THE EFFECTS OF BIORHYTHM CYCLES ON LABOR ONSET, TIME OF DELIVERY AND OUTCOME OF PREGNANCY

by

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ABSTRACT

This study was an attempt to correlate biorhythm theory to outcomes of pregnancy, such as, labor onset, time of delivery, complications, and subjective experience. Sixty-nine pregnant women were asked to complete 6-week daily checklists to correlate with their computed biorhythms. Analysis showed only 21.7 to 27.5% followed predicted cycles; the frequencies were too small to analyze separately for significance.

Using chi-square analysis, data from all subjects showed labor onset and time of delivery did not occur more frequently than expected in any phase of any biorhythm cycle. Complications occurred more frequently than expected in the positive phase of the physical cycle. Subjective experiences had a positive correlation with the emotional cycle and also with the intellectual critical period. Implications include increased support for women laboring in the negative phase of the emotional cycle or during the critical intellectual period.

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CHAPTER I

INTRODUCTION

Rhythmicity in plants and animals has been recognized from the onset of recorded history. Androsthenes, a foot soldier in Alexander the Great's army, observed that leaves elevate during the day and droop at night (Natalini, 1977). Hippocrates taught Greek physicians to observe rhythms and regularities in patients; treatments involved cyclic regimens based on observed periodicity of symptoms (Luce, 1971). The sun, planets and the moon, sand crabs, birds, mammals, insects and man all display cyclic patterns of movement or behavior which are repeated at regular intervals.

Man's inherent cycles have been the focus of extensive research in this century. Recognition of circadian (or daily) rhythms based on regular physiologic changes have led to the rediscovery that man is not constant, that he functions and reacts differently over an approximate 24-hour period.

Other types of human rhythms were recognized at the beginning of this century. It was proposed from

long-term observational studies that man exhibits a physical, emotional and intellectual cycle of 23, 28, and 33 days, respectively (Thommen, 1973). These cycles may explain mood swings, inconsistencies in physical performance and intellectual abilities. Attempts have been made to correlate outstanding performances, physical and mental illness, accidents and even death to an individual's biorhythms.

The purpose of this study was to examine the events surrounding childbirth and correlate them with the biorhythm cycles of the parturient. The researcher attempted to answer the following questions: First, is there a relationship between the physical, emotional, or intellectual biorhythm cycles and the onset of labor and/or the time of delivery? Secondly, are outcomes of labor or complications in childbirth associated with certain phases or critical periods in the mother's biorhythm cycle?

The cause of labor onset has long been a mystery to medical science. Many theories have been discarded due to lack of physiologic evidence. Even with some recent discoveries of the role of prostaglandins and the fetal adrenal cortex, the actual prime motivator remains unknown. If a correlation can be drawn between onset of labor and a particular

phase of a woman's biorhythm, another factor can be added to current knowledge.

From a practical standpoint, if the majority of labors begin during a particular biorhythm phase, a woman and her health care provider could plan with reasonable certainty for delivery on or about a particular day. This predictability would relieve much of the anxiety of an expectant family in considering transportation, arranging for child care, or wondering if the physician or nurse-midwife will be available. The increasing emotional strain a pregnant woman experiences with waiting and wondering when labor will start would also be eliminated.

In addition, if the outcome of the birth correlates with the woman's biorhythms, a certain amount of anticipatory care can be incorporated into the management of labor and delivery. For example, if the woman's physical cycle is in a negative phase (defined as a period of lower energies and decreased endurance, a recharging period), allowance can be made for her to get the required rest in early labor in order to conserve energy for the active phase. An emotionally low biorhythm may indicate the need for much more supportive care during labor. An unfavorable biorhythm pattern may require more

aggressive intervention and/or preparation to the nurse-midwife who must anticipate possible problems in order to call for physician back-up before the emergency occurs.

Definition of Terms

Circadian Rhythms

Circadian rhythms were defined as regular fluctuations in an organism that repeat themselves over approximately a 24-hour period, for example, rest and activity.

Ultradian Rhythms

Ultradian rhythms were considered cycles with a higher frequency than a 24-hour period shorter than one day. Examples are REM sleep, cardiac and respiratory rhythms.

Infradian Rhythms

Infradian rhythms were defined as cycles with periods longer than a day, (weekly, monthly, and yearly) periodic illnesses and the menstrual cycle.

Biorhythm Theory

Originated by Fliess, Swoboda, and Teltscher, biorhythm theory claims men are governed by regular fluctuations of three cycles: the physical, emo-

tional (or sensitivity), and intellectual. These cycles are fixed in frequency, begin on the day of birth in a positive upswing, are unchanging throughout life, and therefore are predictable by simple mathematical calculations.

Physical Cycle

A physical cycle was defined as 23-day rhythm which affects the following physical abilities: strength, endurance, energy, resistance to disease and illness.

