	16.2%
	College	1	50.0%	80	39.2%
Mean Test Score	MC	--	69.2%	--	56.4%
	OC	--	42.1%	--	34.8%
	Total	--	57.8%	--	47.3%

Item #17: Why or why not? Two coaches responded to item #16 by choosing "Yes," indicating that they have discouraged the use of OC by their athletes. These coaches went on to say in item #17 that the reasons they discourage OC use are because they cause "weight gain" and because they are "morally wrong." Table 5.35 presents results from the content analysis of responses to item #17 from coaches who answered "No" to item #16 (n = 204).

Many coaches listed the very same reasons for not discouraging OC use as they did for not encouraging OC use. Not all coaches provided responses to item #17.

Table 5.35. Reasons Coaches Do Not Discourage OC Use by Athletes – Item #17

Reason	Frequency	Percent*
It is a Personal Issue	15	7.4%
It is Not My Place	14	6.9%
I Refer to Doctor/Trainer/Clinic/Nurse	13	6.4%
We Do Not Discuss this Issue	10	4.9%
The Issue Has Never Arisen	8	3.9%
I Have Never Been Asked	7	3.4%
It is None of My Business	6	2.9%
It is Not My Job/Duty/Role	5	2.5%
It is a Parental Issue/Responsibility	4	2.0%
Never Had Athletes w/ OC Problems	3	1.5%
There Has Never Been the Need	3	1.5%
Crosses the Line/Dangerous Line	2	1.0%
I Would Discuss if I Was Asked	2	1.0%
OC are Beneficial/Good Thing	2	1.0%
Not Qualified to Give Advice	1	0.5%
It is Not Appropriate	1	0.5%
Conflict of Interest	1	0.5%
Seems No Reasons to Discourage	1	0.5%
It is Sometimes a Religious Issue	1	0.5%
Discuss OC Relative to Safe Sex Only	1	0.5%
It is Not Morally Correct	1	0.5%
I Do Not Have a Strong Opinion	1	0.5%
Not Right to Promote Sexual Activity	1	0.5%
Have Not Discouraged as of Now	1	0.5%
I'm a Male	1	0.5%
It is Not a Coach's Right	1	0.5%
Lack of Knowledge	1	0.5%
Fear of Parental Confrontation	1	0.5%
Not My Problem	1	0.5%

Table 5.35. continued

Reason	Frequency	Percent*
I Try to Stay Neutral in These Areas	1	0.5%
I Don't Know Who is Using OC	1	0.5%
Athletes Have Good Reasons to Use OC	1	0.5%
I Have Never Given My Opinion	1	0.5%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/204 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

Item #18: Do any of your athletes ever complain of PMS? Responses to this item were coded according to the response choices offered on the questionnaire: 1 = Yes; 2 = No; and 3 = I am not sure. One hundred forty-eight coaches (71.5%) reported knowing that one or more of their athletes complain of PMS; 44 coaches (21.3%) reported knowing that their athletes do not complain of PMS; and 15 coaches (7.2%) indicated uncertainty to this item. For the purposes of analysis in this section, the coaches who responded "No" to this item are considered to have specific knowledge of their athletes (although limitations to this item's ability to measure specific knowledge will be discussed further in Chapter 6). Combining the "Yes" and "No" groups of coaches yields 192 coaches (92.8%) in the "Knowledge" group and 15 coaches (7.2%) in the "No Knowledge" group. An analysis of contingency table cells indicates that the proportions of coaches between knowledge groups did not differ significantly. Additionally, mean scores on the MC, OC, and total tests did not differ significantly. Table 5.36 presents frequencies and percentages for each of the coach knowledge groups according to levels of coach variables and the general knowledge test.

Table 5.36. Frequencies and Percentages of Coach PMS Knowledge Groups – Item #18

		Knowledge n = 192 (92.8%)		No Knowledge n = 15 (7.2%)	
Variable	Level	Frequency	Percent	Frequency	Percent
Coach Gender	Male	78	40.6%	7	46.7%
	Female	114	59.4%	8	53.3%
Coach Age	20-24	23	12.0%	2	13.3%
	25-29	37	19.3%	1	6.7%
	30-34	33	17.2%	1	6.7%

Table 5.36. continued

		Knowledge n = 192 (92.8%)		No Knowledge n = 15 (7.2%)	
Variable	Level	Frequency	Percent	Frequency	Percent
Coach Age	35-39	32	16.7%	4	26.7%
	40-44	17	8.9%	3	20.0%
	45-49	25	13.0%	3	20.0%
	50-54	14	7.3%	0	0.0%
	55-59	8	4.2%	0	0.0%
	60 and over	3	1.6%	1	6.7%
Ages Coached	Middle	14	7.3%	0	0.0%
	High	70	36.5%	8	53.3%
	Mixed M/H	31	16.1%	2	13.3%
	College	77	40.1%	5	33.3%
Mean Test Score	MC	--	57.1%	--	50.3%
	OC	--	35.3%	--	30.7%
	Total	--	47.9%	--	42.0%

Item #19: If yes, how many athletes complain of PMS? If a coach responded by writing in a number, then the response was coded with a 1 = Knowledge; if a coach left the item blank (and answered "Yes" to item #18) or responded by writing "I am not sure," or "I don't know," then the response was coded with a 2 = No Knowledge. Because 148 coaches indicated in item #18 that they know at least one of their athletes complains of PMS, it would be expected that 148 coaches would be able to respond to item #19 with a number. However, only 138 of 148 coaches (93.2%) responded to this item by writing in a number. For the purposes of analysis in this section, the coaches who responded "No" to item #18 are, again, considered to have specific knowledge of their athletes in this case (although limitations to this item's ability to measure specific knowledge will be discussed further in Chapter 6). If a coach selected "No" to item #18 (n = 44), then it may follow that the coach would write in the number "0" for item #19 had it been phrased differently. Combining these two groups of coaches yields 182 coaches (87.9%) in the "Knowledge" group and 25 coaches (12.1%) in the "No Knowledge" group. An analysis of contingency table cells

indicates that the proportions of coaches between knowledge groups did not differ significantly. Additionally, mean scores on the MC, OC, and total tests did not differ significantly. Table 5.37 presents frequencies and percentages for each of the coach knowledge groups according to levels of coach variables and the general knowledge test.

Table 5.37. Frequencies and Percentages of Coach PMS Knowledge Groups – Item #19

		Knowledge n = 182 (87.9%)		No Knowledge n = 25 (12.1%)	
Variable	Level	Frequency	Percent	Frequency	Percent
Coach Gender	Male	75	41.2%	10	40.0%
	Female	107	58.8%	15	60.0%
Coach Age	20-24	23	12.6%	2	8.0%
	25-29	31	17.0%	7	28.0%
	30-34	31	17.0%	3	12.0%
	35-39	31	17.0%	5	20.0%
	40-44	16	8.8%	4	16.0%
	45-49	25	13.7%	3	12.0%
	50-54	14	7.7%	0	0.0%
	55-59	8	4.4%	0	0.0%
	60 and over	3	1.6%	1	4.0%
Ages Coached	Middle	13	7.1%	1	4.0%
	High	67	36.8%	11	44.0%
	Mixed M/H	29	15.9%	4	16.0%
	College	73	40.1%	9	36.0%
Mean Test Score	MC	--	56.7%	--	55.5%
	OC	--	35.1%	--	34.2%
	Total	--	47.6%	--	46.5%

Item #20: What strategies do your athletes use to cope with the symptoms related to the menstrual cycle and PMS? Responses to this item were all dummy coded into the data matrix. As unique responses emerged during scoring, a new dummy code was assigned. If a coach completed this item by listing at least one strategy, then the coach was credited with having knowledge; if a coach left the item blank or wrote in "I am not sure" or "I don't

know," then the coach was not credited with knowledge. One hundred twenty-three coaches (59.4%) listed one or more strategies for this item; 84 coaches (40.6%) listed no strategies for this item. An analysis of contingency table cells indicates that the proportions of coaches between knowledge groups differ significantly based on coaches' gender, $?^2$ (1, N = 207) = 31.50, $p < 0.001$, and coaches' age, $?^2$ (8, N = 207) = 33.81, $p < 0.001$. Additionally, mean scores on the MC, OC, and total tests differed significantly between the two knowledge groups, $F = 5.97$ with $df = (1, 205)$, $p = 0.015$, $F = 13.20$ with $df = (1, 205)$, $p < 0.001$, and $F = 10.15$ with $df = (1, 205)$, $p = 0.002$, respectively. In general, female coaches and younger coaches (aged 20-39 years) were more likely to have knowledge related to this item, and coaches in the "Knowledge" group scored significantly higher on all three components of the general knowledge test than did coaches in the "No Knowledge" group. Table 5.38 presents frequencies and percentages for each of the coach knowledge groups according to levels of coach variables and the general knowledge test.

Table 5.38. Frequencies and Percentages of Coach Knowledge Groups – Item #20

		Knowledge n = 123 (59.4%)		No Knowledge n = 84 (40.6%)	
Variable	Level	Frequency	Percent	Frequency	Percent
Coach Gender*	Male	31	25.2%	54	64.3%
	Female	92	74.8%	30	35.7%
Coach Age*	20-24	21	17.1%	4	4.8%
	25-29	31	25.2%	7	8.3%
	30-34	23	18.7%	11	13.1%
	35-39	14	11.4%	22	26.2%
	40-44	8	6.5%	12	14.3%
	45-49	10	8.1%	18	21.4%
	50-54	9	7.3%	5	6.0%
	55-59	6	4.9%	2	2.4%
	60 and over	1	0.8%	3	3.6%
Ages Coached	Middle	7	5.7%	7	8.3%
	High	53	43.1%	25	29.8%
	Mixed M/H	18	14.6%	15	17.9%

Table 5.38. continued

		Knowledge n = 123 (59.4%)		No Knowledge n = 84 (40.6%)	
Variable	Level	Frequency	Percent	Frequency	Percent
Ages Coached	College	45	36.6%	37	44.0%
Mean Test Score	MC*	--	59.3%	--	52.6%
	OC*	--	38.1%	--	30.4%
	Total*	--	50.3%	--	43.2%

* Contingency table cell values and/or mean test scores are significantly different; $p < 0.05$.

A logistic regression analysis using the "ENTER" method was performed on the outcome of "Knowledge" using four predictor variables: coach gender, coach age, MC test score, and OC test score. A test of the full model with all four predictor variables against a constant-only model was significant, $?^2$ (11, $N = 207$) = 54.65, $p < 0.001$, indicating that the predictors, as a set, reliably distinguished between "Knowledge" and "No Knowledge" groups. The variance explained by the four predictors was 31.3% (Nagelkerke $R^2 = 0.313$). Prediction success was better for the "Knowledge" group at 78.9% than for the "No Knowledge" group at 58.3% (overall prediction success rate = 70.5%). According to the Wald criterion, knowledge was significantly predicted by coach gender, $z = 10.02$, with $df = 1$, $p = 0.002$, and by coach age, $z = 19.00$, with $df = 8$, $p = 0.015$.

Most coaches who had knowledge related to this item listed more than one coping strategy. Accordingly, 123 coaches provided 214 responses across 27 unique categories. Table 5.39 presents coaches' reports about their athletes' coping strategies, and the frequencies with which they were reported.

Table 5.39. Coaches' Specific Knowledge of Athletes' Coping Strategies – Item #20

Coping Strategy	Frequency	Percent*
Use Over-the-Counter Medications	85	69.1%
Practice/Stay Active/Exercise	30	24.4%
Pace Themselves during Practice	18	14.6%
Use Heat Packs	15	12.2%
Sleep/Rest/Nap	15	12.2%

Table 5.39. continued

Coping Strategy	Frequency	Percent*
Deal with It	9	7.3%
Use/Change OC	5	4.1%
Avoid Practice/Game	4	3.3%
Diet	4	3.3%
Drink Water	4	3.3%
See the Trainer	3	2.4%
Use Relaxation Techniques	3	2.4%
Use Home Remedies	3	2.4%
Eat Chocolate	2	1.6%
Avoid Caffeine	2	1.6%
Use Vitamins	1	0.8%
Cry	1	0.8%
Play Harder in Practice	1	0.8%
Seek Peer Support	1	0.8%
Get Massages	1	0.8%
Joke	1	0.8%
Sit in Fetal Position	1	0.8%
Complain	1	0.8%
Stretch	1	0.8%
Decrease Salt and Sugar Intake	1	0.8%
Eat	1	0.8%
Keep a Calendar	1	0.8%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/123 * 100. Due to multiple responses from coaches, percentages will not add up to 100.0%.

Item #21: List any specific words or phrases used by your athletes to describe when one of the athletes is menstruating. Responses to this item were all dummy coded into the data matrix. As unique responses emerged during scoring, a new dummy code was assigned. If a coach completed this item by listing at least one phrase, then the coach was credited with having knowledge; if a coach left the item blank or wrote in "I am not sure" or "I don't know," then the coach was not credited with knowledge. One hundred fifteen coaches (55.6%) listed one or more phrases for this item; 92 coaches (44.4%) listed no phrases for

this item. An analysis of contingency table cells indicates that the proportions of coaches between knowledge groups did not differ significantly. Additionally, mean scores on the MC, OC, and total tests did not differ significantly. Table 5.40 presents frequencies and percentages for each of the coach knowledge groups according to levels of coach variables and the general knowledge test.

Table 5.40. Frequencies and Percentages of Coach Knowledge Groups – Item #21

		Knowledge n = 115 (55.6%)		No Knowledge n = 92 (44.4%)	
Variable	Level	Frequency	Percent	Frequency	Percent
Coach Gender	Male	48	41.7%	37	40.2%
	Female	67	58.3%	55	59.8%
Coach Age	20-24	15	13.0%	10	10.9%
	25-29	25	21.7%	13	14.1%
	30-34	22	19.1%	12	13.0%
	35-39	19	16.5%	17	18.5%
	40-44	6	5.2%	14	15.2%
	45-49	14	12.2%	14	15.2%
	50-54	8	7.0%	6	6.5%
	55-59	4	3.5%	4	4.3%
	60 and over	2	1.7%	2	2.2%
Ages Coached	Middle	6	5.2%	8	8.7%
	High	45	39.1%	33	35.9%
	Mixed M/H	19	16.5%	14	15.2%
	College	45	39.1%	37	40.2%
Mean Test Score	MC	--	57.7%	--	55.2%
	OC	--	36.5%	--	33.0%
	Total	--	48.7%	--	45.8%

Most coaches who had knowledge related to this item listed more than one team phrase. Accordingly, 115 coaches provided 222 responses across 26 unique categories. Table 5.41 presents coaches' reports of phrases used by their athletes, and the frequencies with which they were reported.

Table 5.41. Coaches' Specific Knowledge of Athletes' Use of Phrases – Item #21

Phrase	Frequency	Percent*
It's That Time of the Month	41	35.7%
On Her Period	38	33.0%
On the Rag/Ragging	26	22.6%
She's Cramping/She Has Cramps	21	18.3%
She's PMSing/She Has PMS	20	17.4%
She Has Female Problems	14	12.2%
Flow/Aunt Flow is in Town	12	10.4%
Friend/Charlie/Fred/Edna is in Town	7	6.1%
On Her Cycle/Has Her Female Cycle	7	6.1%
She's Bloated	5	4.3%
She Has a Visitor	3	2.6%
She's Cranky	3	2.6%
She's Sick/Not Feeling Well	3	2.6%
Stomach Hurts/Like Nails in Stomach	3	2.6%
She is Cursed/Has the Curse	3	2.6%
The Dot	2	1.7%
Red Tide	2	1.7%
She Has a Headache	2	1.7%
She is Menstruating	2	1.7%
She is on Her Side/Her Side is Hurting	2	1.7%
Mother Nature is Being Rough on Her	1	0.9%
She is Out of It	1	0.9%
Her Grandmother Died	1	0.9%
She is So Tired	1	0.9%
She is Nauseas	1	0.9%
Code Word	1	0.9%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/115 * 100. Due to multiple responses from coaches, percentages will not add up to 100.0%.

Section 4: Beliefs and attitudes regarding the MC and sport. This section of the questionnaire contains 34 items—some are free response items and some are multiple-choice items. The first thirty items were to be completed by all coaches; items #31 through #34 were to be completed by female coaches only. Directions for completing this section of

the questionnaire instruct coaches that "[t]he following questions pertain to your experiences and opinions as a coach, in general, over the span of your coaching experience."

Coaches' responses to multiple-choice items in Section 4 of the questionnaire were entered into a data matrix using dummy codes (results are summarized together in Table 5.42 for quick reference; highest values are bold-faced). Responses to open-ended items were varied and complex; therefore, these data were treated qualitatively through content analysis (results are summarized separately for each open-ended item following Table 5.42).

Across all coaches, the following trends in beliefs were found for the multiple-choice items in Section 4: (1) the majority of coaches believe that the MC has the potential to influence sport performance; (2) more coaches have observed change patterns consistent with an athlete's MC than have not; (3) the majority of coaches have experienced an athlete withdrawing from practice due to MC issues; (4) the majority of coaches have *not* experienced an athlete withdrawing from *competition* due to MC issues; (5) the majority of coaches view MC issues as a source of stress for athletes; (6) the vast majority of coaches do *not* view menstruation as a form of injury; (7) the vast majority of coaches do *not* view PMS as a form of injury; (8) more coaches report that athletes do *not* generally speak to them about MC issues; (9) the vast majority of coaches report that parents do *not* generally speak to them about MC issues; (10) coaches are split fairly equally as to whether or not they refer athletes to other professionals when faced with MC issues; (11) the majority of coaches do *not* change their expectations of an athlete if they know she is menstruating; (12) the majority of coaches do *not* change their expectations of an athlete if they know she has PMS; (13) the majority of coaches would want to know if an athlete consistently performed worse or better during a certain time of the month; (14) of the coaches who would want to know about monthly performance patterns, more coaches would *not* use this information for the selection of athletes; (15) more coaches would *not* encourage an athlete to manipulate her MC around competitive events; (16) more coaches believe they need to know more about MC issues; (17) of the female coaches, more coaches do *not* believe that their former athletic performances were affected by MC issues; and (18) of the female coaches, more coaches do *not* believe that their *current* athletic performances are affected by MC issues.