Emotional Cycle

An emotional cycle was considered 28-day rhythm which influences sensitivity, creativity, mood, and emotional reactions.

Intellectual Cycle

An intellectual cycle was defined as 33-day rhythm which governs mental responses: memory, creative thinking, cognitive learning, decision-making abilities.

Positive Phase

The first half of each cycle in which performance is optimal or potentially high was defined as a positive phase. In this study the positive days are defined as days 2-11½ for the physical cycle, days 2-14 for

the emotional cycle and days 2-16½ for the intellectual cycle.

Critical Day

A critical day was defined as the day in which a cycle changes from a positive to negative phase or the reverse. This occurs on the first day of each cycle and also at the midpoint or day 12½, 15, and 17½ for the physical, emotional and intellectual cycles, respectively. These two days in each cycle are considered potentially dangerous, the days one is most prone to error or accident. For this study, the critical day was calculated for each subject from the time of birth, if known, to 24 hours later. If the time of birth was unknown, the day was calculated from midnight to midnight. For those critical days occurring on days 12½ or 17½, the day began 12 hours after the birth, if known, or at noon on the 12th and 17th day, respectively.

Critical Period

The critical period was defined as an extension of the critical day to allow for effects of cycle changes and for differences in time of birth. (For example, someone born in late evening would theoretically begin his biorhythm day at that time, and the

cycle's influence would be felt the following day.) For this study, the critical period was limited to a 48-hour period beginning 12 hours before the defined critical day and ending 12 hours after. The 48-hour period was selected over the 72-hour period chosen by many researchers because statistical significance does not seem to increase by the broader time period.

Rhythmist

One whose physical, emotional and intellectual fluctuations seem to follow the theoretical biorhythm curves was defined as a rhythmist.

Review of the Literature

Circadian Rhythms

Although daily, monthly and seasonal rhythms were recognized early in history, perhaps the first recorded research of rhythms occurred in 1729 by a French astronomer, d'Ortous de Maison. He experimented with the periodic opening and closing of the leaves of a heliotrope. Hypothesizing that light caused the daily movements, he placed the plants in constant darkness only to discover the periodic movements continued in the absence of light/dark cycle (Natalini, 1977). Further experiments by other

scientists showed that the same periodic movements continued at different temperatures and in constant light (Weston, 1979). It appeared that plants had an inherent biological clock that controlled daily leaf movement even in a constant environment.

Discovery of circadian rhythms in plants sparked an interest in rhythmic behavior in the animal kingdom. Investigations were initiated to observe the behavior of bees gathering honey, birds migrating on a regular schedule, and fiddler crabs changing color each morning and evening. This led to the inevitable discovery that even man is subject to rhythms or an internal clock that persists regardless of environmental changes. Thus the science of chronobiology was born in the 1930s.

The medical literature is replete with research about circadian rhythms in man. Daily fluctuations which are fairly consistent among subjects have been found in temperature, heart rate, blood pressure, respirations, brain function, muscle function, urine amount and composition, blood enzymes and plasma serum (O'Dell, 1975). Many of these changes have been linked to direct or indirect control by a central nervous system (CNS) oscillator which regulates the secretion of adrenal glucocorticosteroids

(Ferin, Halberg, Richart & VandeWiele, 1974). The pituitary also displays circadian periodicity in the release of the hormones prolactin, thyroid-stimulating hormone (TSH) and luteinizing hormone (LH) (Bunning, 1973).

Some rhythms, such as the sleep-wake cycle are synchronized by exogenous factors (also known as Zeitgebers); some examples of Zeitgebers are: light/dark, high/low temperatures, change of tides, humidity, and social environment (Bunning, 1973). A possible link between light/dark cycles and the physiologic changes in the body has been discovered in studies of the pineal gland. Acting as a neurochemical transducer, this gland receives signals from photoreceptive cells and releases melatonin. Melatonin, its precursor serotonin, and a catalyst N-acetyl transferase all display circadian rhythms that are basically endogenous. However, if the light/dark cycle is reversed, these rhythms also reverse gradually over a six-day period (Zwerin, 1976).

The importance of recognizing the internal body rhythms becomes evident when disruptions occur in the daily cycles. It is commonly recognized that desynchronization of the circadian rhythms can result in patterns of illness (Gorman, 1975; Hoskins, 1981;

Luce, 1970). For example, research of the effects of jet lag and night shift or rotating shifts has shown an increased amount of fatigue, hunger or anorexia, constipation, nervousness, tension, decreased mental alertness and decreased physical performance (Tom & Lanuza, 1976). Stress has been shown to interrupt the adrenal system rhythm which consequently results in illness (Luce, 1970). People with a history of chronic depression have demonstrated arrhythmic sleep pattern as well as a different phase of adrenal rhythm than the "normal" population (Luce, 1970).