Table 5.42. Frequencies and Percentages of Coach Belief Items – Section 4

		Yes		No		Not Sure		Did Not Respond	
Item	Belief Assessed	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
4.1	MC influence sport	**161**	**77.8%**	23	11.1%	23	11.1%	--	--
4.3	Patterns with MC	**98**	**47.3%**	53	25.6%	56	27.1%	--	--
4.5	Withdraw practice	**131**	**63.3%**	58	28.0%	18	8.7%	--	--
4.7	Withdraw competition	28	13.5%	**149**	**72.0%**	28	13.5%	2	1.0%
4.9	MC as stress	**127**	**61.4%**	51	24.6%	29	14.0%	--	--
4.10	Menstruation as injury	14	6.8%	**185**	**89.4%**	7	3.4%	1	0.5%
4.11	PMS as injury	13	6.3%	**183**	**88.4%**	10	4.8%	1	0.5%
4.12	Athletes discuss MC	84	40.6%	**123**	**59.4%**	--	--	--	--
4.15	Parents discuss MC	17	8.2%	**190**	**91.8%**	--	--	--	--
4.18	Refer to professionals	106	51.2%	101	48.8%	--	--	--	--
4.20	Expectations MC	46	22.2%	**150**	**72.5%**	11	5.3%	--	--
4.22	Expectations PMS	43	20.8%	**150**	**72.5%**	14	6.8%	--	--
4.24	Know performance	**147**	**71.0%**	30	14.5%	25	12.1%	5	2.4%
4.26	Use for selection*	50	24.2%	**72**	**34.8%**	25	12.1%	60	29.0%
4.27	Encourage MC change	64	30.9%	**90**	**43.5%**	49	23.7%	4	1.9%
4.29	Need to know more	**91**	**44.0%**	83	40.1%	29	14.0%	4	1.9%
4.31	Formerly affected**	47	22.7%	**68**	**32.9%**	5	2.4%	87	42.1%
4.33	Currently affected**	14	6.8%	**56**	**27.1%**	9	4.3%	128	61.9%

*Last 2 columns contain data that are "N/A" to this item. **Last 2 columns contain data that are " N/A" to these items (i.e., data include males and include females who weren't/aren't athletes).

Item #2: If yes, in what way(s)? One hundred sixty-one coaches (77.8%) reported in item #1 that they believe the MC has the potential to influence sport performance. The majority of coaches indicated in item #2 that they believe the MC *negatively* influences sport performance. Some coaches stated this belief in general (e.g., "during the cycle, performance level seems to drop"), whereas most coaches expanded upon this belief by including mediating factors (e.g., "negatively due to cramping, bloating, fatigue, irritability, and lack of concentration"). Some coaches specified whether the mediating factor was increased or decreased by the MC (e.g., "less energy, less focus, more irritability, less teamwork, less endurance"), while some coaches simply listed mediating factors (e.g., "concentration, mood, endurance"). For the purposes of reporting coaches' responses to this item, it is inferred that factors desirable to sport performance are meant as "decreased or hindered" and that factors undesirable to sport performance are meant as "increased," unless otherwise stated by the coach. Table 5.43 presents results from the content analysis of responses to item #2 from coaches who believe that the MC *negatively* influences sport performance. Many coaches listed multiple mediating factors within their responses. Accordingly, 219 responses across 41 unique categories are summarized below.

Table 5.43. Reasons Coaches Believe the MC Negatively Influences Sport – Item #2

Reason	Frequency	Percent*
Fatigue/Decreased Energy	33	20.5%
Cramps	20	12.4%
Athlete Does Not Feel Well	19	11.8%
Athletes Distracted/Loss of Focus	18	11.1%
Poor/Hindered/Altered Performance	17	10.6%
Pain	17	10.6%
Mood Affected/More Emotional	13	8.1%
Irritable/Annoyed/Cranky	9	5.6%
Attitude Affected	6	3.7%
Headaches/Migraines	5	3.1%
Less Endurance/Stamina	5	3.1%
Athletes Miss Practice	5	3.1%
Loss of Coordination/Balance	5	3.1%

Table 5.43. continued

Reason	Frequency	Percent*
Depends on the Athlete	5	3.1%
Fear of Leaking/Supplies Concern	4	2.5%
Bloating	4	2.5%
Slower	3	1.9%
Self-Conscious	2	1.2%
Weight Gain	2	1.2%
When Athlete Believes MC Influences	2	1.2%
Worry/Think about It Too Much	2	1.2%
Mobility Affected/Restricted Movement	2	1.2%
Anemia/Blood Loss	2	1.2%
Teamwork Affected	2	1.2%
Sportsmanship Affected	1	0.6%
Less Cooperative	1	0.6%
Gastrointestinal Problems	1	0.6%
Change in VO_2max	1	0.6%
Queasy	1	0.6%
Don't Play Smart/Use Their Heads	1	0.6%
Does Not Want to Work as Hard	1	0.6%
ACL Injuries	1	0.6%
Perception of Ball/Court	1	0.6%
Confidence Affected	1	0.6%
Motivation Affected	1	0.6%
Athletes are Inconsistent	1	0.6%
Athletes are Sometimes Stiff	1	0.6%
Less Ability to Move Abdominals	1	0.6%
Hormonal Changes	1	0.6%
Physical Stress	1	0.6%
Soreness in Abdomen	1	0.6%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/161 * 100. Due to multiple responses from coaches, percentages will not add up to 100.0%.

Nine coaches indicated in item #2 that they believe the MC *positively* influences sport performance. Because these responses are few in number, they are presented in their

entirety in Table 5.44. Lastly, one of the 23 coaches who answered "No" to item #1 also responded to item #2, indicating that she does not believe the MC has the potential to influence sport performance "because I was an athlete and it did not affect mine."

Table 5.44. Reasons Coaches Believe the MC Positively Influences Sport – Item #2

Reason
I did a study in college that showed girls were better physically just prior to their period.
I have seen it affect some women mentally…possibly physically. The physical effects seem hard to determine and arbitrary. I've had many athletes perform their best when menstruating.
Seems to elevate performance.
Athlete-dependent; some excel when on their period—others have sub-par performances.
I have heard athletes make comments connecting their performance to the menstrual cycle, both positive and negative comments.
I think it can influence a woman in many ways. Some women have a higher tolerance of discomfort than others. I play harder when I cramp because I'm pissed off. Some cannot play at all.
I've seen women who compete very well, maybe due to hormonal changes, and others who were debilitated.
Cramping is distracting and painful. My riders are sometimes stiff and weak. Can also be beneficial—sometimes more determined and more aggressive.
Stopping so much of the PMS.

Item #4: If yes, please explain. Ninety-eight coaches (47.3%) reported in item #3 that they have observed performance change patterns consistent with an athlete's MC. Coaches responded similarly to this item as they responded to item #2—that is, coaches primarily listed mediating factors or symptoms that may occur throughout the female menstrual cycle (symptoms that coaches believe interfere with sport performance). Only seven coaches responded with a comment that addressed a *performance* pattern of one or more athletes that occurred at a consistent *time* during the menstrual cycles: (1) Some athletes know they run better on their 3rd or 4th day of period; (2) My best scorer seems heavy-footed and "off" when she first "starts"; (3) The one player who suffered from severe headaches during her period, her performance drastically declined; (4) One player in particular is always different during period—she seems "lazy" or slow, doesn't focus as well and will "pout" on court more; (5) Sluggish behavior on period vs. not menstruating; (6) During their period, they were sluggish; and (7) When their cycle begins, it's usually harder for them to get pumped up/excited about competition if they are experiencing symptoms. The remaining responses were summarized in a manner identical to that described for item #2. Table 5.45 presents results from the content analysis of responses to item #4.

Table 5.45. MC-Related Performance Change Patterns Observed by Coaches – Item #4

Pattern	Frequency	Percent*
Poor/Hindered/Altered Performance	15	15.3%
Athletes Distracted/Loss of Focus	11	11.2%
Mood Affected/More Emotional	10	10.2%
Fatigue/Decreased Energy	10	10.2%
Pain	9	9.2%
Cramps	8	8.2%
Athlete Does Not Feel Well	5	5.1%
Slower/Sluggish	4	4.1%
Attitude Affected	3	3.1%
Depends on Athlete	3	3.1%
When Athlete Believes MC Influences	2	2.0%
Irritable/Short-Tempered	2	2.0%
Lack of Effort	2	2.0%
Clumsy/Loss of Coordination	2	2.0%
Athletes Aren't "All There"	1	1.0%
Not Assertive	1	1.0%
ACL Injuries	1	1.0%
Supplies Concerns	1	1.0%
Decreased Tolerance for Intensity	1	1.0%
Athletes Don't Care as Much	1	1.0%
"On My Period" Used as an Excuse	1	1.0%
Only in My Own as an Athlete	1	1.0%
Athletes Not as Alert	1	1.0%
Judgment Affected	1	1.0%
All Tend to Menstruate at Same Time	1	1.0%
Less Strength	1	1.0%
Only in Young Athletes	1	1.0%
Can't Go Full Speed for Long Periods	1	1.0%
Some Excel When on Their Period	1	1.0%
Others Are So Mad They Push Through	1	1.0%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/98 * 100. Due to multiple responses from coaches, percentages will not add up to 100.0%.

Two coaches who answered "No" to item #3 also responded to item #4: (1) They'll complain about it sometimes in practice but never in a game!; and (2) The above [response in item #2] does not always happen with each girl on a consistent basis. Additionally, four coaches who answered "I am not sure" to item #3 also responded to item #4: (1) I don't know when my players are menstruating, so I can't gauge its impact on their performance patterns; (2) Not on a consistent basis, which would give it validity to me; (3) Don't chart; and (4) I usually speculate, but don't make judgments or assumptions.

Item #6: If yes, how did you feel and react? One hundred thirty-one coaches (63.3%) reported in item #5 that one or more athletes whom they have coached have withdrawn from a practice due to MC-related issues. Because this item asks coaches to report both how they felt (internal emotion) and how they reacted (action or behavior on behalf of feeling), the content analysis for this item is presented in two separate tables. Table 5.46 presents the content analysis of coaches' reported feelings—some were positive (e.g., "I understand, cramps are horrible and I had a very hard time with my period when I was an athlete" and "I sympathized with them, let them go get medicine, and/or allowed them to recoup a little and join us when they were ready"); some were fairly neutral (e.g., "It was okay with me—I know what girls are serious and which ones aren't" and "Turned a cheek…did not challenge or question…asked girl asst. or senior to check on her"); and some were negative (e.g., "I don't like it. I make them practice/play anyway. My kids are young and they are just starting their periods. So they don't know how to act or prepare when on their period" and "Mad. If I played through it, I didn't understand how they did not").

Table 5.47 presents the content analysis of coaches' reported reactions—some were passive (e.g., "Fine—just something to deal with and move on" and "Disappointed that she could not perform thinking drug would work, but nothing I could do. Hoping this wouldn't happen on a game day") and some were proactive (e.g., "Tried to tell them to attempt workout or do best they can" and "Shocked, supportive but I encouraged them to practice").

Table 5.46. Coaches' Feelings about Athletes' Withdrawal from Practice – Item #6

Feeling	Frequency	Percent*
Understanding	28	21.4%
I Can Relate/Been in the Same Boat	10	7.6%
Sympathetic	5	3.8%
OK	5	3.8%
Fine	5	3.8%
No Problem	5	3.8%
Frustrated	4	3.1%
That's Life/It is Life	3	2.3%
Don't Like It	3	2.3%
Not Happy	3	2.3%
Supportive	3	2.3%
Empathetic	3	2.3%
Compassionate	2	1.5%
No Excuses	2	1.5%
Deal with It	1	0.8%
Shocked	1	0.8%
Awkward	1	0.8%
Trust Them	1	0.8%
No Different	1	0.8%
Not Positively	1	0.8%
Disappointed	1	0.8%
Not a Huge Issue	1	0.8%
Hurry Up	1	0.8%
Won't Blame Her	1	0.8%
Mad	1	0.8%
Does Not Bother Me	1	0.8%
Not Much Reaction	1	0.8%
They're Being "Soft"	1	0.8%
Go Home	1	0.8%
Disapprove	1	0.8%
Depends on the Situation	1	0.8%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/131 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

Table 5.47. Coaches' Reactions to Athletes' Withdrawal from Practice – Item #6

Reaction	Frequency	Percent*
Encouraged Continued Practice	9	6.9%
Allowed Athlete to Decide No Practice	6	4.6%
Referred to Doctor/Trainer	3	2.3%
Recommended/Allowed Medicine	3	2.3%
Talked about It	2	1.5%
Asked Athlete to Tell Me When Ready	2	1.5%
Explained That Exercise Would Help	2	1.5%
Allowed Quick Bathroom Visit Only	2	1.5%
Turned a Cheek	1	0.8%
Athletes are Excused One Time Only	1	0.8%
Made the Athlete Practice	1	0.8%
Sent the Athlete Home	1	0.8%
Asked Athlete to Sit and Watch	1	0.8%
Only Allowed this Once	1	0.8%
Wanted to Help	1	0.8%
Asked Assistant to Check on Athlete	1	0.8%
Worked Out Plan for Athlete to Cope	1	0.8%
Looked for Signs of Pain in Future	1	0.8%
Recommended Sleep	1	0.8%
Hope It Doesn't Happen on Game Day	1	0.8%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/131 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

Three coaches who answered "No" to item #5 also responded to item #6: (1) They know better than to tell me this!; (2) If I did, I would have them do something (not at 100%) because exercise helps the pain; and (3) It's their body—they have to be the one to determine at what level of pain they need to stop. My usual response is to explain how exercise will help alleviate most discomfort. Additionally, two coaches who answered "I am not sure" to item #5 also responded to item #6: (1) I have always assumed that some of the "sick" days are menstrual cycle-related, but I don't push the girls for details. I just take it in stride, realizing that girls are likely to have a few more "sick" days than boys will; and (2) Maybe they used another excuse as to why to stop.

As a side note, three coaches may not have read the item properly, as they listed symptoms as responses to item #6: (1) cramps; (2) abdominal pain; and (3) cramping—over bleeding. This occurrence will be discussed further in Chapter 6.

Item #8: If yes, how did you feel and react? Twenty-eight coaches (13.5%) reported in item #7 that one or more athletes whom they have coached have withdrawn from a competition due to MC-related issues. Because this item asks coaches to report both how they felt (internal emotion) and how they reacted (action or behavior on behalf of feeling), the content analysis for this item is presented in two separate tables. Table 5.48 presents the content analysis of coaches' reported feelings and Table 5.49 presents the content analysis of coaches' reported reactions. Few coaches responded to this item.

Table 5.48. Coaches' Feelings about Athletes' Withdrawal from Competition – Item #8

Feeling	Frequency	Percent*
Understanding	4	14.3%
Fine	4	14.3%
OK	1	3.6%
Doesn't Bother Me	1	3.6%
No Problem	1	3.6%
Take Care of Business Prior to Game	1	3.6%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/28 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

Table 5.49. Coaches' Reactions to Athletes' Withdrawal from Competition – Item #8

Reaction	Frequency	Percent*
Sent Athlete Home	1	3.6%
Tell Athlete Don't Make It a Habit	1	3.6%
Wished I Could Make Athlete Better	1	3.6%
Asked Athlete to Sit and Watch	1	3.6%
Dealt With It and Moved On	1	3.6%
Thought They Could Play through It	1	3.6%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/28 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

Two coaches who answered "No" to item #7 also responded to item #8: (1) They are tough. It's their job to compete, even if they're not at their best on that given day; and (2) Not that I'm aware of. Additionally, one coach who answered "I am not sure" to item #7 also responded to item #8: (1) Same answers as #s 5 and 6 above—although I probably show a bit of frustration/disappointment if a key player has to miss an important game; however, if a player is sick or "sick," there's no other choice but to move on.

Again, one coach may not have read the item properly, as this coach listed "cramps" as the response to item #8. This occurrence will be discussed further in Chapter 6.

Item #13: If yes, please describe. Eighty-four coaches (40.6%) reported in item #12 that athletes generally talk to them about MC-related issues. Coaches who responded to item #13 primarily listed topics of conversation as responses. Table 5.50 presents the content analysis of coaches' descriptions of athletes' talk about MC issues.

Some coaches (n = 8) did not describe the typical topics of conversation for item #13; instead, they provided a more general statement about communication style or climate: (1) They would come to me as opposed to a male coach; (2) My athletes discuss many personal issues as well as menstrual cycle issues. Since they are all females they feel free to discuss these matters; (3) My athletes feel very comfortable talking to me and trusting. I am approached more because we have a male head coach; (4) We talk about female issues and problems openly; (5) I try to acknowledge I do care about their cycle-related issues; (6) I send to my assistant to help; (7) I try to be very open with my athletes and I encourage open discussions to keep all lines of communication available; and (8) I work in the training room; if athletes are in pain I see them; I am also the only female trainer on staff.

Additionally, two coaches who answered "No" to item #12 also responded to item #13: (1) They have but we have trainers that they share this with; and (2) Only if they have problems (i.e., pain, absence, etc.).

Item #14: If yes, how do you feel when approached about these issues? Table 5.51 presents the content analysis of coaches' reported feelings when approached about MC-related issues.

Table 5.50. Coaches' Descriptions of Athletes' Talk about MC Issues – Item #13

Topic	Frequency	Percent*
Specify/Complain about Symptoms	18	21.4%
If Athletes Feel it is a Problem	10	11.9%
General "I am not feeling well"	9	10.7%
Ask Questions/Advice	4	4.8%
Request Supplies from Coach	4	4.8%
Athletes Joke about It	3	3.6%
To Say it May Affect Their Performance	2	2.4%
General "I am on my period"	2	2.4%
Athlete Started Period for First Time	2	2.4%
Discuss Missing Their Period	1	1.2%
Discuss the Use of OCs	1	1.2%
Want Sympathy	1	1.2%
How to Ease Pain and Level Out Moods	1	1.2%
Discuss Changes in MC	1	1.2%
Want Relief	1	1.2%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/84 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

Table 5.51. Coaches' Feelings about Athletes' Talk about MC Issues – Item #14

Feeling	Frequency	Percent*
Fine	12	14.3%
Glad They Feel Comfortable Talking	10	11.9%
Doesn't Bother Me	7	8.3%
Comfortable	7	8.3%
It's Natural/Normal/Part of Life	6	7.1%
Want/Try to Help	5	6.0%
OK	4	4.8%
No Problem	4	4.8%
Refer to Parents/Nurse/Other	4	4.8%
Sympathetic	4	4.8%
Open	3	3.6%
Not an Issue	2	2.4%

Table 5.51. continued

Feeling	Frequency	Percent*
Understanding	2	2.4%
Not Willing to Give In	1	1.2%
Relaxed	1	1.2%
Keep Focus on Performance	1	1.2%
I Don't Believe Them	1	1.2%
Like a Big Sister	1	1.2%
No Big Deal	1	1.2%
Easy	1	1.2%
Part of the Job	1	1.2%
View it as Opportunity to Educate	1	1.2%
Happy	1	1.2%
Don't Let up on Them	1	1.2%
Empathetic	1	1.2%
Matter of Fact	1	1.2%
Play through It	1	1.2%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/84 * 100. Due to rounding, percentages will not add up to 100.0%.

Eight coaches who answered "No" to item #12 also responded to item #14: (1) Fine—that's my job; (2) Would be glad they felt comfortable enough to do so; (3) When they have, I have felt glad to be included in something private in their lives, and compassionate about them not feeling well; (4) Would not bother me; (5) Not comfortable; (6) Try to be understanding; (7) Open to discussion; and (8) It's rare, but when they say things I take an approach of "you'll deal with this the rest of your life, so you may as well get used to it." I am sympathetic when symptoms seem overwhelming, but much if it is drama too.

Item #16: If yes, please describe. Seventeen coaches (8.2%) reported in item #15 that parents generally talk to them about MC-related issues. Because only 11 of the 17 coaches who answered "Yes" to item #15 also responded to item #16, the responses are presented in their entirety in Table 5.52.

Additionally, two coaches who answered "No" to item #15 also responded to item #16: (1) Rarely, I've only had one parent do that; and (2) Not generally, but I have had a couple of parents ask me to take care of their young daughters who had just started their periods and were traveling to an out-of-town competition..

Item #17: If yes, how do you feel when approached about these issues? Table 5.53 presents the full responses of coaches' reported feelings when approached about MC-related issues by parents. (One coach who answered "No" to item #15 also responded to item #16: Fine. My athletes have all been like daughters to me.)

Table 5.52. Coaches' Descriptions of Parents' Talk about MC Issues – Item #16

Description
They will if their daughter suffers with bad periods.
Only on occasion.
Mainly to let me know what is happening.
They give me an insight on the front end.
If they feel it is necessary.
Only when it is just starting for the first time.
Cramps.
Note of awareness.
Most do, because they want to know that we take due diligence with regard to their child's health.
Coaches are usually notified when athletes have begun their period for the first time.

Table 5.53. Coaches' Feelings about Parents' Talk about MC Issues – Item #17

Feeling
I encourage them to let their daughters to play through it.
I appreciate the info.
Relaxed, ready, and open-minded.
I have taught or coached a lot of the parents as I have no problem with talking to them.
Comfortable.
No big deal.

Table 5.53. continued

Feeling
This is normal!
Fine.
Great—helps me to understand athlete and their current state.

Item #19: If yes, please list the professional(s) to whom you refer athletes and parents. One hundred six coaches (51.2%) reported in item #18 that they generally refer athletes and parents to other professionals when MC-related issues arise. Some coaches listed more than one professional when responding to this item. Accordingly, 106 coaches provided 137 responses across 11 unique categories. Table 5.54 presents the content analysis of coaches' responses to item #19.

Table 5.54. Professionals to Whom Coaches Refer Athletes and Parents – Item #19

Professional	Frequency	Percent*
Athletic Trainer	46	43.4%
Nurse/School Nurse	31	29.2%
Doctor/Team Doctor	30	28.3%
Gynecologist	15	14.2%
Female Coach/Assistant Coach	5	4.7%
Health Services/Center	3	2.8%
Female Nurse	2	1.9%
Female Athletic Trainer	2	1.9%
Medical Professional	1	0.9%
Female Teachers at the School	1	0.9%
Counselor	1	0.9%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/106 * 100. Due to multiple responses from coaches, percentages will not add up to 100.0%.

Item #21: If yes, how do your expectations change? Forty-six coaches (22.2%) reported in item #20 that they change their expectations of an athlete if they know she is menstruating. Twelve of the 46 coaches stated, in one way or another, that they lower their expectations of menstruating athletes (e.g., "do not expect as much; I do not let them know

this but it is how I react," "she obviously can't perform at an optimal level," "they usually do not perform as when normal," and "look at athlete as if they may have a physical limitation that will affect their performance"). The remaining coaches did not specifically state whether they raise or lower their expectations, but their responses all implied that they lower their expectations of menstruating athletes. Moreover, these coaches primarily addressed their feelings or reactions regarding a menstruating athlete in practice or competition (e.g., "more understanding if athlete cannot push themselves as hard," "if she gives the best effort possible, I'm OK with that," and "I may not make her do some of the training—just depends"). None of the coaches reported or implied that they raise their expectations of menstruating athletes. Table 5.55 presents the content analysis of coaches' responses to item #21.

Table 5.55. How Coaches Change Expectations of Menstruating Athletes – Item #21

Change	Frequency	Percent*
Lower Expectations/Expect < 100%	12	26.1%
Ease Up Training/Allow to Sit Out	8	17.4%
More Understanding/Forgiving	8	17.4%
Just Expect/Encourage Best Effort	2	4.3%
I Don't Push Too Hard	2	4.3%
Expect More Time Stretching, Fluids	1	2.2%
If Athlete Changes Expectations of Self	1	2.2%
If a Person is Uncomfortable (not MC)	1	2.2%
Only if Problems are Severe	1	2.2%
I Don't Take Moodiness Too Harshly	1	2.2%
Just Like if Male Athletes Aren't Well	1	2.2%
Maybe as If Athlete Has an Injury	1	2.2%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/46 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

Five coaches who answered "No" to item #20 also responded to item #21: (1) I always want them to simply try their best however that is on a particular day; (2) But I do try to let her pace herself if necessary; (3) I don't ever get mad at someone for performing worse because of their period, but they still need to get the job done; (4) No—unless they

approach me with a problem; and (5) Only if they typically have problems—not all athletes do. With some, you'd never know. Additionally, one coach who answered "I am not sure" to item #20 also responded to item #21: I never know, but I would assume that I would be more patient/tolerant with that player if I did know she was menstruating or had PMS.

Item #23: If yes, how do your expectations change? Forty-three coaches (20.8%) reported in item #22 that they change their expectations of an athlete if they know she has PMS. Nearly all of these coaches provided identical feedback to item #21 and item #23, so there are few differences between the two content analyses. Table 5.56 presents the content analysis of coaches' responses to item #23.

Table 5.56. How Coaches Change Expectations of Athletes with PMS – Item #23

Change	Frequency	Percent*
Lower Expectations/Expect < 100%	11	25.6%
Ease Up Training/Allow to Sit Out	6	14.0%
More Understanding/Forgiving	6	14.0%
I Don't Push Too Hard	3	7.0%
Just Expect Best Effort	1	2.2%
Expect More Time Stretching, Fluids	1	2.2%
If Athlete Changes Expectations of Self	1	2.2%
Only if Problems are Severe	1	2.2%
I Don't Take Moodiness Too Harshly	1	2.2%
Just Like if Male Athletes Aren't Well	1	2.2%
I am More Encouraging	1	2.2%
Expect That They Try to Make It	1	2.2%
Trust to Tell Me What I Need to Do	1	2.2%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/43 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

Item #25: Why or why not? One hundred forty-seven coaches (71.0%) reported in item #24 that they would want to know about documented performance patterns of athletes, if possible. Table 5.57 presents the content analysis of responses to item #25 from coaches who answered "Yes" to item #24. Fourteen comments from coaches were not included in the

table below for various reasons: (1) the comment was too vague (e.g., "competition performance"); (2) the comment was irrelevant (e.g., "I think some girls would be hesitant to tell me"); or (3) the comment simply restated that the coach would like to know the information (e.g., "I would want to know, but it would not change my expectations").

Table 5.57. Reasons Coaches Want to Know Performance Patterns – Item #25

Reason	Frequency	Percent*
Alter Game Planning and Scheduling	33	22.4%
To Maximize Performance/To Win	11	4.5%
Extra Information/Knowledge is Good	10	6.8%
Help to Get Better/Train/Cope	8	5.4%
Know/Change What to Expect	7	4.8%
Understand Athletes Better	6	4.1%
Just Interested/Curious	5	3.4%
To Explain Performance	5	3.4%
Interested in New Data/Research	4	2.7%
To Inform the Athletes of Results	1	0.7%
Help in Providing Medical Care	1	0.7%
To Have Proof for Male Coaches	1	0.7%
To Justify Performance	1	0.7%
Awareness is Best Form of Prevention	1	0.7%
Want to Know Injury Occurrence	1	0.7%
I Wouldn't Be as Hard on Them	1	0.7%
Help How I Coach or Try to Inspire	1	0.7%
Because I Believe Athletes are Affected	1	0.7%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/147 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

In contrast, 30 coaches (14.5%) reported in item #24 that they would *not* want to know about documented performance patterns of athletes, if possible. Table 5.58 presents the responses to item #25 from coaches who answered "No" to item #24. Because only 19 of 30 coaches responded to item #25 and because the responses were rather varied in their content, the responses are presented in their entirety.

Table 5.58. Reasons Coaches Do Not Want to Know Performance Patterns – Item #25

Reason
The need to learn life lessons from playing with pain, performing life jobs when they don't feel like it, etc.
Many girls' teams have [gone] undefeated during a 4-month season. I am certain that many of those players played through that time.
Coach with preconceived prejudice. Let athlete "make the adjustment." Should it be an excuse? What about the workplace when they graduate?
I don't want to be more sympathetic, or treat them differently.
Not an area of which I'm comfortable knowing of or discussing!
At my level of coaching, and where I coach, there is very little pressure to win—we concentrate on teaching skills, having fun, and being as successful as possible with the athletes we have. I wouldn't change my schedule or my line-up depending on who was menstruating at a particular time.
I coach high schoolers and middle schoolers; I see no need in overspecializing or overcomplicating the athletes' experience. Perhaps professional/Olympic athletes could engage in this "timing" practice, but it seems unnecessary for the average MS or HS athlete.
There is not anything I could or want to do to help in the matter.
I'm not sure it would make any real difference.
Can't change practice and games to fit them.
It wouldn't affect the way I coach one way or the other. I would still expect them to play as hard as they could. Everyone has bad days, period or not.
I have certain expectations that I expect to always be met unless they are injured
I think there is a fine line between sympathy for personal issues, whatever those may be, and direct separation of female/male athletes—a Pandora's box if taken to point out the "problems" with female athletes. There is a concern of how such info will be used.
There are other things that need to be looked at and frankly I don't have enough time.
Sports are part of life, not the reason for it. It is an arena in which to learn to handle many different situations. Winning is not what it is all about, only the sprinkles on the icing on the cake. It appears that the next step from knowing would be to control.
What's the point? Would there be a solution or just facts?
Too many kids use this as an excuse. For some kids it seems to be much worse in practice (especially running, weight training, etc.) than in a game.
It would provide that person with an excuse not to play/practice. You cannot change the day of a game.
Can't allow it to be an excuse—if I did, we would constantly deal with it.

Item #28: Why or why not? Sixty-four coaches (30.9%) reported that they would encourage the practice of safe manipulation of athletes' MC around important competitive events. Table 5.59 presents the content analysis of responses to item #28 from coaches who answered "Yes" to item #27.

Table 5.59. Reasons Coaches May Encourage Safe Manipulation of MC – Item #28

Reason	Frequency	Percent*
To Improve Performance/To Win	17	26.6%
If it is Safe	14	21.9%
If the Athlete Wants to do This	3	4.7%
Lessen Stress	3	4.7%
Lessen Distractions/Improve Focus	2	3.1%
So Athlete Feels Better/Comfortable	2	3.1%
If Athlete Has Negative MC Effects	2	3.1%
I Have Done it Myself	1	1.6%
Lessen Worry/Embarrassment	1	1.6%
With Parental Consent	1	1.6%
Under Doctor's Supervision	1	1.6%
Would Benefit All of Us	1	1.6%
Limit Missed Practices/Games	1	1.6%
For Their Personal Benefit	1	1.6%
Depends on Work Effort of Athlete	1	1.6%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/64 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

In contrast, 90 coaches (43.5%) reported in item #27 that they would *not* encourage the practice of safe manipulation of athletes' MC around competitive events. Table 5.60 presents the responses to item #28 from coaches who answered "No" to item #27. Lastly, 49 coaches (23.7%) reported in item #27 that they are uncertain if they would or would not encourage the practice of safe manipulation of athletes' MC around important competitive events. Table 5.61 presents the responses to item #28 from coaches who answered "I am not sure" to item #27. Because only 15 of 49 coaches responded to item #28 and because the responses were rather varied in their content, the responses are presented in their entirety.

Table 5.60. Reasons Coaches May Not Encourage Safe Manipulation of MC – Item #28

Reason	Frequency	Percent*
It's Not Natural/Let Nature Take Course	14	15.6%
It's Not Healthy/Health More Important	10	11.1%
Not for the Sake of a Game/Sports	5	5.6%
Not at the Level I Coach	5	5.6%
MC Effects are Not That Big of a Deal	5	5.6%
I Question the Safety/Use of "Safely"	5	5.6%
Leave it to God/Don't Play God	3	3.3%
Winning is Not That Important	3	3.3%
Should Not Be Used as an Excuse	3	3.3%
It is the Athlete's Decision	3	3.3%
It Seems Wrong	2	2.2%
It's Not My Place/Decision	2	2.2%
They Need to Learn to Deal with It	2	2.2%
This is Too Controlling	1	1.1%
Important to Be Regular and Consistent	1	1.1%
I Don't Believe in Using Drugs	1	1.1%
Not Fair to the Athlete	1	1.1%
Priorities	1	1.1%
Manipulation for Health Reasons Only	1	1.1%
May Conflict with Other Life Events	1	1.1%
It Wouldn't Change My Line-Up	1	1.1%
Cannot Control	1	1.1%
That's Ridiculous	1	1.1%
Too Complicated and Unrealistic	1	1.1%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/90 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

Table 5.61. Reasons Coaches are Uncertain about Safe Manipulation of MC – Item #28

Reason
Don't know the health risks involved.
Only if there were sufficient reasons. It would be her call, along with our medical staff.

Table 5.61. continued

Reason
Because I would need to be more educated about "safely manipulate." It sounds wrong, but I would be open to learning more.
It would have to be proven and consent given by each player's doctor, the player herself and the player's parents.
That should be left up to her and her parents.
It depends on how she would have to manipulate and whose definition of safely it is.
Would probably agree in instance of swimmers. Actually would agree for all athletes (if it were proven definitely safe).
I'm not sure that manipulating a cycle is in the best interest of an athlete's health. What does "safely" really mean?
If there was no physical harm to the athlete, then maybe.
I would need more information and it would depend on the student-athlete.
If it was not dangerous or inconvenient to the athlete.
Some people are not as bad as others. If an athlete had bad pains, I probably would so that it wouldn't affect her.
Not enough information and not my place.
Only if safely beyond doubt and in accordance with her religious beliefs.
I would need to know all the risks before I could do that.

Item #30: Why or why not? Ninety-one coaches (44.0%) reported in item #29 that they believe they generally need to know more about MC-related issues. Table 5.62 presents the content analysis of responses to item #30 from coaches who answered "Yes" to item #29.

Table 5.62. Reasons Coaches Need to Know More about MC – Item #30

Reason	Frequency	Percent*
Knowledge/Education/Info is Good	10	11.0%
Due to This Survey	8	8.8%
It Would Be Helpful/Allow Me to Help	7	7.7%
To Understand Athletes and Their Issues	6	6.6%
Because I Coach Females	6	6.6%
To Be More Knowledgeable (General)	5	5.5%

Table 5.62. continued

Reason	Frequency	Percent*
To Be a Better Coach	3	3.3%
Because the MC Affects Athletes	3	3.3%
I Don't Use OC/Know More about OC	2	2.2%
Responsible for Athletes' Health/Safety	2	2.2%
Help Me Answer Athletes' Questions	2	2.2%
If the MC Influences Performance	1	1.1%
Because I am in a Position of Guidance	1	1.1%
If the MC Poses a Risk to Athletes	1	1.1%
Because I Do Not Have Bad Cycles	1	1.1%
I Should Be More Sensitive	1	1.1%
If Research Offers New Information	1	1.1%
Job is to Safely Maximize Performance	1	1.1%
Injury/Emotional Stress	1	1.1%
Because I am a Woman	1	1.1%
Understand Strength/Skill Development	1	1.1%
To Better Train Athletes	1	1.1%
Because I am a Man	1	1.1%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/91 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

In contrast, 83 coaches (40.1%) reported in item #29 that they believe they do *not* generally need to know more about MC-related issues. Table 5.63 presents the responses to item #30 from coaches who answered "No" to item #29.