The implications of these studies are that an awareness of one's body rhythms and a life style consistent with these rhythms will be more beneficial to man by reducing stress and promoting health. Many nursing authors propose that patient assessment should include a review of the individual's biological rhythms so that treatments and interventions may be scheduled at optimal times (Hoskins, 1981; Natalini, 1977; Tom & Lanuza, 1976; O'Dell, 1975). Hoskins (1981) pointed out that most medical/nursing procedures are unfortunately completed in the early morning when the blood levels of adrenal corticosteroids usually peak and the individual has his greatest susceptibility to fear.

Another application of vital concern to nursing is the timing of drug therapy. Chronopharmacology is a relatively new area of research and unfortunately its principles are largely ignored in administering drugs. Yet researchers have shown that by varying dosage and time of administration according to a patient's circadian rhythms, the side effects are reduced and overdosage can be avoided (Natalini, 1977; Hoskins, 1981; Tom & Lanuza, 1976; O'Dell, 1975).

Infradian Rhythms

The most frequently researched infradian rhythm isthe menstrual cycle. As circadian rhythms, a physiologic basis of hormonal fluctuations can be identified. The hypothalamic-pituitary-ovarian feedback mechanism allows for the maturation and release of an ovarian follicle and the sloughing of the endometrial lining of the uterus approximately every 28 days. Mutual interactions of the adrenocortical system and the gonadal steroid hormones affect many other recognizable monthly changes in mood, behavior, and sensitivity in the female. For example, monthly rhythmicity in adrenal glucocorticoid hormones causes fluctuations in carbohydrate metabolism; which accounts for changes in appetite and energy levels associated with the menstrual cycle (Ferin et al., 1974).

A number of other functions which show roughly a monthly rhythm has been identified in the female. Among these are taste, hearing, smell, two-point discrimination, sensitivity to ultraviolet light, acne, allergic reaction, libido and mood (Ferin et al., 1974).

Women are not unique in their monthly cycles. In addition to the circadian rhythms of the male hormone testosterone, the adrenal 17-ketosteroid shows approximately a monthly rhythm (Luce, 1970). Hence men are also subject to periodic changes in mood and sensitivity due to hormonal fluctuations.

Certain diseases display a periodic recurrence of varying cycle lengths. Edema, peritonitis, purpura, and hypertension are a few examples (Luce, 1970). Mental illness also has a periodicity, especially evident in manic-depression and catatonia. The cyclic behavior patterns are sometimes regular and predictable, but many times are random. Whether or not sedatives and antidepressants obscure the internal rhythm is not known (Luce, 1971). As previously mentioned, mental illness may represent a disruption of inherent rhythms.

Biorhythm Theory

The observations of some periodic illnesses are

responsible for the discovery of the biorhythm cycles considered in this study. According to Thommen (1973), the biorhythm theory originated at the turn of the century by a German physician and an Austrian psychologist. In Berlin, Fleiss observed variations between exposure and onset of a disease and also periodicities in illnesses, fever, and death among his patients. Tracing the periodic days to birth, he concluded that man is subject to a 23- and a 28-day rhythm. He incorporated his previously developed theory of bisexuality in man by ascribing the 23-day cycle to masculine or physical traits. Whether these conclusions resulted from empirical evidence or merely from the fact that a 28-day cycle corresponded to the female menstrual cycle is unknown. His published works are in German, and English translations were unavailable for review by this researcher.

Concurrently but independently in Vienna, Swoboda discovered a regular pattern of changes not only in fevers, heart attacks, and edema, but also in emotional behavior, dreams and creativity. He, too, concluded the rhythmicity was basically a 23- and a 28-day cycle that began at birth. He developed a slide rule to calculate certain "critical days" (when the cycle changes from positive to negative or

vice versa) in which a person was more susceptible to illness. Unfortunately, most of his research documentation was destroyed by the Russians during World War II.

The third cycle, labelled intellectual was reported in the 1920s by Teltscher, an Austrian professor. By carefully recording the ups and downs of his students' intellectual abilities, he supposedly found a consistent 33-day cycle. His original data and reports, however, are not available; accounts of his research are based solely on second-hand information (Thommen, 1973).

Explanations for the apparent existence of these three cycles is hazy at best. Shortly after their proponents announced the biorhythm theory, medical scientists proposed that the rhythms possibly resulted from periodic secretions of glands (Thommen, 1973), but there is no research to support this claim. Fliess' explanation of male and female cells may not have been too "far-fetched" when considering the rhythms of the male and female sex hormones. However, these cycles are not consistently regular; they are influenced greatly by age, stress, physical strain, changes in light and temperature and drugs (Ferin et al., 1974).