Table 5.63. Reasons Coaches Do Not Need to Know More about MC – Item #30

Reason	Frequency	Percent*
I Already Have Enough Knowledge	6	7.2%
Not a Big Issue for My Athletes	6	7.2%
Trainer/Medical Personnel Area	5	6.0%
Because I'm a Female/Have My Own	5	6.0%
Personal/None of My Business	4	4.8%
Only if There is a Medical/Safety Issue	2	2.4%
Team/Athlete Needs to Adjust	2	2.4%

Table 5.63. continued

Reason	Frequency	Percent*
It Will Not Change Anything	1	1.2%
Don't Coach w/ Preconceived Prejudice	1	1.2%
Expectations to Be Met (Unless Injured)	1	1.2%
I Want to Know More about Problems	1	1.2%
Athlete is Already Exposed to Issues	1	1.2%
Life Doesn't Stop if Menstruation Starts	1	1.2%
It Should Not Be an Excuse	1	1.2%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/83 * 100. Due to a lack of responses from coaches, percentages will not add up to 100.0%.

Item #32: If yes, please explain. (This item was to be completed by female coaches only). Forty-seven female coaches (22.7% of all coaches; 38.5% of all female coaches) reported in item #31 that, as former athletes, they believe their performance was affected by MC-related issues; 68 female coaches reported that their prior athletic performance was not affected by MC-related issues; 5 female coaches reported uncertainty; and 2 female coaches were not former athletes (all 85 male coaches were coded as "N/A" for item #31). Table 5.64 presents the content analysis of responses to item #32 from female coaches who answered "Yes" to item #31.

Table 5.64. Female Coaches' Reports on MC and Performance as Athletes – Item #32

Report	Frequency	Percent*
Experienced Fatigue/Decreased Energy	15	31.9%
Experienced Cramps	13	27.7%
Specified Poor/Negative Performance	5	10.6%
Experienced Pain/Discomfort	4	8.5%
Supply Issues/Stress about Leaks	4	8.5%
Experienced Mood Changes	4	8.5%
Experienced Decreased Motivation	3	6.4%
Experienced Attitude Changes	3	6.4%
Experienced Decreased Focus	2	4.3%
Had to Start Using OC for Symptoms	2	4.3%
Had to Take Medication	2	4.3%

Table 5.64. continued

Report	Frequency	Percent*
Experienced Decreased Speed	2	4.3%
Experienced Headaches	2	4.3%
General Not 100%/Not Feeling Well	2	4.3%
Experienced Heavy Bleeding	1	2.1%
Had to Withdraw from Competition	1	2.1%
Experienced Diarrhea	1	2.1%
Experienced Decreased Coordination	1	2.1%
Had to Lower Caffeine Consumption	1	2.1%
Had to Warm Up Longer	1	2.1%
Experienced Decreased Effort	1	2.1%
Had to Work Harder Mentally	1	2.1%
Tore Both ACLs Right Before Period	1	2.1%
Performed Better When at End of Cycle	1	2.1%
Experienced Changes in Perception	1	2.1%

*Percent is proportion of coaches indicating a particular response. In this case, percent = frequency/47 * 100. Due to multiple responses from coaches, percentages will not add up to 100.0%.

Item #34: If yes, please explain. (This item was to be completed by female coaches only). Fourteen female coaches (6.8% of all coaches; 11.5% of all female coaches) reported in item #33 that, as current athletes, they believe their performance is affected by MC-related issues; 56 female coaches reported that their current athletic performance is not affected by MC-related issues; 9 female coaches reported uncertainty; and 43 female coaches are not current athletes (all 85 male coaches were coded as "N/A" for item #31). Table 5.65 presents the responses to item #34 from female coaches who answered "Yes" to item #33 (due to the low number of coaches in this group, responses are presented in their entirety).

Table 5.65. Female Coaches' Reports on MC and Performance as Athletes – Item #34

Report
It just makes performing more of a chore and not as enjoyable. Thank goodness for prescribed drugs!
Decreased performance prior to menstruation and first day or so—bloating, cramps, diarrhea.
I just feel different while menstruating. It's harder mentally and physically.

Table 5.65. continued

Report
Not as energetic; difficult to concentrate as well.
Sometimes it is hard to get energy.
I run—at times my cramps are noticeable and I do not feel 100%.
I sometimes feel tired when I am on my period.
Fatigue and stress of leaking bother me.
I now focus more on leakage and other people knowing.
I feel that as I have gotten older, PMS affects my performance for a couple of days before my period starts. Once it starts, no problems.
Mental and physical coping issues.

Posttest Phase – Focus Group for Questionnaire Feedback

Results from the posttest focus group are presented according to the topic of discussion: (1) commentary—focus group members shared stories about the salience of the MC and sport performance; (2) exploratory—focus group members indicated important items for questionnaire inclusion prior to reviewing the questionnaire; and (3) feedback—focus group members provided important feedback following the review of the questionnaire.

Commentary. Although focus group members were invited to provide feedback to the questionnaire as it is currently written, an overview of the area of research (namely, the MC, OC use, and sport performance) elicited some initial discussion about its significance. The following are paraphrased excerpts and some direct quotes from this portion of the discussion:

> On one team, all of the athletes' periods came together.
>
> For one elite team of athletes, important athletic testing occurred at the same time of everyone's periods. Coaches did not want to hear about it…they wanted the athletes to deal with it. All coaches were men. The athletes wanted the head coach to change the schedule and he wouldn't work with them. Almost the whole team had negative symptoms.

The coaches who weren't open to hearing about the MC unless the athlete is basically keeled over dying are "old-school traditional" males. It seems to be associated with age in men. Some male coaches see it as a weakness. Focus group members do not view it as a weakness. Some girls may use it as an excuse, but for most girls it is real.

Even a focus group member who doesn't have bad symptoms finds it to be inconvenient. "You just didn't talk about this around men or boys. With guy coaches, you talked to your teammates or the captain. You had to be deathly ill for it to be brought to his attention."

The first place to start is that it's not dirty; it's not disgusting. It may be a bigger deal for middle school and high school girls. Female coaches tend to not feel sorry for you…they want you to deal with it. Their attitudes set the stage for the rest of the team, based on their own experiences.

The male coaches don't care…"just deal with it…I don't want to know what you're taking…just get through it."

Coaches need to know enough to be supportive and understanding. Athletes in pain from their MC should be treated as any other athlete who is injured.

Exploratory. Focus group members were then asked to offer material to be included in a questionnaire for coaches (much like the focus group members were asked during the test construction phase) to explore important areas without biasing the members with the questionnaire and to confirm inclusion of items that already appeared on the questionnaire. Their ideas regarding questions to include are summarized below:

Is your coaching style reflective of how your coaches coached you?

Ask female coaches about their history of periods and their symptoms.

Would you consider modifying training for an athlete with negative MC symptoms? An athlete with a sprained ankle? An athlete who is throwing up?

How comfortable are you talking about menstruation?

If an athlete brings it up, how open are you?

Measure their empathy, in general, for someone in pain.

How knowledgeable are coaches about what can alleviate the negative symptoms?

Coaches should know about heavy and longer durations of blood flow; anemia.

In general, they should know how the cycle works; what happens to the body; and anatomy. [Some group members think that men won't want to get that involved.]

They should know specifically the cycle of their team; when does it occur; is everyone on the same schedule?

They should know the symptoms associated with the MC.

Do you see the MC as a sign of weakness? If a coach sees it this way, then a girl will not approach them about these issues.

Coaches should know the fluctuation of hormones; that it affects performance; and that it may increase the risk of injury.

Myth versus truth. Is it more likely for athletes to get injured during this phase?

Menstrual synchrony…they should know that this happens.

Know that it's individual for every girl, and it can be different every month for a girl.

They should know where sanitary supplies are stored and/or available…especially at the middle school and high school level. This is so new and scary to them. They need to feel comfortable asking for these things or not having to ask at all. It should be addressed with their teams.

Coaches should know the risks and benefits associated with OC.

Feedback. Lastly, focus group members reviewed the questionnaire and were asked to offer revisions, to identify problematic items, and to assist in explaining why some items were frequently unanswered. Their insights and recommendations follow:

<u>Section 2</u>

Option #4h: This response option is double-barreled.

Item #4: Add the options fatigue, nausea, and vomiting, as coaches may be able to observe those, unlike bloating or fluid retention

For items like #4, #7, and #8: Is there a response effect? Do coaches seem to encircle the first few response options more frequently than the last response options? Consider alphabetizing the response options.

Items #8 and #9: These are double-barreled items

Retain items #13 and #14: Coaches should know the risks and benefits of OC, as athletes may feel more comfortable speaking to a coach than a parent; plus coaches should want to know about *any* medications that an athlete is using…so why not also OC? They need to know risks in case there are any problems on their team.

Expand from item #10: Coaches should know *if* women's periods can come together.

Section 3

Items #1 and #3: I see a lot of coaches saying "yes" and then why, "because they are 15." This may present a problem.

Retain items #7 and #8: Coaches should know if their girls are on OC; you have to ask specifically though, because females often don't consider OC as medication for some reason.

Items #14 and #16: If coaches say "yes" to either of those items, they are probably in trouble with their schools. There's no way I would answer those questions. Phrase it, "Do you believe that athletes should be encouraged to use OC?" *Believe* is less active than *encourage*. There's a difference between educating and encouraging, too. Can coaches educate their athletes? Ask, "Have you ever educated your athletes on the use of OC?"

Expand from items #18 and #19: Ask, "What are the complaints athletes have regarding their periods or PMS?" This may offer more knowledge.

Section 4

Items #5 and #7: Bold-face the words *practice* and *competition*; these items otherwise look like the same items. Did many coaches skip over #7? That might be why.

Item #24: When coaches answer this item, they might be trying to be politically correct by saying "no," assuming the item is about the MC; it would be interesting to compare how much coaches want to win and if they would want this type of documentation.

Additional items: Do you view menstruation as a strength? Do you view menstruation as a weakness? Ask the positive and negative version of each stem.

Overall Construction

In general, change the format and create a multidimensional Likert-type scale. Ask coaches to rate the extent to which they agree with various items. That will solve a lot of problems during analysis…especially when there are so many coaches who aren't responding to certain questions. That will be a lot stronger. For example, include the item "Athletes should be encouraged to take OC for pain."

The shorter the questionnaire, the better, in order to get coaches to fill it out.

Give coaches the answers afterward…make a pamphlet to give to them.

Write more items than are actually necessary because there will be poor items and there will be some redundancy.

Consider presenting the questionnaire online. I would be more likely to fill it out online. I would strongly encourage that.

It may also be created as a Word-documented form (fill-in-the-blank) and then emailed as an attachment to coaches.

CHAPTER 6

DISCUSSION

This chapter appraises the current research endeavor according to each of the four sections of the questionnaire. Included in each separate section, where appropriate, are the following: (1) discussion of the properties of the questionnaire and any necessary or recommended revisions; (2) considerations regarding the validity and reliability of the questionnaire; (3) commentary on exploring the data outcomes of pretesting the questionnaire with a sample of 207 coaches; and (4) directions for further and more in-depth investigation into the MC, OC use, and sport performance.

Section 1: Demographic Information

Several demographic variables were explored through pretesting the questionnaire with a sample of 207 coaches from across the southeastern region of the United States. Based upon the results of pretesting, each demographic item is addressed in terms of its value for retention on the questionnaire, its need for revision, its utility in future research endeavors, and/or its reason for elimination from the questionnaire.

"School of Employment" is currently not a variable of interest related to coaches' knowledge or attitudes, but it was included to demonstrate the regional coverage of the coach sample. Perhaps as the questionnaire is administered to larger samples of coaches across the United States, that variable may be tested for regional effects (or the questionnaire may include an item specifically related to region of the United States to ease the coding and data entry process). Additionally, either the phrasing of this item may need to read "Institution/Facility Where Coaching" or the current item may need to include further instructions for completion because, for example, one coach was employed at an elementary

school as a teacher (obtained from "School of Employment" response), but coached high school-aged athletes at another location (not identifiable from "School of Employment" response).

"Title of Employment at School" may be considered for elimination because coaches in this sample were primarily either *coaches only* or *teachers/coaches*. This dichotomy of titles is highly related to the "Age Range of Athletes on Team" item; that is, if a coach was a *coach only* by title, s/he likely coached college-aged athletes and, in turn, if a coach was a *teacher/coach* by title, s/he likely coached middle school- or high school-aged athletes. "Age Range of Athletes on Team" encompasses "Title of Employment at School," but is able to provide further detail by separating coaches of middle school athletes from coaches of high school athletes. [During the scoring and data entry process, it was recognized that presenting "Age Range of Athletes on Team" as an open-ended response item was unnecessary. Responses to this item were ultimately coded according to the school level (i.e., middle school, high school, mixed middle and high school, or college) such that this item should have been presented as forced-choice].

Based upon reports in the literature, it may be expected that items pertaining to education and training would assist in explaining differences in knowledge levels (e.g., Foster, Ralph, Arons, Brindis, & Harper, 2007; Gronlund & Milner, 2006; Levy, Fein, & Stephenson, 1993; Thanavaro, Moore, Anthony, Narsavage, & Delicath, 2006; Venter, 2006). However, for this sample of coaches, "Course(s) Taught at School," "Your Highest Educational Level Completed," "Your College Major(s)," and additional courses/special training did not relate to knowledge scores. Interestingly, (1) coaches who taught *related* courses (e.g., health) scored lower on the MC test and total test than did coaches who taught *unrelated* courses; (2) coaches with Master's and PhD degrees scored lower on all three test components than did coaches with 4-year college degrees; (3) coaches with a *related* college major scored lower on all three test components than did coaches with *unrelated* college majors and coaches who did not attend college; and (4) coaches who reported special training scored lower on all three test components than did coaches who reported no special training. Additionally, college major and special training were highly correlated, such that a

response to special training was supplementary information from only the coaches who reported *unrelated* college majors.

Some possible reasons to explain why items relating to education were unable to account for differences in knowledge levels include: (1) small sample sizes for various subgroups of coaches (e.g., coaches who completed only high school for education; coaches who attained PhD degrees; coaches who taught related courses; and coaches who received special training); (2) overall sample size for analysis was cut almost in half when addressing the relatedness of courses taught—97 coaches in this sample were *coaches only* by title and, therefore, did not teach any classes; and (3) for this sample of coaches, gender presented as the leading variable that explains differences in scores across most knowledge items in the questionnaire. Due to the strength of the gender variable, research with future samples of coaches should include gender as a co-variate in all analyses.

Although the "Sport Coached" variable was not hypothesized to explain differences in knowledge levels, a main effect was found for this sample of coaches. Further examination of the data indicated that certain sports were coached exclusively or overwhelmingly by females—for example, gymnastics, dance, cheerleading, volleyball, and swimming. Indeed, mean knowledge scores for coaches of these sports were higher than mean knowledge scores for coaches of other sports. Future investigations, once again, need to control for the effects of gender in all analyses.

As an open-ended item, "Number of Athletes on Team" understandably yielded a wide array of responses. These responses required grouping into ranges for the purposes of coding, data entry, and subsequent analysis (e.g., 1-5, 6-10, 11-15). Further grouping may be necessary in future investigations to allow for appropriate analysis of this variable. For example, teams could be grouped according to "small," "medium," and "large" (the specific number of athletes forming each of these categorical variables must be defined by the researcher). At this point, it is not clear how (or if) the size of an athletic team influences the knowledge and attitudes of coaches. Some possible research questions to ask related to this variable of interest include: (1) Do larger teams have more discussion among the athletes such that opportunities for hearing and learning about MC-related issues increase for the coach?; (2) Do larger teams contribute to a coach's understanding of MC-related issues

simply by virtue of the number and diversity of athletes available to the coach for discussion?; and (3) Do smaller teams have a stronger sense of relatedness or belongingness such that these athletes feel more comfortable discussing these issues with coaches and other athletes? Team dynamics would need to be investigated in an effort to explore this variable and, accordingly, interviews and observations may be necessary as data-gathering tools.

A further variable of interest regarding team dynamics is whether the sport is an individual or team sport. This variable of interest did not emerge during the test construction process and so it was not presented on the questionnaire. It may be possible to extract this variable from the "Sport Coached" variable, but it would be simpler and more efficient to include this variable as a forced-choice option on the questionnaire. The idea of comparing coaches of team and individual sports arose, not only from exploring the "Number of Athletes on Team" variable, but also from a coach's comment on the questionnaire. This coach indicated that he did not need to know more about MC-related issues and elaborated with the following statement:

> Thus far in my still-young coaching career, menstrual cycle-related issues have not arisen (at least none of which I have been aware). It just doesn't seem appropriate for me to get involved in this aspect of my players' lives. If a young woman can't play on a given day, the team has to adjust. Perhaps it's easier for me to deal with these issues since I coach a team sport. Menstrual cycle-related issues might be a bigger factor for those who coach individual sports like golf or tennis. (Just a thought...).