To justify a totally consistent rhythm set at birth and not subject to internal or external stimuli, some authors sought cycles in the universe to explain man's biorhythms. The influence of the moon on certain emotional changes is recognized though little understood. Cittelson (1977) suggested that the phase of the moon at the time of a person's birth was the key factor, and the 28-day emotional cycle corresponded with the lunar changes. This was supported by an extensive study of accidents by Sandia Laboratories in 1971. Collecting accident data for the previous 25 years, the researchers "asserted the possibility of a heightened accident susceptibility for people during the phase similar to that in which they were born, and for the lunar phase 180^{o} away from that in which they were born" (Gittelson, 1977, p. 37). Unfortunately, Gittelson did not report the statistics from the study, nor whether the results were significant; nor was a reference provided to allow a critical review of the research. Furthermore, corresponding phases of the moon occur not every 28 days but 29.5306 days, the length of a synodic month (Menzel, 1970).

It was further suggested that perhaps the sun's 33-day rotation on its axis influenced the intel-

lectual cycle (Gittelson, 1977). However, this actually varies 25 to 29 days according to solar latitudes (Menzel, 1970). This could possibly explain the lack of significant results with biorhythm studies in different countries. A similar external 23-day cycle influencing the physical abilities of man could not be discerned by this researcher, but conceivably such a cycle could exist in the solar system.

Several researchers have attempted to measure monthly rhythmicity in the laboratory. Hersey conducted a long-term study of moods of factory workers. Based on observations, interviews and questionnaires, he plotted a 33-36 day mood cycle of most workers (Gittelson, 1977).

Neil and Sink (1976) did extensive daily measurements of three naval officers over a 70-day period. The battery of tests included tasks to measure reaction time, movement time and information processing performance. Some patterns emerging from the tests followed approximately the cycles predicted by biorhythm theory, although not necessarily the cycle supposedly being measured by the particular task. In addition, there was considerable individual variation and some of the cycles did not correspond to the expected 23-, 28- and 33-day cycles. The authors

concluded that either the biorhythm theory was invalid, or the tasks were not appropriately measuring physical and intellectual abilities. It is also possible that the three individuals tested were able to mask the influence of their cycles by trying harder, or that the tasks were not sufficiently challenging to the subjects.

These two studies demonstrate what most people know empirically: that people fluctuate in moods and behavior in a fairly regular pattern. Support of the biorhythm theory, however, is not evident from the observed frequencies.

In another attempt to measure intellectual cycles, Neil (Gittelson, 1977) followed four graduate students over a 14-month period to correlate academic performance with their biorhythms. Overall, average performances occurred throughout the cycle, but above average performance occurred mostly during the positive phase (75%), while below average performance occurred mostly in the negative phase. The performance tests were objective in nature and the data were analyzed statistically.

Critical Days

A number of books written for nonprofessional readers (Thommen, 1973; O'Neill & Phillips, 1975; Gittelson,

1977; Wernli, 1976) cite extensive research with impressive percentages to "prove" the existence of the three cycles. They emphasize critical days as potentially dangerous, accident- and illness-prone days. They claim studies indicate that 60-90% of accidents, heart attacks, and death occur on critical days. Such statistics are indeed persuasive, considering that, with two critical days for each cycle, approximately 20% of the days are considered critical (20.3557% as calculated by Thumann, 1977).

One of the early studies often reported was a doctoral dissertation by Schwing in 1939 (Thommen, 1973; Gittelson, 1977). Using information from insurance companies, he attempted to correlate single person accidents and deaths to critical days. Of 700 accidents, he found 401 (57%) occurred on critical days; 197 (65.7%) of 300 deaths occurred on physical or emotional critical days. No tests of significance were reported, but these figures are impressive if indeed Schwing collected a random sample and did not "make allowances" for critical days (considering the 24-hour period before or after the designated critical day would increase the chance of occurrence to 38-60%).

Research by Buchow in 1954 (Thommen, 1973) was directed toward 497 accidents involving agricultural

machinery. He claimed that 24.75% of the accidents occurred on a triple critical day (when all three cycles cross the baseline on the same day; which occurs approximately only once in seven years). Forty-six percent of the accidents occurred on a double critical day (about 1.5% chance occurrence); while another 26.6% occurred on a single critical day. Again the results are astounding; skeptics would certainly question the method of selection for the accident data or the method of analysis.

Sanhein's report of over 1300 accidents in 1975 is included in its entirety in Thumann's book (1977). Sanhein concluded 41.75% of the accidents occurred on critical days and 52.03% occurred during critical periods. He clearly defined and provided rationale for different ways of calculating "critical periods" and demonstrated the different percentages obtained with each method. Unfortunately, many advocates of the biorhythm theory report only the frequencies and not the method of data collection or the expected frequencies for the findings.