This line of thinking would be worth exploring since an individual sport athlete is solely responsible for her performance. In cases where an individual sport athlete's performance is debilitated by MC-related symptoms, a coach may only have three options: (1) play the athlete and risk competitive failure or injury; (2) forfeit the event and ensure a loss; or (3) replace the athlete with a substitute, if possible. Athletes who participate in team sports have other athletes on the team who may be able to compensate for any poor individual performance. Thus, a team sport athlete whose performance is debilitated by MC-related symptoms may still be played without necessarily affecting the outcome of the event

(i.e., a win or a loss). Of course, other factors may mediate in these scenarios, such as: (1) the critical nature of the position on the team (e.g., pitcher of a softball team); and (2) the depth of the team roster (i.e., number of substitute athletes available to the coach). Still, the hypothesis that MC-related issues may be more salient to coaches of individual sport athletes may be considered for future research. An investigation into the consequences of athletic injuries to coaches of individual and team sports may be worthwhile as a starting point.

"Years of Overall Coaching Experience," as an open-ended item, was another variable that yielded a wide array of responses. This variable also necessitated additional attention during the scoring and data entry process to create coded groups or ranges (e.g., <1 year; 1-4 years; 5-9 years). It would be more efficient to present this variable as forced-choice, but it is so highly related to the coaches' ages that this information may be redundant. In general, younger coaches had fewer years of coaching experience whereas older coaches had more years of coaching experience. Moreover, younger coaches cannot possibly have more years of coaching experience than they have lived and it was rare to have an older coach with few years of coaching experience in this sample of coaches. Based on results from this sample of coaches, "Years of Overall Coaching Experience" should be eliminated from the questionnaire.

Coaches' age would be preferred over "Years of Overall Coaching Experience" because it allows for further classification of females into menopausal status groups. As gender was the primary factor in explaining knowledge differences across coaches in this sample, and female coaches had significantly higher knowledge scores than did male coaches, it may be interesting to examine further differences in each gender subgroup. This line of inquiry includes questions related to menopausal status: (1) Do younger women (pre-menopausal) know more about MC-related issues because they are so salient?; (2) Do younger women know more about OC because they are using them (as opposed to post-menopausal women who have stopped menstruating and, thus, would not require OC as a means of birth control)?; (3) Do older women (menopausal and post-menopausal) know more about MC-related issues because they have experienced them over many more years?;

and (4) Do older women (post-menopausal) know more about OC because they have daughters who are now of the age to consider using OC?

Results from this sample of coaches were mixed. Overall, there were no significant differences in general knowledge test scores across age groups of female coaches (albeit the sample sizes in the age range categories of 45-49, 50-54, and 55-59 were relatively small). However, with the exception of coaches aged 45-49 years (who produced the lowest scores), older coaches (aged 40-59 years) scored higher on the MC and total tests than did younger coaches (aged 20-39 years). Additionally, coaches aged 20-24 years and 50-59 years scored highest on the OC test. Larger sample sizes of female coaches are necessary to examine differences in knowledge levels in relationship to age and to begin to address the reasons *why* females may differ in their knowledge of MC-related and OC-related issues.

The ethnicity of the coach was not related to items on the questionnaire and, moreover, the only ethnic group that was well represented by this sample was the Caucasian ethnicity. Coaches who reported African-American ethnicity made up only 9.7% of the sample; coaches who reported Hispanic ethnicity made up only 1.4% of the sample; there were no coaches of an Asian or Native American ethnicity; and 1.9% of coaches in the sample declined to indicate their ethnicity. Perhaps an option that reads, "I prefer not to report my ethnicity," should be included with this item to definitively identify that preference. The lack of response for this item does not necessarily mean that a coach preferred not to answer the item; perhaps the coach accidentally skipped this item due to distraction or due to a layout characteristic of the questionnaire items. In the future, the questionnaire would need to be extended across regions of the United States and, if possible, across various countries to assess the knowledge and attitudes of coaches from various ethnic backgrounds. The instrument needs to undergo further scrutiny and pretesting before such a large-scale endeavor can commence.

Lastly, marital status was considered a variable of interest related to male coaches. Specifically, it was hypothesized that married male coaches who are married would score higher on knowledge tests than would male coaches who are single. Although the main effect for marital status was not statistically significant, married male coaches did score higher on all three test components than did male coaches who are single. Interestingly,

male coaches who are divorced (thus, once married) scored the highest. The sample sizes for single male coaches (n = 13) and divorced male coaches (n = 5) were, admittedly, very small. This item should likely be retained on the questionnaire for further investigation with larger and more diverse samples of coaches since the general hypothesized trend in knowledge scores was apparent for this sample of male coaches. It is recognized, however, that there may be single men who date women and who take an interest in MC-related and OC-related issues of their significant others' lives; alternatively, it is also recognized that there may be married men who do not wish to be involved in the MC-related and OC-related issues of their significant others' lives.

Section 2: General Knowledge of the MC and OC

This section of the questionnaire contains a 24-item multiple-choice knowledge test that resulted in 3 scores for each coach: (1) MC knowledge score; (2) OC knowledge score; and (3) total knowledge score. In addition to examining the knowledge scores as they related to demographic variables (as discussed in the previous section), knowledge items were also scrutinized through an item analysis process to address their internal consistency. The complete item analysis is presented in Chapter 5 ("Results") of this document.

First and foremost, the recommendation from focus group 1 during the test construction phase to reduce the likelihood of guessing correctly by providing the response option, "I am not sure," was appropriate. Indeed, the "I am not sure" response option was chosen at a much greater frequency by coaches in the lower group of knowledge scores than by coaches in the upper group of knowledge scores. This option should be retained for all multiple-choice items on future versions of the questionnaire.

Secondly, it is recognized that considerations for scoring, coding, data entry, analysis, and interpretation were not afforded appropriate attention during the item construction phase. Specifically, the inclusion of items like #4 on section 2 of the questionnaire (i.e., "Circle all of the physical changes that you believe can occur to women throughout the menstrual cycle."), wherein multiple response options are correct answers to the stem, made it difficult to complete an item analysis. This type of item may be presented as a series of True/False items in subsequent tests since this type of item is not a true

multiple-choice item as it is currently presented. Moreover, items #21 and #22 further complicated scoring and coding because they both presented the response option "all of the above." This option was unnecessary due to the fact that coaches could simply encircle all of the other available responses to, literally, choose all of the above. This oversight may also be corrected by presenting this type of item as a series of True/False items. For example, item #21 currently reads:

> What is/are the warning sign(s) that may signal the onset of pill-related problems?
> (a) chest pain
> (b) yellowing of the skin
> (c) pain in the calf of the leg
> (d) none of the above
> (e) all of the above
> (f) I am not sure

On the revised questionnaire, the item may read as a series of True/False items such as:

> Chest pain is a warning sign that may signal the onset of pill-related problems.
> (a) True
> (b) False
> (c) I am not sure
>
> Yellowing of the skin is a warning sign that may signal the onset of pill-related problems.
> (a) True
> (b) False
> (c) I am not sure
>
> Pain in the calf of the leg is a warning sign that may signal the onset of pill-related problems.

(a) True

(b) False

(c) I am not sure

Repeatedly reading stems that are similar may lead to boredom, confusion, or distractibility and, thus risks non-response or errors. Perhaps it would be best to present the items as follows:

A warning sign that may signal the onset of pill-related problems is _____:

Chest pain	(a) True	(b) False	(c) I am not sure
Yellowing of the skin	(a) True	(b) False	(c) I am not sure
Pain in the calf of the leg	(a) True	(b) False	(c) I am not sure

Continued discussion with focus group members and further pretesting will aid in revising the knowledge test items, although not all of the test items require revision.

Regarding the true multiple-choice items presented in this section (n = 11), six items met the research-based standards of item analysis criteria (i.e., acceptable difficulty index, p, and acceptable discrimination index, D):

9. Regarding the menstrual cycle, what **may** happen to a female who overtrains in sport or exercise?;

10. What is menstrual synchrony (assume hormonal substances, like birth control pills, are **not** being used)?;

11. What is amenorrhea?;

16. How many weeks include "active" pills in a standard pack of birth control pills?;

17. How many weeks include "inactive" pills in a standard pack of birth control pills?; and

18. What **may** happen when "inactive" pills are skipped and "active" pills are continuously taken in their place?

Four additional multiple-choice items may meet research-based standards with the simple revision of one distractor item, as each of these items had one response option that was not chosen by any of the coaches in this sample:

1. What is the **average** duration of one complete menstrual cycle?
   None of the coaches chose (d) 42 days;
2. What is the **average** duration of a menstrual bleeding period?
   None of the coaches chose (d) 13 days;
3. At about what age do **most** girls being to menstruate?
   None of the coaches chose (d) age 18 years; and

15. How many pills are in a standard pack of birth control pills?
    None of the coaches chose (d) 42

It must be noted, however, that items #15, #16, and #17 are related in content, such that an incorrect response to one item may lead to incorrect responses for the other items. In essence, answering all three items correctly or incorrectly may serve to indicate that a respondent has knowledge about only one area—not about three distinct areas. For this sample of coaches, responses to items #16 and #17 were significantly correlated (Pearson's $r = 0.881$, $p < 0.001$). Responses to item #15 were also significantly correlated to item #16 (Pearson's $r = 0.332$, $p < 0.001$) and to item #17 (Pearson's $r = 0.361$, $p < 0.001$), although the strength of these correlations were not as high as the strength of the correlation between items #16 and #17. Accordingly, a revised version of the questionnaire may retain item #15 for further investigation, but eliminate either item #16 or item #17.

The remaining multiple-choice item (i.e., item #6 "What does the abbreviation PMS represent?") should be removed as it was extremely easy and, thus, did not discriminate between coaches with knowledge and coaches without knowledge. It is worth noting, however, that one male coach who indicated in item #29 of section 4 that he needed to know more about MC-related issues elaborated upon the reason why with the following comment:

Well…I thought PMS was during menstrual cycle…apparently it is afterward? I need to know more for sure!

Regarding the True/False items and the multiple-choice items that were treated as True/False items during item analysis, 34 items met research-based standards. Retention of these items would result in a True/False knowledge test that may appear as follows:

Physical changes that occur to women throughout the menstrual cycle include _____:

Migraine	(a) True	(b) False	(c) I am not sure
Diarrhea	(a) True	(b) False	(c) I am not sure
Weight Gain	(a) True	(b) False	(c) I am not sure

Areas that are potentially altered by the menstrual cycle include _____:

Cognition	(a) True	(b) False	(c) I am not sure
Aggression	(a) True	(b) False	(c) I am not sure
Diet	(a) True	(b) False	(c) I am not sure
Sleep	(a) True	(b) False	(c) I am not sure

Symptoms that may accompany PMS include _____:

Tension	(a) True	(b) False	(c) I am not sure
Headache	(a) True	(b) False	(c) I am not sure
Depression	(a) True	(b) False	(c) I am not sure
Fatigue	(a) True	(b) False	(c) I am not sure
Breast Swelling	(a) True	(b) False	(c) I am not sure
Increased Appetite	(a) True	(b) False	(c) I am not sure
Constipation	(a) True	(b) False	(c) I am not sure
Abdominal Bloating	(a) True	(b) False	(c) I am not sure
Anxiety	(a) True	(b) False	(c) I am not sure
Insomnia	(a) True	(b) False	(c) I am not sure
Dizziness	(a) True	(b) False	(c) I am not sure

Nausea (a) True (b) False (c) I am not sure

Methods for alleviating symptoms associated with the MC and PMS include _____:

Oral Contraceptives (a) True (b) False (c) I am not sure

OTC Medications (a) True (b) False (c) I am not sure

Dietary Changes (a) True (b) False (c) I am not sure

Vitamin Therapy (a) True (b) False (c) I am not sure

Breathing Exercises (a) True (b) False (c) I am not sure

Relaxation Training (a) True (b) False (c) I am not sure

Exercise (a) True (b) False (c) I am not sure

Benefits that can potentially result from the use of birth control pills include _____:

Relief from painful periods (a) True (b) False (c) I am not sure

Relief from PMS (a) True (b) False (c) I am not sure

Decreased blood flow (a) True (b) False (c) I am not sure

Reduced acne (a) True (b) False (c) I am not sure

Risks that are potentially associated with the use of birth control pills include _____:

Weight Gain (a) True (b) False (c) I am not sure

Conditions that may make it dangerous for a woman to use the pill include _____:

High Blood Pressure (a) True (b) False (c) I am not sure

Smoking (a) True (b) False (c) I am not sure

Other than pregnancy, there are currently no methods available to women for reducing the frequency of menstruation.

(a) True (b) False (c) I am not sure

It is important to point out that the correct answer to all of these items is "True." While this type of presentation may lend itself to easier and more efficient processes

involved in evaluation, this type of presentation may elicit a response pattern from test takers—that is, if a test taker, indeed, has the knowledge that any of these items is "True" and, accordingly, begins to encircle the (a) option to those items, s/he may have the tendency to simply select all of the remaining (a) options as a response pattern. Additionally, savvy test takers may actually "catch on" to the fact that every correct answer is "True." These occurrences that undermine the validity of obtained scores (due to the introduction of construct-irrelevant variance), were not apparent with this sample of coaches. For that reason, the original presentation of these items may need to be retained. Further pretesting is necessary to determine the type of presentation that leads to optimal internal consistency of items and, ultimately, to improved validity in the interpretation and utility of test scores.

Finally, additional measures using Cronbach's coefficient alpha indicate high internal consistency of items across the MC test, OC test, and total test. Alpha levels that are too high (e.g., = 0.95), however, may indicate redundancy in items. The high alpha levels for the test components (i.e., MC test, a = 0.93; OC test, a = 0.84; and total test, a = 0.94) may be explained by the fact that 24 test items were essentially reformatted into 93 test items during the item analysis process. Alpha levels generally increase when the number of test items increases. Importantly, internal consistency not only addresses the reliability of item performance, but high internal consistency may provide initial support for the structural validity of an instrument (Clark & Watson, 1995; Loevinger, 1957; Messick, 1995).

Section 3: Specific Knowledge of Athletes' MC and OC Use

Several concerns regarding the construction and presentation of items in section 3 arose from pretesting the questionnaire with this sample of coaches. Much like the items in section 2, appropriate attention was not devoted to the evaluation component of the study, making score computation and data interpretation difficult. Moreover, the construct-irrelevant variance that is introduced in this section due to test construction errors threatens the instrument's construct validity and, thereby, weakens the validity of score interpretation and utility.

For example, item #1 assesses whether or not a coach knows if any athletes have begun their MC. Any response that indicated one or more athletes have begun their MC was

coded as demonstrating knowledge. Many coaches, especially at the college level, wrote in "all." It often had to be inferred that if a coach knew that all of the athletes on the team have begun their MC, then *zero* athletes on the team have *not* begun their MC. Thus, for the purposes of scoring responses to item #3, those coaches who listed "all" in item #1 were also credited as having knowledge about item #3. This caused problems because coaches of college-aged athletes were included in the same sample with coaches of middle school-aged athletes. Based on the current scoring scheme for these items, a college coach would be credited with having knowledge about two items simply by virtue of answering one item; conversely, a middle school coach would be credited with knowledge about two items only by answering both items (assuming the middle school coach did not also write "all" as a response to item #1). Item #3 does not seem to be a relevant item to all coaches. Moreover, is knowledge of the *absence* or *lack of* an incident an appropriate area to measure? That is, if an athlete doesn't discuss that which she does not yet have, does this mean that a coach lacks knowledge in this area? This item may not be a valid measure of knowledge and, given its lack of relevance to coaches of postmenarcheal athletes, it should be considered for elimination from the questionnaire.

Another scoring difficulty with items #1 and #3 stemmed from an examination of the open-ended responses that followed (i.e., free responses to items #2 and #4). For example, some coaches indicated in items #2 and #4 that they assumed their athletes have begun their MC based on their ages. That assumption may not indicate specific knowledge of their athletes (it may indicate, instead, general knowledge about the average age of the onset of menses). Also, other coaches responded that they know their athletes have begun their MC because they observed athletes borrowing sanitary products from each other or because they overhear athletes complaining about symptoms of their MC. This may, indirectly, afford coaches knowledge about their athletes, but it may more appropriately indicate their ability to pay attention to their athletes (which is still useful information).

In order to use responses from item #1 properly, it may be appropriate to simply consider the indication of knowledge as knowledge, no matter how a coach comes by the information. Perhaps responses to item #2 reflect the coaches' level of involvement or communication with athletes. For example, coaches who reported knowing because the

athletes informed them or because the athletes asked them for supplies may have a different relationship with their athletes than coaches who acquired the knowledge by asking the athletic trainer or by reviewing athletes' health forms. This difference in coaching style, level of involvement, or communication style (however the construct is to be defined) may be a global trait/style of the coach or it may be specific to the topics of the MC and OC use. It would be interesting to compare coaches' scores or profiles on a measure of communication style with a tool specific to the topic of athletic injury (not gender-specific) and also to a tool specific to the topic of the MC (especially because female focus group members indicated that they view MC-related symptoms as pains or discomfort that are not unlike what is experienced when any athlete, male or female, is sick or injured).

In the sample used in this research, male coaches seemed more closed to MC-related issues whereas female coaches seemed more open to MC-related issues. Are these patterns consistent when dealing with injured female athletes or with injured male athletes? In the future, it may be more worthwhile to explore this line of inquiry with male coaches only, as female coaches (1) are more likely to be open to discussing MC-related issues, and (2) do not typically coach male athletes, such that a comparison across gender in that scenario would not be permissible.