With a positive correlation between accidents and critical days established, the next step was application of biorhythm knowledge to reduce industrial accidents. The National Lead Company used this

approach in a quasiexperimental study (Gittelson, 1977). For two groups of workers, biorhythms were computed and foremen were alerted to provide closer supervision or assign the employee to less hazardous jobs when a worker was having a critical day. The third group was given safety warnings, closer supervision and different jobs on a random basis only. After six months, one of the two biorhythm groups reduced their injury rate by 18% over the previous six months; after 18 months injuries were reduced 40%. The second experimental group reduced accidents only slightly. The control group had a 28% increase after 18 months. The use of a control group should eliminate the Hawthorne effects of a safety program. It is unknown whether all groups were equal in accident records at the beginning of the investigation. A number of extraneous variables could have affected the results: the personality and leadership qualities of the foremen involved, the type of work and machinery used, the expertise of the individual worker, and the explanations given each group. Nevertheless, the cost effectiveness of this type accident reduction program was significant to the National Lead Company, regardless of whether the data were statistically significant in supporting the biorhythm theory.

Thommen (1973) reported a study initiated with private pilot accident data from Woodham of the Guggenheim Aviation Safety Center. In his "limited study" (N not identified) he claimed "about 80% of the accidents coincided with the pilot's critical day" (p.67). Apparent small sample size, lack of clearly defined critical periods, and lack of appropriate statistical testing cast doubt on the validity of his claims. Indeed, similar research by Sacher (1974) of 4,600 Navy pilot-error flight accidents and another by Wolcott et al., (reprinted in Thumann, 1977) of 5,845 pilot-involved accidents showed no significant correlation between the expected and actual frequencies of accidents on critical days or any other phase of the biorhythm cycle.

In 1974, United Airlines in San Francisco conducted a pilot study using biorhythms to reduce accidents with apparently favorable results. In a personal correspondence with Halverson (1976), the manager of United Airlines' industrial engineering department expressed his doubt that the results were due solely to biorhythms. He noted employees were more aware of safety because of the project; and by exercising caution during critical periods, they were especially careful over 50% of the time.

Traffic accidents were another area rich for biorhythm research. Willis (1974) found that of 100 fatal single-car accidents in Missouri, 46% occurred on a critical day with more than half of these on an emotional critical day. Similar results have been reported in Japan: 59% of 1,166 traffic accidents occurred on the driver's critical day; 82% of all self-caused traffic accidents in Tokyo in 1971 were on a critical day (Gittelson, 1977); Omi Railroad, using biorhythm charting, had an accident-free record for over 4 million kilometers (Thumann, 1977); a major transportation company with 385 buses and 300 taxis reported 35-40% reduction in accidents by cautioning drivers on critical days (Thommen, 1973). (Some companies used additional incentives, such as a box of candy for each accident-free day, which may have contributed to the reduced accident rate.)

Willis (1974) of Missouri Southern State College investigated biorhythm charts of athletic teams and claimed he could predict outcomes of events with consistent accuracy. A number of individual competitions and record-breaking accomplishments have been explained in terms of biorhythms (O'Neill & Phillips, 1975), but these examples are "hand-picked" and the authors offer "far-fetched" explanations for outcomes

inconsistent with calculated biorhythm cycles.

In the field of medicine, many studies have been conducted in an attempt to correlate biorhythms to illnesses and death. Willis (1975) examined 200 deaths from heart attacks or other medical incidents and found that 56% occurred on a critical day. He introduced the concept of "hospital effect," claiming that medical staff efforts can prolong life when a person would otherwise have died. By considering the three days after a critical day, he was able to raise the frequency to 68%. (Willis did not mention that by increasing the "critical day" period to 4 days, potentially 80% of the days could be included in his count. If so, greater than a 68% frequency of deaths would be expected.) He also noted 27 deaths occurred when two or more cycles were in the negative phase, whereas only 17 occurred when two or more cycles were positive. Of six suicides, four occurred on an emotional critical day, although sample size was much too small to make any generalizations. Of 50 heart attacks, 28 occurred on critical days: 10 on a physical critical day, 11 on emotional, and 7 on intellectual. Willis repeated his study examining 120 deaths the following year with similar results.

In unpublished master's theses, Halverson (1976)

and Andolina (1978) compared biorhythms with myocardial infarctions and cardiac arrests. Both studies were retrospective with data collected from medical records of over 100 patients. Halverson found no significance between critical days and onset of MI or subsequent complications. Andolina's only significant finding was a correlation of cardiac arrests with intellectual critical days. This she explained by suggesting the patient may have acted unwisely, forgotten to take his medicine or overexerted himself. This argument would not be applicable if the patient was in the hospital when the arrest occurred.

The discrepancies in these studies necessitate comment. Willis included only deaths in his research; his method of selection is unknown, but the information was obtained from a local newspaper. His critical days were not defined, nor were his results subjected to appropriate statistical tests. The graduate students chose as subjects survivors of MIs and cardiac arrests, which may in itself imply occurrence on a noncritical day. With MIs, the timing of the pathology was uncertain. Also, the data were collected from medical records, which are subject to numerous human errors and omissions.

A number of investigators considered the relat-

ionship of biorhythms to postoperative complications. Goodman (1975) at Arizona State University examined only elective surgeries and the physical cycle. The incidence of complications during both the critical periods and nadir of the physical cycle were significant at the $p < .001$ level. King (1976) considered cardiac surgeries and found no statistical significance of complications occurring on critical days. Her sample was considerably smaller than Goodman's (N=68). In addition, cardiac surgery is relatively high risk, with 60 of her subjects developing complications. An interesting fact from her study was that all patients having surgery on a critical day (n=16) developed complications.

Simon conducted (1976) a prospective study of 74 subjects and tested critical versus noncritical days for each category of postoperative complications. She found no significant correlation. Another investigator, Messer (1982) utilized 403 elective cholecystectomy patients and considered postoperative infections and need for analgesia. She found greater than the expected frequency of infections in the physical critical and negative periods, but no significant differences. There was a significant difference in mean pain score during emotional

critical or negative periods when compared to positive periods. She also found that significantly fewer infections occurred in a positive emotional phase.

Each of these investigators used a different sample, considered different variables for correlation, and used different methods of analysis for the data. It is, therefore, difficult to conclude any definite support or rejection of the biorhythm theory as applied to surgical complications. All mentioned the probable value of considering the surgeon's biorhythms on the day of surgery.

A number of other investigations were completed at the University of Rochester from 1976 to 1978 under an Office of the Navy Research Grant headed by Armstrong, Miller and Hagopian. In 25 studies of accidents, academic performance, illness, emergency room visits, and compatibility testing, most of the hypotheses tested were nonsignificant. The correlation of human error accidents to biorhythms were found to increase only during an intellectual positive phase (Vanderlinde, 1978). The influence of biorhythms on emergency room visits for nonacute clients showed no significance with date of visit nor onset of symptoms (Baker, 1978). There were no significant

findings in terms of falls in the institutionalized elderly (Wilson, 1978), although many authors claim that the biorhythm cycles tend to desynchronize with advanced age. A study of junior high students and accidents also showed no significant relationship to critical days or periods (Dolan, 1976). Researchers of nursing medication errors found more errors in the negative phase of the physical cycle and fewer in the positive phase (Hoyt, 1978).

Other investigators showed an expected trend in one area, or a single significant finding, but the full reports were not available for review. The major investigators concluded that some, but certainly not all, claims for biorhythms can be accepted. They recommended "that responsible investigators conduct carefully controlled studies to separate the valid and reliable from the unfounded claims" (Armstrong et al., 1978).

Onset of Labor

Two reports were found in the literature dealing with circadian aspects of birth. Kaiser and Halberg (1962) collected data from published reports in the United States and Western Europe from 1848-1960. From a total of 601,222 subjects, they concluded that onset of labor peaked at 0100 hours and normal, spontaneous

deliveries peaked at 0300 to 0400 hours with a nadir at 1700 to 1800. Another interesting finding was that abnormal labors (not further defined) began and terminated at times other than the normal peaks. Also a peak hour of delivery for stillbirths and neonatal deaths occurred in the late afternoon.

Malek, Gleich and Maly (1962) examined labor onset based on data of 92,590 births. They also found a peak time of onset at 0100 hours, with the nadir at 1200 to 1300. Another conclusion they reached was that labors starting before midnight were shorter and associated with fewer surgical deliveries than those beginning after 0200. Although the data of these two studies seem to confirm peak, if not an optimum time of labor onset and birth, it is necessary to question the validity of data about labor collected retrospectively to onset. The exact timing of this event is purely subjective, has various definitions by different authorities, and frequently cannot be determined from information given by the parturient herself. It would be interesting, and far more accurate, to collect data from the laboring woman at the time of admission using precise criteria and compare the findings to the results of these studies.

In addition to circadian rhythms of birth,

seasonal rhythms are also recognized. The number of live births tends to peak in August and September, while perinatal pathologic conditions occur more in January and February (Natalini, 1977). No logical explanation has been offered to account for these phenomena.

Both Kennedy (1981) and Thommen (1973) mentioned a high correlation between onset of labor and/or delivery and the mother's physical or emotional critical day. Their discussion of this "research" is inconclusive; no data or references were given, and none were found in a literature search by this investigator.

Contrary to these reports, an investigation of 286 subjects at the University of Rochester showed an inverse correlation between physical critical periods and labor onset, apgar scores of newborns, or post-partum complications (Armstrong et al., 1978).

Summary

There is substantial evidence that rhythms exist in nature. In the past decade, medical science has explored circadian aspects of almost every measurable physiologic function in man and animals. The conclusions point to the adrenal glucocorticoid system as the prime source of periodicities with stimulation

by a central nervous system (CNS) oscillator. Many rhythms continue regardless of stresses or environmental changes, but some respond to external cues such as light and dark.

The biorhythm theory, as promoted by Thommen in this country, claims man is governed by three cycles that are fixed at birth and continue in a regular pattern regardless of changes impacting on the organism. No physiologic basis has been found to correspond to these cycles; hence, medical science is reluctant to subscribe to the theory.