Item #7 in section 3 of the questionnaire (i.e., "Are any of the athletes using oral contraceptives?") also presented scoring interpretation difficulties for items #7, #8, and #9. If a coach answered "yes" to item #7, then the ability to answer item #8 (i.e., "If yes, how many athletes on your team use oral contraceptives?") and item #9 (i.e., "Please circle all of the reasons why the athletes are using oral contraceptives.") would allow for demonstration of further knowledge. However, if a coach answered "no" to item #7, then items #8 and #9 did not apply to him. Nevertheless, knowledge may still be credited to coaches for those items, because answering "no" to item #7 implies knowing the answer to #8 is zero and knowing the answer to #9 is "none" or "not applicable" (although those response options were not offered). The same problematic issues in items #1 and #3 regarding ages of athletes coached apply here, but only in regard to middle school coaches in this case. College coaches who are more likely to coach athletes who might be using OC, needed to answer all three items to demonstrate knowledge for each (assuming they answered "yes" to item #7).

In contrast, middle school coaches who are less likely to coach athletes who might be using OC, only needed to answer "no" to item #7 to be credited with knowledge of item #8. Due to this flaw in test design, responses to item #9 were not assigned a knowledge score and, thus, were not examined across various demographic variables.

As previously stated in Chapter 5, items #10 through #17 are misplaced in this section of the questionnaire that proposes to measure coaches' specific knowledge of their athletes. These items assess beliefs about the potential of OC to benefit and/or harm athletes (items #10-#13) and behavior on behalf of those beliefs (items #14-#17)—that is, whether or not coaches have encouraged or discouraged the use of OC by their athletes. Moreover, very few coaches answered "yes" to either item #14 or item #16, resulting in a small sample size for those subgroups during analysis. It seems surprising that approximately 46% of coaches believe that OC can benefit their athletes, but that only approximately 6% of coaches have encouraged the use of OC by their athletes. Either these items measure very different things, or item #14 may need to be revised (or both). Based upon the content analysis of responses to item #15, it may be more valuable to present item #14 as:

> If you knew that one of your athletes experienced negative symptoms associated with her MC, would you recommend that the athlete speak to a medical professional and/or parent about the possibility of using OC?

Items #14 through #17 may need to be eliminated altogether from the questionnaire because the percentages for items #16 and #17 were very small. Specifically, approximately 29% of coaches believe that OC can harm their athletes, but only 1% of coaches have discouraged the use of OC by their athletes. Several coaches indicated that this area was none of their business, not their place, a personal matter of the athlete, and so forth. While these items provide little room for comparing subgroups of coaches, they do offer valuable information related to the reasons coaches do not engage in behaviors on behalf of their beliefs.

Items #18 and #19 (i.e., "Do any of your athletes ever complain of PMS? and "If yes, how many athletes complain of PMS?," respectively) of this section present the same

scoring dilemma as the aforementioned items relating to specific knowledge. An additional point of interest concerning items #18 and #19 and, incidentally, item #21, is that knowledge related to these items did not differ significantly by coach. Gender differences were significant across almost every other specific knowledge item in this section, as well as across general knowledge test scores. Furthermore, most coaches (92.8%) reported having knowledge whether or not athletes or their team complain about PMS. Once again, does this item directly measure knowledge, the ability of a coach to listen to or pay attention to their team, or something else entirely? Perhaps this item more prominently indicates the level of openness and discussion among athletes—that is, it may speak to team dynamics instead. Also, what role do expectations and beliefs play in answering this question, especially for male coaches? In general, do male coaches tend to believe that all or most women suffer from PMS such that they would tend to respond in the affirmative for this item regardless of real incidence? At a more fundamental and test construction level, if a coach does not know what the acronym PMS represents, how would s/he be able to answer this question (albeit only 7 coaches in this sample did not know what PMS represents)? The lack of differentiation in responses to items #18, #19, and #21 from male and female coaches does not provide support for external validity, as it is expected that responses to these knowledge items would differ according to gender (based upon pretesting the questionnaire with this sample of coaches and based upon prior research related to gender differences in knowledge of female health and/or reproductive issues; e.g., Beier & Ackerman, 2003; Dyer, Abrahams, Mokoena, & van der Spuy, 2004; Hollander, 1997; Werner, 1988).

In conclusion, section 3 of the questionnaire necessitates substantial revision and, perhaps, requires further work with focus groups to determine the more fundamental issue of its appropriateness for inclusion in the questionnaire. Based on feedback from the focus group members who participated in this study, it may not be critical that a coach has knowledge about athletes' specific MC-related issues; it is, however, important to athletes that a coach be supportive and understanding once MC-related issues are evident (whether recognized by the coach or made known by the athlete).

If specific knowledge of athletes' MC-related issues is deemed salient, then the overall goal for this section would be to design a series of items that is able to produce a

composite score indicating self-reported level of knowledge. Unlike the general knowledge test, where responses may be scored dichotomously as either correct or incorrect, responses to items assessing specific knowledge may need to permit occurrence along a continuum (after all, there are multiple athletes on a team, such that a coach may know about one or two athletes, but not necessarily the entire team of athletes). In this case, specific knowledge items may be presented as follows:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I know when my athletes are having their periods.	1	2	3	4	5
I know the symptoms experienced by my athletes when they are having their periods.	1	2	3	4	5
I know the strategies my athletes use to cope with the symptoms of their periods.	1	2	3	4	5
I know how my athletes prefer to be treated when they are having their periods.	1	2	3	4	5
I know what level of performance to expect from my athletes when they are having their periods.	1	2	3	4	5
I know how long my athletes' periods last.	1	2	3	4	5
I know the phrases my athletes use to describe when they are having their periods.	1	2	3	4	5
I know what to expect from my athletes during practice when they are having their periods.	1	2	3	4	5

I know what to expect from my athletes during competition when they are having their periods.	1	2	3	4	5
I know the symptoms experienced by my athletes before they start their periods.	1	2	3	4	5
I know how athletes who are having their periods affect other athletes on the team.	1	2	3	4	5

Additionally, similar items phrased in the opposite language may be included to assess internal consistency and to examine if there are any response patterns among coaches. For example, consider the item "I know how long my athletes' periods last." Another item may be included that reads, "I do not know the duration of my athletes' periods." Items like this simply need to be reverse scored during data entry for the purposes of meaningful analysis. An alternative scoring scale may be appropriate if specific instructions are provided to coaches: "Please assess how true each of the following statements is based on the *number of athletes* on your team that you have knowledge about." The Likert-type scale would then read: 0 = "None," 1 = "Few," 2 = "Some," 3 = "Most," 4 = "Almost All."

Section 4: Beliefs and Attitudes Regarding the MC and Sport Performance

This section of the questionnaire instructed coaches that "[t]he following questions pertain to your experiences and opinions as a coach, in general, over the span of your coaching experience." Responses to these 34 items were not "scored" in any way—that is, no rubric for defining a coach's belief pattern was established. However, as this line of inquiry is exploratory in nature, descriptive reports and content analyses of coaches' responses yielded interesting information. This information may begin to give rise to the social and value consequences of such an instrument or, more specifically, to the social and value consequences of the meaning and utility of scores obtained from such an instrument (i.e., consequential basis of validity, as recommended by Messick, 1995).

For example, the following trends emerged from this sample of coaches: (1) the majority of coaches believe that the MC has the potential to influence sport performance (moreover, the majority of coaches believe the MC *negatively* affects performance); (2) the majority of coaches have experienced an athlete withdrawing from practice due to MC issues; (3) the majority of coaches view MC issues as a source of stress for athletes; (4) the majority of coaches would want to know if an athlete consistently performed worse or better during a certain time of the month; and (5) more coaches believe they need to know more about MC issues than not. Given these trends, the social and value implications for educating coaches and for tracking athletes' MC and sport performance are apparent. Results from this sample of coaches reveal the relevance and significance of the MC as it relates to female athletics (similar to that which was revealed by focus group members during the course of this study). Overall, it seems this area of research warrants further and more in-depth investigation.

To this end, some modifications to items in section 4 are required. First, items #1 (i.e., "Do you believe that the MC has the potential to influence sport performance?") and #3 (i.e., "Have you ever observed performance change patterns consistent with an athlete's MC?") were asked in an effort to reflect the individual variation among athletes with regard to their MC and sport performance. That is, are coaches aware that some athletes' performances may be negatively affected by their MC, some athletes' performances may be positively affected by their MC, and some athletes' performances are not affected at all by their MC? However, the responses to items #2 and #4 indicated that coaches primarily believe *negative* influences and *negative* performance patterns occur with the MC. Items #1 and #3 were specifically written in a neutral tone so as not to lead coaches to respond in a certain manner. Are coaches' reports about their beliefs and observations an indication of reality, or are they a product of poorly constructed test items? Perhaps the tone of the questionnaire and/or society's preconceptions lead coaches to focus more on the negative aspects of the MC. To rectify these possibilities and, subsequently, to minimize threats to validity, these items may be revised as follows:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I believe that the MC has the potential to *impair* the sport performance of an athlete.	1	2	3	4	5
I believe that the MC has the potential to *enhance* the sport performance of an athlete.	1	2	3	4	5
I believe that the MC may have *no effect* on the sport performance of an athlete.	1	2	3	4	5
I have observed a monthly pattern of *impaired* performances consistent with an athlete's MC.	1	2	3	4	5
I have observed a monthly pattern of *enhanced* performances consistent with an athlete's MC.	1	2	3	4	5
I have observed a monthly pattern of *consistent* performances, regardless of an athlete's MC.	1	2	3	4	5

Items #5 and #7 produced an interesting trend—almost 64% of coaches in this sample have experienced an athlete withdrawing from *practice* due to MC issues, but only 13.5% have experienced an athlete withdrawing from *competition* due to MC issues. This disparity may warrant further exploration. Are athletes more motivated to engage in competitive events rather than in practice sessions such that they are able to more easily overcome the negative symptoms associated with their MC for competition? Do athletes take advantage of the perceived "less-critical" nature of practices and, thereby, withdraw from practice even when they could "push through" (some coaches in this sample believe that athletes use their MC as an excuse)? Additionally, where lack of practice may lead to poor performance during competition, is withdrawal from practice a salient issue for

coaches? Intuitively, one would think so, but the responses indicated in the open-ended items to describe feelings and reactions reveal that most coaches are "sympathetic," "understanding," they feel "OK," they think it's "fine," and so forth. Again, these items likely need to be more specific to uncover the answers to pertinent research questions:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I believe that an athlete may use her MC as an excuse to withdraw from *practice*.	1	2	3	4	5
I believe that an athlete may use her MC as an excuse to withdraw from *competition*.	1	2	3	4	5
I believe that an athlete may legitimately need to withdraw from *practice* due to her MC.	1	2	3	4	5
I believe that an athlete may legitimately need to withdraw from *competition* due to her MC.	1	2	3	4	5
I believe that an athlete's withdrawal from practice, due to her MC, may *negatively* affect her performance during competition.	1	2	3	4	5
I believe that an athlete's withdrawal from practice, due to her MC, may *positively* affect her performance during competition.	1	2	3	4	5
I believe that an athlete's withdrawal from practice, due to her MC, may have *no effect* on her performance during competition.	1	2	3	4	5

Items #9, #10, and #11 elicited responses from this sample of coaches that were inconsistent with the beliefs of many focus group members. While coaches and focus group members, alike, view MC issues as a source of stress for athletes, focus group members were more likely to view menstruation much like they view an injury. However, focus group members may be speaking about the *pain* that is common to both menstruation and injury when drawing parallels between the two. As such, the items on the questionnaire were unable to elicit the same view from coaches. For example, item #10 is currently written as, "Do you view menstruation as a form of injury?" Based upon feedback from coaches and from focus group members, most view menstruation as natural—as part of life. Therefore, neither coaches nor focus group members would agree that menstruation is an injury—as is implied by the current phrasing of the item. It may be more appropriate here to address the symptoms that are shared by athletes having their periods (or experiencing premenstrual symptoms) and athletes who are injured, specifically pain. That is, at the most fundamental level is the question, would a coach allow an athlete who is in excruciating pain to participate in practice or competition? The following series of items should be considered:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I understand if an athlete skips practice due to prolonged *vomiting*.	1	2	3	4	5
I understand if an athlete skips practice due to frequent *diarrhea*.	1	2	3	4	5
I understand if an athlete skips practice due to severe *migraines*.	1	2	3	4	5
I understand if an athlete skips practice due to *anemia*.	1	2	3	4	5
I understand if an athlete skips practice due to extreme *cramping*.	1	2	3	4	5
I understand if an athlete skips practice due to her *MC*.	1	2	3	4	5

The first five items present symptoms that are commonly associated with the MC and PMS. However, these symptoms are not *unique* to the MC and PMS. If taken out of context (i.e., removed from the topic of females and their MC), how would coaches respond to these items? It seems that the point from focus group members is that menstruation does not equate with injury, but perhaps the feelings and treatment coaches demonstrate toward athletes who are menstruating and athletes who are injured is (or should be) much the same. After all, coaches may not typically play an athlete who is already in such pain as to risk further injury. Does the *source* of the pain play a role in a coach's attitude about this situation (or the athlete) and, if so, why? Is a stigma associated with females who are in pain from their MC as opposed to females who are in pain because they are injured?

Regarding the extent of communication that takes place on a team, items such as #12 through #19 may be more appropriately assessed through a general assessment in communication style used in conjunction with specific items related to MC topics (this would necessitate the construction of a new tool). This methodology may assist in answering fundamental questions such as, do coaches maintain their typical patterns of communication style when approached with issues related to the MC (as this topic seems to be controversial, sensitive, or taboo)? Do coaches' typical patterns of communication style relate to their attitudes about the MC and/or their subsequent treatment of athletes who are debilitated from MC symptoms?

Measures that typify or profile individuals along various dimensions may be appropriate for these purposes, such as: (1) the *DISC Personality Profile Assessment* that classifies individuals according to the dimensions dominance, influence, steadiness, and conscientiousness—furthermore, individuals may be labeled according to their strengths/weaknesses on the four dimensions as analyzer, implementor, conductor, persuader, promoter, relater, supporter, and coordinator (John Geier, 1990; Friedbert Gay, 2002; based on the work of William Moulton Marston, 1928, 1931); (2) *What's My Communication Style?* is a brief self-reporting tool that classifies individuals along two continua—assertiveness and expressiveness—resulting in four labels or typical styles—direct, spirited, considerate, and systematic (HRDQ Research and Development Team,

1995); and (3) the *Interpersonal Communication Competence Scale* is a brief self-reporting tool that measures individuals along ten dimensions—immediacy, expressiveness, empathy, altercentrism, supportiveness, social relaxation, environmental control, assertiveness, self-disclosure, and interaction management (Rubin, Martin, Bruning, & Powers, 1993) and has been used in investigating the relationships between head coaches and female athletes (see Haselwood, Joyner, Burke, Geyerman, Czech, Munkasy, & Zwald, 2005).

Additional instruments used by Haselwood et al. (2005) in a study of head coaches and their competence in communicating with the female athletes whom they coach include: (1) the *Communicator Competence Questionnaire* that examines competence from the perspective of the receiver (Monge, Bachman, Dillard, & Eisenberg, 1981); and (2) a modified version of the *Scale for Effective Communication in Sports Teams* that examines individuals according to three factors—considerate communication, close communication, and angry communication (Sullivan, 2000).

Responses to items #20 through #23 in section 4 demonstrate an inexplicable trend for this sample of coaches: (1) the majority of coaches believe that the MC *negatively* influences sport performance; and (2) the majority of coaches have experienced an athlete withdrawing from practice due to her MC; and (3) the majority of coaches view the MC as a source of stress for athletes; *but* (4) the majority of coaches do *not* change their expectations of athletes who are on their period or who have PMS. This sample of coaches cited a long list of reasons why they believe the MC negatively influences sport performance—fatigue, cramping, loss of focus, pain, affected mood and attitude, decreased endurance, loss of coordination, slow, decreased motivation—but, they don't expect any changes in their athletes' performance levels? One coach who reported changing his/her expectations reported, "[I] do not expect as much; I do not let them know this but it is how I react." Perhaps it is perceived as socially unacceptable to answer in the affirmative for these items. Much like other areas in this section of the questionnaire, this domain of coaching behavior or cognition necessitates a greater number of items to be adequately assessed.

Assuming coaches completed the questionnaire items in the order in which they were presented, by the time coaches reached items #24 through #30, they had already completed 10 pages of questionnaire items. Remarkably, approximately 98% of coaches in this sample

completed the items on the last page of the questionnaire (not counting the items exclusively for female coaches).

The open-ended items on this page of the questionnaire elicited some markedly different responses from coaches. For example, one coach who responded "yes" to item #24 (i.e., "If it could be documented that an athlete consistently performed worse or better during a certain time of the month, would you want to know?") elaborated by stating, "Every coach would want to know if their athlete is hampered in any way so to make adjustments, or if she is in her top level." In contrast, one coach who responded "no" to item #24 elaborated by commenting, "Not an area of which I'm comfortable knowing of or discussing!" Does this coach actually mean that he is not comfortable knowing about the performance levels of his athletes? Based on several comments from item #25, it is clear that numerous coaches were unable to read this statement exactly as it is written (i.e., to refrain from assuming that the item pertains to females only or that "time of the month" equates to a female's menstrual period). It is apparently difficult for test takers to remove items from the contextual framework in which they are presented. Moreover, given that "time of the month" is a common phrase used to describe the female menstrual cycle, it is recognized that this item needs to be revised.

Items #27 and #28 also elicited strikingly different responses from coaches. For example, one coach who answered "yes" to item #27 (i.e., "If an athlete could safely manipulate her cycle around important competitive events, would you encourage this practice?") elaborated by commenting, "What kind of question is this? I am paid to win." In contrast, one coach who responded "no" to item #27 elaborated by remarking, "I would not want to do anything that could possibly affect the chance of my players having healthy children. Altering God's plan for a cycle is not right. No one can give 100% safety so leave the cycle alone." Also, another coach responded by stating, "That's ridiculous."