Conclusions of many studies supporting biorhythms indicate a high frequency of accidents, illnesses, and death occurring on critical days. Most scientific research in recent years does not verify these claims, although some significant findings do suggest the validity of the theory.

The timing of labor and delivery demonstrates a circadian rhythm as well as consistent seasonal variations. The literature links the onset of labor to a physical or emotional critical day, but research to test that hypothesis produced a negative correlation.

Much more research needs to be conducted in the area of biorhythms to validate or reject claims of

how these rhythms impact human lives. Few would reject the concept of rhythmicity, and laboratory testing has demonstrated cycles very similar to the 23-, 28-, and 33-day rhythms under question. Whether or not biorhythms are fixed at birth and the internal (or external) clock that controls the rhythms remains undetermined.

CHAPTER II

METHODOLOGY

Research Questions

This was a descriptive correlational study in which attempts were made to define a relationship between the biorhythm cycle and the onset of labor, time of delivery, and outcomes and/or complications.

The research questions considered were the following:

1. Does labor onset occur more frequently than expected during the positive phase, negative phase, critical days or critical periods of any of the biorhythm cycles?

2. Does time of delivery occur more frequently than expected during the positive phase, negative phase, critical days or critical periods of any of the biorhythm cycles?

3. Do complications, such as premature labor, prolonged labor, hypertension, hemorrhage, infections, emergency Cesarean sections, and infant Apgar scores of less than 7, occur more frequently than

expected during the negative phase, critical day or critical period of any of the cycles?

4. Does a mother's subjective rating of her birth experience correlate with the positive or negative phase, critical days or critical periods of any of the biorhythm cycles?

The study was prospective and data were collected directly from the subjects in an attempt to gather more accurate and complete information than that available from medical records. In addition, attempts were made to verify whether or not each subject was a rhythmist, that is, whether or not she seemed to follow her predicted biorhythm cycles. (Most studies indicate approximately 70% of the total population followed their biorhythms [Kennedy, 1981]. No explanation has been offered for this phenomenon, and the method of arriving at this conclusion was not elucidated.)

Assumptions

The assumptions for this research were as follows:

1. Individuals fluctuate physically, emotionally, and intellectually in 23-, 28-, and 33-day cycles, respectively.

2. Most, but not all, people follow these exact cycles as predicted from the time of birth.

3. An individual can subjectively record his physical, emotional and intellectual status each day, and this information can be correlated to a computed biorhythm curve to indicate whether or not a subject is a rhythmist.

4. The onset and progress of labor and complications of labor and delivery are effected by physical and emotional variables, and therefore are influenced by the mother's biorhythms.

Sample

The target population included all pregnant women, regardless of age, race, parity, socioeconomic status, and so on. The sample was selected from accessible pregnant women in the Salt Lake City area. It was recognized that a majority of residents in this particular city are of one religious-ethnic background. However, since the independent variable of biorhythm cycles is fixed at birth and theoretically unchanged by internal or environmental factors, the demographic variables of the subjects were considered irrelevant to the research questions.

There was no attempt to control for age, race, parity or socioeconomic status. Subjects were limited to those who spoke English to avoid the inconvenience of an interpreter. Also, those who would probably

have a scheduled repeat Cesarean birth were not included since their delivery dates would often be artificially predetermined. However, a subject having a Cesarean section related to complications of labor was included in the sample. Those subjects whose labors were induced were eliminated, unless induction followed spontaneous rupture of membranes. Those who experienced augmentation of labor already in progress were retained in the sample.

A sample of 125 women was desirable to achieve statistical significance. Chi-square tests were used for analysis. The n was derived after consultation with a biostatistician. Using $p = .05$, the computed n was 88; considering that only 70% of the subjects would be expected rhythmists, the necessary sample size was increased to 125 (88 - .70).

Due to time constraints and delays in obtaining permission to attend prenatal classes, data collection was stopped after 106 subjects were recruited. By this time, it was also apparent that very few subjects were classified as rhythmists by the criteria established. The comparison of rhythmists with non-rhythmists would therefore require a much larger sample than was possible to obtain at this time. For most tables analyzing all subjects, a minimum of five fre-

quencies per chi-square cell was achieved. The sample size was therefore considered adequate for the chi-square tests of significance.

Method

Subjects were solicited from prenatal classes at the University of Utah Hospital, LDS Hospital and from private prenatal classes in Salt Lake City. Pregnant women between 28 and 34 weeks gestation were asked to participate in a study on biorhythms in pregnancy. They were told the purpose of the research, a brief explanation of the biorhythm theory, and detailed instructions on what their participation required. An informed consent form was signed by each subject; this consent insured free-will participation, anonymity, and right to withdrawal from the investigation (Appendix A) (A revised consent form was required by LDS Hospital). Subjects were offered a six-month biorhythm chart after completion of data collection in appreciation for their cooperation.