The primary implication from reviewing the responses to these two items is that coaches have little knowledge that the practice of manipulating the MC through the use of OC (1) has been used by female athletes for quite some time now, and (2) is currently being marketed to women (regardless of any affiliation with sport) across the United States in television commercials and in print advertisements. For example: (1) Seasonale® and

Seasonique™ allow just four periods a year and have been on the market for several years now; (2) Yaz™, Yasmin®, and Loestrin® reduce the duration of a menstrual period to approximately three days; and, more recently, (3) Lybrel® is now available to stop menstruation altogether while using it and it is approved by the FDA (although this oral contraceptive was not available at the time the coaches completed this questionnaire).

Coaches also noted in item #28 that they felt uncomfortable with the word "manipulate," remarking that it had a negative connotation. The word "encourage" may also present some uneasiness as it is a rather proactive behavior. The item may be revised to read, "If an athlete could safely *change* her cycle (or *stop* her cycle) for important competitive events, would you *support* this practice?"

Lastly, it was somewhat discouraging to learn that only 44% of coaches in this sample believed that they generally needed to know more about MC issues (item #29). However, further examination of the responses to item #30 provided some insight as to why this percentage may have been low. At least one coach misread the item, based upon this statement, "Again, I've gone through and seen enough of the general. I would like to know a little more about problems." Another coach said that it depends on the athlete. Item #29 was not intended to imply having specific, personal knowledge of an athlete. It was written to capture these types of questions: (1) Do you need to know more about what the MC is?; (2) Do you need to know more about the symptoms that accompany the MC?; (3) Do you need to know more about what PMS is?; (4) Do you need to know more about how the MC can influence sport performance?; and so forth (e.g., much of the information that was addressed in the general knowledge test). It was believed that the phrase "menstrual cycle-related issues" could encompass those domains. In the future, as the general knowledge test is refined and the specific knowledge test is reconstructed, the following types of items may be placed at the end of each section:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I would like to know more about the MC, in general.	1	2	3	4	5

I would like to know more about the symptoms that accompany the MC.	1	2	3	4	5
I would like to know more about PMS.	1	2	3	4	5
I would like to know more about the symptoms that accompany PMS.	1	2	3	4	5
I would like to know more about OC, in general.	1	2	3	4	5
I would like to know more about the benefits of using OC.	1	2	3	4	5
I would like to know more about the risks of using OC.	1	2	3	4	5
I would like to know more about my athletes' MC.	1	2	3	4	5
I would like to know more about my athletes' OC use.	1	2	3	4	5

Validity and Reliability: Current and Future Considerations

During the course of this study, consideration was afforded to issues of validity and reliability in accordance with the perspectives of Messick (1995), who emphasizes validity as a "unified concept" (p. 741). Although the overall validity of test scores is relatively weak at this stage of instrument design, some evidence that supports various aspects of validity was available and, thus, was discussed in the previous sections where relevant (threats to validity were also discussed). However, some elements of evidential strengths and weaknesses have not yet been addressed; therefore, a more comprehensive look at validity follows.

Messick (1995) asserts that validity involves a comprehensive evaluation of the degree to which both theory and empirical evidence substantiate the suitability, meaning,

and utility of score inferences. This approach abandons the line of thinking that a *test* can be valid and replaces it instead with the view that the *score meaning* and *future action* on its behalf must be valid. Thus, Messick incorporates empiricism (need for research-based evidence/support) and social values (consequences of score meaning and utility) into the concept of validity of test interpretation and use.

More specifically, Messick (1995) emphasizes six dimensions of validity (or the unified conceptualization of "construct validity") that should serve as general validity standards for all assessment tools: (1) content, (2) substantive, (3) structural, (4) generalizability, (5) external, and (6) consequential. These criteria for addressing the issue of construct validity are intended to assist in the judgment that score interpretations are meaningful, appropriate, and useful. In accordance with the outline provided by Messick, the six aspects of construct validity are elaborated upon below as they relate to the goals of this study.

Content Aspect

This aspect of validity is meant to require evidence of content relevance—that questionnaire items were written to appropriately assess coach knowledge of the MC and OC and attitudes/beliefs about the MC, OC use, and sport performance. Moreover, the questionnaire should contain a sufficient number of items to represent each of the construct domains.

Focus groups were utilized to contribute to the content of the questionnaire so that constructed items were appropriate to the domain and inclusive of all important facets of the domain. Content ideas from focus groups composed of athletes (i.e., ideas regarding the general and specific knowledge that athletes *wished* coaches had) provide support for the relevance and representativeness of questionnaire items. Focus groups comprising coaches indicated relevant and representative ways in which coaches' attitudes and beliefs about the MC, OC use, and sport performance may be assessed on a paper-and-pencil instrument. Finally, focus group members with an expertise in testing and measurement principles influenced the content of the demographic portion of the questionnaire as well as the technical quality of test items.

Upon drafting the questionnaire, expert judgment was utilized to appraise the relevance, representativeness, and technical quality of items appearing on the questionnaire. Experts well-versed in the female menstrual cycle and oral contraceptives (i.e., medical personnel in a gynecology office) were deemed appropriate to review the demographic and general knowledge sections of the questionnaire. Based upon the item analysis and internal consistency estimates, the general knowledge test items performed well and require little revision.

The athletes and coaches who participated in designing the specific knowledge and attitudes/beliefs portions of the questionnaire should also serve to substantiate the test content's relevance to and representation of the domain. However, given many of the quantitative and qualitative responses from coaches, it seems that some questionnaire items may not be relevant, some items may not be representative, and some items are neither relevant nor representative. For example, item #1 in section 4 attempts to capture a coach's view of the relationship between the MC and sport performance. As presented (i.e., "Do you believe the MC has the potential to influence sport performance?"), the item is unable to cover all aspects of this view: (1) regarding *the MC*, there is the premenstrual phase, the menstrual bleeding period, and the postmenstrual phase; (2) regarding *influence*, there may be a negative or positive influence; and (3) regarding *sport performance*, there must be a defining structure—practice, competition, wins/losses, and so forth. The additional open-ended item #2 that follows item #1 was intended to allow for expanded coverage, but it is clear that the test taker should not be relied upon to compensate for a poorly constructed test item. Continued focus group sessions are required to address the necessary revisions for items in sections 3 and 4.

Substantive Aspect

The substantive aspect of validity overlaps the content aspect in that they are both concerned with the content of the questionnaire being representative of the construct domain. However, substantive issues go beyond this to include "the need for empirical evidence of response consistencies or performance regularities reflective of domain processes" (Messick, 1995, p. 745). This component of construct validity requires that the *processes* necessary to engage in the task performance be observed. Messick (1995) cites

recording response times, detecting eye movement patterns, and observing "think aloud" sessions as exemplar methods in gathering support for the substantive component of validity. In this study, coaches were not observed or recorded in any fashion while they completed the questionnaires.

In anticipation that cognitive processes inherent in answering questions of knowledge would lead to guessing on the two knowledge sections of the questionnaire, a response choice of "I am not sure" was included. Also, the test instructions directed that the respondent refrain from guessing and, instead, to choose "I am not sure" if there was uncertainty about a response to an item. However, consideration must be given to the fact that a response of "I am not sure" may not represent the construct of knowledge level (a lack of knowledge, in this case), but instead represent low self-efficacy. Nevertheless, the "I am not sure" response option was chosen by the coaches in the lower knowledge score group at a much higher rate than by the coaches in the upper knowledge score group.

Structural Aspect

The structural aspect of construct validity requires the gathering of evidence to support the structure and dimensionality of the domain—evidence that may be best acquired through factor analytic procedures (Martinez, Bunderson, & Wiley, 2000). Messick (1995) indicates that this aspect of construct validity also applies to the judgments one must make about the fit of the scoring structure to that of the domain structure. The high level of internal consistency of items on the general knowledge test assist in providing evidence for the structure of section 2.

Generalizability Aspect

Messick's (1995) notion of the generalizability aspect of construct validity encompasses the traditional views of reliability issues for instrument design—that is, an instrument should produce similar results across various tasks of the same domain (e.g., an interview of knowledge and attitudes), across time with the same set of respondents, across various samples and settings, and with different raters or scorers of the instrument. Due to limited financial resources, these additional supports for generalizability were not achieved. The internal consistency of items on the general knowledge test was measured and indicated

high levels of internal reliability: MC test, a = 0.93; OC test, a = 0.84; and total test, a = 0.94.

External Aspect

External aspects of construct validity require that the instrument correspond to other measures like it in a similar fashion (convergent evidence) and also that the instrument be distinct from other measures unlike it (divergent evidence). Here again, limited financial resources precluded the achievement of these separate studies. However, Messick (1995) also notes that "the constructs represented in the assessment should rationally account for the external pattern of correlations" (p. 745). As anticipated, significant gender differences were found across scores on the general knowledge test and across almost all of the specific knowledge items. More specifically, female coaches scored significantly higher on the MC test, OC test, and overall test than did male coaches and, additionally, female coaches demonstrated a greater amount of specific knowledge about the athletes whom they coach. It should be noted, however, that a bias against male coaches may be present related to knowledge test items, such that low-scoring female coaches may still achieve higher test scores than high-scoring male coaches. As such, future investigations of respondent data should incorporate gender as a co-variate in all analyses and should also examine the interaction effects with other variables.

Lastly, where unexpected trends arose from pretesting the questionnaire with this sample of coaches (e.g., general knowledge test scores were not related to college major), the threats to external validity were discussed in previous sections.

Consequential Aspect

Consequential aspects of validity extend from the external concern with applied use and application of scores to question "the intended and unintended consequences of score interpretation and use in both the short- and long-term" (Messick, 1995, p. 746). This aspect represents Messick's inclusion of social values into a unified concept of construct validity and he remarks that the social consequences of the use of test inferences may be both positive and negative. The crucial threat here is that any negative social consequences that might occur should not arise from flawed properties of the test. Messick notes that, "low scores should not occur because the assessment is missing something relevant to the focal

construct that, if present, would have permitted the affected persons to display their competence" (p. 746). This is an important consideration especially for the development of a knowledge questionnaire. In general, the social and value consequences of utilizing the information from this questionnaire may be a need to educate coaches and a need to track athletes' menstrual cycles. These two implications are supported by coaches' responses to various questionnaire items, but they were discussed primarily in section 4 of this chapter.

Summary

Although this 12-page questionnaire produced an overwhelming amount of quantitative and qualitative data, several key outcomes prevailed. In reference to the overall purpose and research questions of this investigation, focus group members and coaches substantiated the significance of examining the area of the MC and sport performance. Concerning the test construction process, (1) the scoring and interpretation of responses must be a primary consideration during the design phase of an instrument; (2) focus group sessions should be more numerous, more diverse, and more "focused"; and (3) scales based on different constructs should be distinct, relevant, and comprehensive. Lastly, regarding the exploration of responses from the sample of 207 coaches, general and specific knowledge consistently differed according to the gender and age of the coach, such that these categorical variables should be treated as co-variates in future studies and interaction effects with other variables should be examined.

At the heart of this investigation and what inspired exploration of a somewhat sensitive research topic was the question, "Does the menstrual cycle influence sport performance?" Based on feedback from focus group members and from 207 coaches—and as contended earlier in this document—it depends on the athlete.

APPENDIX A
HUMAN SUBJECTS APPROVAL LETTERS

Florida State
UNIVERSITY

Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida 32306-2763
(850) 644-8633 · FAX (850) 644-4392

APPROVAL MEMORANDUM

Date: 8/11/2004

To:
Teresa Johnson
1950 North Point Blvd. #917
Tallahassee Fl 32308

Dept.: **EDUCATIONAL PSYCHOLOGY AND LEARNING SYSTEMS**

From: **John Tomkowiak, Chair** John Tomkowiak M.D.

Re: **Use of Human Subjects in Research**
General Knowledge of the Menstrual Cycle(MC) and Oral Contraceptives (OC) Specific Knowledge of Athletes' MC and OC use, and Attitudes toward MC and OC use as they relate to Sport Performance: The conceptualization and development of a Questionnaire

The forms that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Human Subjects Committee at its meeting on **6/9/2004**. Your project was approved by the Committee.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals which may be required.

If the project has not been completed by **6/8/2005** you must request renewed approval for continuation of the project.

You are advised that any change in protocol in this project must be approved by resubmission of the project to the Committee for approval. Also, the principal investigator must promptly report, in writing, any unexpected problems causing risks to research subjects or others.

By copy of this memorandum, the chairman of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols of such investigations as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Protection from Research Risks. The Assurance Number is IRB00000446.

cc: David Pargman
HSC No. 2004.414

Florida State
UNIVERSITY

Office of the Vice President
For Research
Tallahassee, Florida 32306-2763
(850) 644-8673 · FAX (850) 644-4392

APPROVAL MEMORANDUM

Human Subjects Committee

Date: 8/13/2003

Teresa Johnson
1950 North Point Blvd., Apt. 917
Tallahassee, FL 32308

Dept.: **Educational Psychology & Learning Systems**

From: **David Quadagno, Chair** DQ/ph

Re: **Use of Human Subjects in Research**
Menstrual Cycle and Female Athletic Performance: Coach Perspectives

The forms that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Secretary, the Chair, and two members of the Human Subjects Committee. Your project is determined to be exempt per 45 CFR § 46.101(b) 2 and has been approved by an accelerated review process.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals, which may be required.

If the project has not been completed by **8/12/2004** you must request renewed approval for continuation of the project.

You are advised that any change in protocol in this project must be approved by resubmission of the project to the Committee for approval. Also, the principal investigator must promptly report, in writing, any unexpected problems causing risks to research subjects or others.

By copy of this memorandum, the chairman of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols of such investigations as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Protection from Research Risks. The Assurance Number is IRB00000446.

Cc: David Pargman
HSC No. 2003.373

Florida State
UNIVERSITY

Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida 32306-2763
(850) 644-8633· FAX (850) 644-4392

REAPPROVAL MEMORANDUM

Date: 10/18/2004

To:
Teresa Johnson
1950 North Point Blvd., Apt. 917
Tallahassee, FL 32308

Dept.: **Educational Psychology & Learning Systems**

From: **John Tomkowiak, Chair** John Tomkowiak M.D.

Re: **Reapproval of Use of Human subjects in Research:**
Menstrual Cycle and Female Athletic Performance: Coach Perspectives

Your request to continue the research project listed above involving human subjects has been approved by the Human Subjects Committee. If your project has not been completed by 8/12/2005 please request renewed approval.

You are reminded that a change in protocol in this project must be approved by resubmission of the project to the Committee for approval. Also, the principal investigator must report to the Chair promptly, and in writing, any unanticipated problems involving risks to subjects or others.

By copy of this memorandum, the Chairman of your department and/or your major professor are reminded of their responsibility for being informed concerning research projects involving human subjects in their department. They are advised to review the protocols of such investigations as often as necessary to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

Cc: David Pargman
HSC No. 2004.625-R

APPENDIX B
INFORMED CONSENT LETTERS

Informed Consent

I freely and voluntarily, and without element of force or coercion, consent to participate in the research project entitled, "General Knowledge of the Menstrual Cycle (MC) and Oral Contraceptives (OC), Specific Knowledge of Athletes' MC and OC Use, and Attitudes toward MC and OC Use as They Relate to Sport Performance: The Conceptualization and Development of a Questionnaire for Athletic Coaches," conducted by Teresa Johnson, M.S., Florida State University. This study partially fulfills the requirements for a Ph.D. degree in sport psychology at Florida State University. This study will design a questionnaire to assess coach knowledge and attitudes about general and athlete-specific menstrual cycle issues.

I understand that I will be asked to participate in a focused group discussion composed of six to twelve members led by the researcher. I understand that this focused group discussion will entail offering insights and ideas for the design of a questionnaire to be used with athletic coaches that will assess their knowledge and attitudes about the menstrual cycles, oral contraceptive use, and sport performance of the athletes whom they coach. I understand that the focused group discussion will be recorded both on an audio device and in a written format by the researcher and an independent recorder. All recordings of the focus groups will be confidential, to the extent allowed by law, and audio recordings will be destroyed three years following their recording date.

I understand that I will also complete a brief demographic questionnaire used only to provide a profile of focus group composition. I understand that my name will appear on the questionnaire to be viewed only by the researcher, but that my name will not appear in conjunction with any information provided in the focus group. Focus group discussions should last approximately one to one and a half hours.

Participation in this study is voluntary and may be refused or withdrawn at any time without prejudice or penalty. There are no foreseeable risks to you by participating in this study. You may benefit by becoming aware of a potentially significant issue regarding females and athletic performance and by reflecting upon your perspectives as a female athlete or individual who works with female athletic teams.

I understand that I have the right to ask and have answered any inquiry concerning this study. Any questions have been answered to my satisfaction. I also understand that I may contact Teresa Johnson, (850) 385-5994, for further questions and to obtain group results. I may also contact Dr. David Pargman, faculty advisor, (850) 644-8793, for additional questions and concerns, and I may contact the Human Subjects Committee at Florida State University, (850) 644-8633, for issues concerning my rights as a subject in this study. Thank you for your consideration and your important contribution to this study is greatly appreciated.

I have read and fully understand this consent form.

_____ _____

Signature Printed Name

Informed Consent

I freely and voluntarily, and without element of force or coercion, consent to participate in the research project entitled, "The Menstrual Cycle and Female Athletic Performance: Coach Perspectives," conducted by Teresa Johnson, M.S., Florida State University. This study partially fulfills the requirements for a Ph.D. degree in sport psychology at Florida State University. This study will assess coach knowledge and attitudes about general and athlete-specific menstrual cycle issues.

I understand that I will be asked to complete one paper-and-pencil questionnaire that asks general questions about me as a coach and questions concerning my perspectives on the menstrual cycle and female athletic performance. Completion of the questionnaire will take approximately 20 minutes. I understand that my name will not appear on the questionnaire, or on any of the results obtained from the questionnaire. I understand that my specific responses to items on this questionnaire will remain confidential, to the extent allowed by law. Moreover, individual results will not be reported; only group findings will be available. Completed questionnaires and all data related to this study will be stored in a locked filing cabinet in the researcher's home, to which only the researcher will have access. Additionally, all materials related to this study will be destroyed on December 11, 2007.

Participation in this study is voluntary and may be refused or withdrawn at any time without prejudice or penalty. There are no foreseeable risks to you by participating in this study. You may benefit by becoming aware of a potentially significant issue regarding females and athletic performance and by reflecting upon your perspectives as a coach.

I understand that I have the right to ask and have answered any inquiry concerning this study. Any questions have been answered to my satisfaction. I also understand that I may contact Teresa Johnson, (828) 713-4148, for further questions and to obtain group results. I may also contact Dr. David Pargman, faculty advisor, via pargman@mail.coe.fsu.edu, for additional questions or concerns, and I may contact the Human Subjects Committee at Florida State University, (850) 644-8633, for issues concerning my rights as a subject in this study. Thank you for your consideration and your important contribution to this study is greatly appreciated.

I have read and fully understand this consent form.

_____

Coach Signature

_____

Date

APPENDIX C
COACH QUESTIONNAIRE COVER LETTER

Teresa Johnson
262 Rose Hill Road
Asheville, NC 28803
828-713-4148

Dear Coach,

Coaching in women's sports requires a thoughtful and extensive understanding of the unique and multidimensional female athlete. The menstrual cycle, in particular, presents a special set of circumstances that almost every female athlete must eventually encounter. As a coach, you are undoubtedly a significant and influential factor in the lives of the female athletes whom you coach. Accordingly, your perspectives on the menstrual cycle, oral contraceptives (i.e., birth control pills), and their relationship to sport performance are important views to document. The larger, overall goal of such documentation is to ultimately aid in addressing *why* female athletes vary in their experiences with the menstrual cycle and sport.

The attached questionnaire assesses your perspectives on these issues and presents general demographic items to you simply to gain a "profile" of each coach who completes the questionnaire. The questionnaire only *appears* lengthy because each page comprises mostly *space* for your responses—the questionnaire can generally be completed in 20-30 minutes.

Your participation in this research endeavor is making a significant contribution to the study of issues related to women's sports. It is also aiding in dissertation research necessary for the completion of a doctorate degree in Sport Psychology at Florida State University. Your sincere and thoughtful insights into this area are truly appreciated.

Please retain this letter as a record of contact information and return the signed consent form and completed questionnaire to your principal, athletic director, or mailbox, as appropriate. If you have questions, concerns, or ideas regarding this research, please call me, Teresa Johnson, 828-713-4148 or faculty advisor Dr. David Pargman, 850-644-8793. If you have questions concerning your rights as a participant in this study, please call the Florida State University Human Subjects Committee, 850-644-8633. A copy of the questionnaire, answers to the multiple-choice items in section 2, additional information about this research area, and overall group results may be accessed via the web address http://garnet.fsu.edu/~trj0112/research/ beginning March 2005.

Thank you for your time and effort.

With Great Appreciation,

Teresa Johnson, M.S.
Sport and Educational Psychology
Florida State University

APPENDIX D
QUESTIONNAIRE FOR COACHES

The Menstrual Cycle and Female Athletic Performance: Coach Perspectives

Section 1

Please circle your responses to the following items when choices are presented. When choices are not presented for an item, please write in your responses in your most legible handwriting. Additional space is available on the back of each page.

School of Employment: _____

Title of Employment at School: _____

Course(s) Taught at School: _____
(if applicable)

Sport(s) Coached: _____
(indicate head coach, assistant coach, volunteer coach, etc. for each sport)

Number of Athletes on Team(s): _____
(please specify for each team you coach)

Age Range of Athletes on Team(s): _____
(please specify for each team you coach)

Years of Overall Coaching Experience: _____
(not limited to current school and/or sport)

Your Gender: (1) Male
(2) Female

Your Age: (1) 18-19
(2) 20-24
(3) 25-29
(4) 30-34
(5) 35-39
(6) 40-44
(7) 45-49
(8) 50-54
(9) 55-59
(10) 60 or over

Your Ethnicity: (1) White / Caucasian
(2) Black / African-American
(3) Hispanic
(4) Asian
(5) Native American
(6) Other,_____

Your Highest Educational Level Completed: (1) High School
(2) 2-year College
(3) 4-year College
(4) Master's Degree
(5) Ph. D. Degree
(6) Other,_____

Your Marital Status: (1) Single
(2) Married
(3) Divorced
(4) Widowed
(5) Other,_____

Your College Major(s): _____
(if applicable)

Please describe any courses or special training you have received regarding the female reproductive system, the menstrual cycle, or oral contraceptives (i.e., birth control pills). _____

_____

_____

The following information is requested **only** because it is believed that your responses may have a bearing on your perspectives of the menstrual cycle, oral contraceptives, and female athletic performance.

Are there any females present in your household who have begun their menstrual cycle?

(1) Yes
(2) No

If yes, what is their relationship to you? _____

Are there any females present in your household who currently use or have formerly used oral contraceptives?

(1) Yes
(2) No

If yes, what is their relationship to you? _____

Section 2

Please circle the best answer(s) to the following items. Please do not guess. If you are not certain of the best answer(s) to an item, please choose the response "I am not sure."

1. What is the **average** duration of one complete menstrual cycle?

   (a) 21 days
   (b) 28 days
   (c) 35 days
   (d) 42 days
   (e) I am not sure

2. What is the **average** duration of a menstrual bleeding period?

   (a) 2 days
   (b) 5 days
   (c) 9 days
   (d) 13 days
   (e) I am not sure

3. At about what age do **most** girls begin to menstruate?

   (a) age 9 years
   (b) age 12 years
   (c) age 15 years
   (d) age 18 years
   (e) I am not sure

4. Circle all of the physical changes that you believe can occur to women throughout the menstrual cycle.

(a) abdominal pain
(b) cramping
(c) migraine
(d) diarrhea
(e) fluid retention
(f) weight gain
(g) altered alcohol tolerance
(h) altered zinc and potassium levels
(i) aggravated asthma
(j) I am not sure

5. Circle all of the areas that you believe can potentially be altered by the menstrual cycle.

(a) cognition
(b) mood
(c) aggression
(d) alcohol consumption
(e) diet
(f) sleep
(g) suicide
(h) accident proneness
(i) I am not sure

6. What does the abbreviation PMS represent?

(a) perimenstrual stage
(b) postmenstrual shock
(c) premenstrual syndrome
(d) painful menstruation syndrome
(e) I am not sure

7. Circle all of the symptoms that you believe may accompany PMS.

(a) irritability
(b) tension
(c) headache
(d) depression
(e) fatigue
(f) breast swelling
(g) increased appetite
(h) constipation
(i) abdominal bloating
(j) anxiety
(k) forgetfulness
(l) insomnia
(m) cold sweats
(n) dizziness
(o) nausea
(p) I am not sure

8. Circle all of the methods you believe are available for alleviating symptoms of the menstrual cycle and PMS.

(a) oral contraceptives
(b) diuretics
(c) antidepressants
(d) over-the-counter pain medication
(e) dietary changes
(f) vitamin therapy
(g) breathing exercises
(h) relaxation training
(i) psychotherapy
(j) exercise
(k) I am not sure

9. Regarding the menstrual cycle, what **may** happen to a female who overtrains in sport or exercise?

(a) estrogen concentration may become toxic
(b) progesterone concentration may become toxic
(c) menstruation may stop
(d) the anterior pituitary gland may shrink
(e) I am not sure

10. What is menstrual synchrony (assume hormonal substances, like birth control pills, are **not** being used)?

(a) a condition wherein a woman gets her period on the same day of the week every cycle
(b) a condition wherein a group of women sharing time and/or space exhibit similar menstrual cycles
(c) a condition wherein a woman gets her period at the same time of day every cycle
(d) a condition wherein a woman can determine her fertility every cycle
(e) I am not sure

11. What is amenorrhea?

(a) a condition of the absence of menstruation
(b) a condition of regular patterns of menstrual cycle functioning
(c) a condition of irregular patterns of menstrual cycle functioning
(d) a condition of painful menstruation
(e) I am not sure

12. Circle the times when you believe pain can occur in a menstrual cycle.

(a) before a period
(b) during a period
(c) after a period
(d) I am not sure

13. Circle all of the benefits you believe can potentially result from the use of birth control pills.

(a) menstrual cycle regulation
(b) relief from headaches
(c) relief from painful periods
(d) relief from PMS
(e) decreased menstrual blood flow
(f) reduced risk for endometrial cancer
(g) reduced risk for ovarian cancer
(h) reduced risk for benign breast disease
(i) reduced risk of pelvic inflammatory disease
(j) reduced risk of sexually transmitted diseases
(k) reduced acne
(l) reduced iron-deficiency anemia
(m) fewer ovarian cysts
(n) fewer ectopic pregnancies
(o) I am not sure

14. Circle all of the risks you believe are potentially associated with the use of birth control pills.

(a) bleeding irregularities
(b) headache or migraine
(c) gastrointestinal upset
(d) breast tenderness
(e) weight gain
(f) blood clotting
(g) acne
(h) hypertension
(i) increased risk for human papilloma virus
(j) increased risk for cervical cancer
(k) fatigue
(l) I am not sure

15. How many pills are in a standard pack of birth control pills?

(a) 21
(b) 28
(c) 35
(d) 42
(e) I am not sure

16. How many weeks include “active” pills in a standard pack of birth control pills?

(a) 1
(b) 2
(c) 3
(d) 4
(e) I am not sure

17. How many weeks include "inactive" pills in a standard pack of birth control pills?

(a) 1
(b) 2
(c) 3
(d) 4
(e) I am not sure

18. What **may** happen when "inactive" pills are skipped and "active" pills are continuously taken in their place?

(a) menstrual periods stop
(b) a woman becomes permanently infertile
(c) menstrual periods occur continuously
(d) the pill as a contraceptive becomes ineffective
(e) I am not sure

19. There is medical research to support that reducing the frequency of menstruation may have health benefits.

(a) True
(b) False
(c) I am not sure

20. Other than pregnancy, there are currently no methods available to women for reducing the frequency of menstruation.

(a) True
(b) False
(c) I am not sure

21. What is/are the warning sign(s) that may signal the onset of pill-related problems?

(a) chest pain
(b) yellowing of the skin
(c) pain in the calf of the leg
(d) none of the above
(e) all of the above
(f) I am not sure

22. What medical condition(s) may make it dangerous for a woman to use the pill?

(a) high blood pressure
(b) smoking
(c) diabetes
(d) none of the above
(e) all of the above
(f) I am not sure

23. Birth control pills are **not** available over the counter in the United States—a qualified individual must prescribe them.

(a) True
(b) False
(c) I am not sure

24. Many women consider using birth control pills for reasons other than preventing pregnancy.

(a) True
(b) False
(c) I am not sure

Section 3

The following questions pertain specifically to the athletes whom you coach. Refer to your current team(s) if your sport(s) is/are currently in pre-season or in season; refer to your previous team(s) if your sport(s) is/are not yet in pre-season or season. Please circle your responses when presented with choices, or write in your responses when provided spaces. Please do not guess. If you are not certain of the answer to an item, please write in or choose "I am not sure."

1. How many athletes on your team do you know, **for certain**, have begun their menstrual cycles? _____

2. How do you know this information? _____

_____

3. How many athletes on your team do you know, **for certain**, have **not** begun their menstrual cycles? _____

4. How do you know this information? _____

_____

5. Of the athletes who have begun their menstrual cycles, do you know when any of them are menstruating (i.e., on their "period")?

   (a) Yes
   (b) No
   (c) I am not sure

6. If yes, how do you know this information? _____

_____

7. Are any of the athletes using oral contraceptives (i.e., birth control pills)?

   (a) Yes
   (b) No
   (c) I am not sure

8. If yes, how many athletes on your team use oral contraceptives? _____

9. Please circle all of the reasons why the athletes are using oral contraceptives.

   (a) Prevent pregnancy
   (b) Minimize menstrual blood flow
   (c) Alleviate cramping/pain
   (d) Regulate menstrual cycle
   (e) Reduce acne
   (f) Others, please specify _____
   (g) I am not sure

10. Do you believe oral contraceptives can **benefit** your athletes?

    (a) Yes
    (b) No
    (c) I am not sure

11. Why or why not? _____

_____

_____

12. Do you believe oral contraceptive can **harm** your athletes?

    (a) Yes
    (b) No
    (c) I am not sure

13. Why or why not? _____

_____

_____

14. Have you ever **encouraged** the use of oral contraceptives by your athletes?

    (a) Yes
    (b) No

15. Why or why not? _____

_____

_____

16. Have you ever **discouraged** the use of oral contraceptives by your athletes?

    (a) Yes
    (b) No

17. Why or why not? _____

_____

_____

18. Do any of your athletes ever complain of PMS?

    (a) Yes
    (b) No
    (c) I am not sure

19. If yes, how many athletes complain of PMS? _____

20. What strategies do your athletes use to cope with the symptoms related to the menstrual cycle and PMS? _____

_____

_____

21. List any specific words or phrases used by your team to describe when one of the athletes is menstruating. _____

_____

_____

Section 4

The following questions pertain to your experiences and opinions as a coach, in general, over the span of your coaching experience. Please circle your responses when presented with choices, or write in your responses when provided spaces. Additional space is available on the back of each page.

1. Do you believe that the menstrual cycle has the potential to influence sport performance?

   (a) Yes
   (b) No
   (c) I am not sure

2. If yes, in what way(s)? _____

_____

_____

3. Have you ever observed performance change patterns consistent with an athlete's menstrual cycle?

   (a) Yes
   (b) No
   (c) I am not sure

4. If yes, please explain. _____

_____

_____

5. Have any athletes whom you have coached ever withdrawn from a practice or training session because of menstrual cycle-related issues?

   (a) Yes
   (b) No
   (c) I am not sure

6. If yes, how did you feel and react? _____

_____

_____

7. Have any athletes whom you have coached ever withdrawn from competition because of menstrual cycle-related issues?

   (a) Yes
   (b) No
   (c) I am not sure

8. If yes, how did you feel and react? _____

_____

_____

9. Do you view menstrual cycle-related issues as a source of stress for athletes?

   (a) Yes
   (b) No
   (c) I am not sure

10. Do you view menstruation as a form of injury?

    (a) Yes
    (b) No
    (c) I am not sure

11. Do you view PMS as a form of injury?

    (a) Yes
    (b) No
    (c) I am not sure

12. Do athletes generally talk to you about menstrual cycle-related issues?

    (a) Yes
    (b) No

13. If yes, please describe. _____

_____

_____

14. If yes, how do you feel when approached about these issues? _____

_____

_____

15. Do parents of athletes generally talk to you about menstrual cycle-related issues?

    (a) Yes
    (b) No

16. If yes, please describe. _____

_____

_____

17. If yes, how do you feel when approached about these issues? _____

_____

_____

18. Do you generally refer athletes and parents to other professionals when menstrual cycle-related issues arise (for e.g., refer to the school nurse, team physician, athletic trainer, gynecologist)?

    (a) Yes
    (b) No

19. If yes, please list the professional(s) to whom you refer athletes and parents. _____

_____

20. Do you change your expectations of an athlete if you know she is menstruating?

    (a) Yes
    (b) No
    (c) I am not sure

21. If yes, how do your expectations change? _____

_____

_____

22. Do you change your expectations of an athlete if you know she has PMS?

    (a) Yes
    (b) No
    (c) I am not sure

23. If yes, how do your expectations change? _____

_____

_____

24. If it could be documented that an athlete consistently performed worse or better during a certain time of the month, would you want to know?

    (a) Yes
    (b) No
    (c) I am not sure

25. Why or why not? _____

_____

_____

_____

26. If yes to question #24, would you use this information in aiding your decision in selecting athletes for competition?

    (a) Yes
    (b) No
    (c) I am not sure

27. If an athlete could **safely** manipulate her cycle around important competitive events, would you encourage this practice?

    (a) Yes
    (b) No
    (c) I am not sure

28. Why or why not? _____

_____

_____

_____

29. Do you believe you generally need to know more about menstrual cycle-related issues?

    (a) Yes
    (b) No
    (c) I am not sure

30. Why or why not? _____

_____

_____

_____

The following items are to be answered by **female** coaches only.

31. If you **formerly** participated as an athlete in sport, do you believe that your performance was affected by menstrual cycle-related issues?

    (a) Yes
    (b) No
    (c) I am not sure

32. If yes, please explain. _____

_____

_____

_____

33. If you **currently** participate as an athlete in sport, do you believe that your performance is affected by menstrual cycle-related issues?

    (a) Yes
    (b) No
    (c) I am not sure

34. If yes, please explain. _____

_____

_____

_____

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BIOGRAPHICAL SKETCH

Teresa Johnson received her BA degree in Psychology from the University of Central Florida in 1994 and she received her MS degree in Sport and Educational Psychology from the Florida State University (FSU) in 1999. While pursuing her academic endeavors at FSU, Teresa taught for two years in an undergraduate Educational Psychology course and for one semester in an undergraduate Sport Psychology course. Teresa also worked as a Volunteer Assistant Coach with the FSU Women's Softball Team for two years and with the FSU Men's Golf Team for one year. In these roles, Teresa consulted with athletes and coaches on various psychological components and training to work toward enhanced sport performance and overall satisfaction and well-being. Teresa also served one year as President of the Sport Psychology Organization and Research Team (SPORT) and she presented her Master's thesis research in Banff, Alberta at the Association for Applied Sport Psychology conference.