At the time of the initial contact, demographic data were collected from each subject (Appendix B). Included were the subject's date of birth and time, if known, plus the place of birth, in order to adjust the biorhythm cycle for different time zones. A list of complications or pregnancy, derived from obstet-

ric textbooks was included to determine if complications of labor and delivery were related to these predisposing factors. The complications listed were not definitive, nor were medical conditions, such as diabetes and heart disease listed.

Also provided to subjects were Individual Daily Checklist sheets (Appendix C) with instructions to complete them every day for the following six weeks and mail the completed sheets to the researcher. These biorhythm checklists were employed in a previous study by Armstrong et al., (1978) and were utilized with permission. This instrument had not been used previously for determining rhythmists. A subjective tool for this purpose was not found in the literature. Pretesting with six nonpregnant subjects was attempted prior to data collection, but cooperation in conscientiously completing the checklist over a six-week period was limited. Analysis was inconclusive because of insufficient data and time limitations prevented further pretesting of the instrument.

Each subject was given a questionnaire (Appendix D) to provide data for the onset of labor, length of labor, time of delivery, and any complications. The complications included the three most common cause of maternal morbidity: Preeclampsia/eclampsia, in-

fection, and hemorrhage. The complications listed were not defined in medical terms nor were criteria established for "high blood pressure," "fever," or "excessive bleeding." This was a recognized weakness of the questionnaire. It was anticipated that in recruiting women from prenatal classes, the subjects would be more aware of, if not actively involved with, the progress of labor. The questionnaire was to be completed immediately after delivery and mailed to the researcher. Stamped, addressed envelopes were provided.

A telephone call was made to each subject within the first week of participation in order to answer any questions involving completion of the sheets. A second telephone call was made at least two weeks after the subject's EDC to increase the rate of return.

Analysis of Biorhythm Checklists

The KOSMOS I Biorhythm Computer was used to plot individual biorhythm charts, based on each subject's date of birth. The six-week checklists were correlated to biorhythm curves for each subject. A summary of the three cycles and days of each phase as defined for this study are presented in Table 1.

According to the literature (summarized by Thumann, 1977, p. 81), an individual experiences peak

Table 1

Phases of the Biorhythm Cycles

Cycle	Positive Phase	Negative Phase	Critical Days
Physical	Days 2-11½	Days 13½-23	Days 1 & 12½
Emotional	Days 2-14	Days 16-28	Days 1 & 15
Intellectual	Days 2-16½	Days 18½-33	Days 1 & 17½

performance or good moods during the positive phase of the biorhythm cycle, and below par or stressful days during the negative phase. It was expected, therefore, that an individual's "good" days would occur more frequently in the positive phase and "bad" days would be more indicative of the negative phase. Critical days are considered accident-prone days, but since their effect cannot be distinguished from a nadir of the negative phase, and since an accident does not occur on every critical day, these days were not considered for the purposes of defining a rhythmist in this study.

The checklist was composed of three questions relating to each of the biorhythm cycles. (Questions 1-3 referred to the emotional cycle, questions 4-6 the intellectual, and questions 7-9 the physical cycle.) Each question had five rank-ordered choices, which were numbered from 1 to 5 in descending order. For each date the mean of the three questions for each cycle was calculated. If the mean was less than or equal to 2, that day was considered positive or "good" for that particular cycle. A mean equal to or greater than 4 was considered negative or "bad" for that cycle. For each cycle the number of reported positive days over one complete cycle was totaled, and the percentage

of reported positive days occurring during the computed positive phase of the biorhythm cycle was calculated. The total number of reported negative days was also counted, and the percentage of reported negative days during the computed negative phase of the cycle was calculated.

The expected frequencies of events occurring by chance for each cycle are as follows as in reported in Table 2.

Using chi-square analysis, a significant difference from chance events was reached if $\geq$ 61% of reported positive days occurred in the positive phase of any of the cycles, or if $\geq$ 61% of the reported negative days occurred in the negative phase of any of the cycles. This was derived using the following formula for X^2 with 1 degree of freedom:

$$X^2 = \frac{(|O - E| - 0.5)^2}{E}$$

For the positive phase intellectual cycle:

$$X^2_{.95} \quad \frac{(O - 46.97 - 0.5)^2}{46.97} - 3.841$$

$$O \quad 61$$

If a subject's checklist showed that $\geq$ 61% of the positive days and $\geq$ 61% of the negative days

Table 2

Expected Frequencies for Phases of the Biorhythm Cycles

	Positive and Negative	Critical Day	Critical Period	Positive and Negative
Physical	$(\frac{10.5}{23} = 45.652)$	$(\frac{1}{11.5} = 8.696)$	$(\frac{2}{11.5} = 17.39)$	$(\frac{9.5}{23} = 41.305)$
Emotional	$(\frac{13}{28} = 46.428)$	$(\frac{1}{14} = 7.143)$	$(\frac{2}{14} = 14.286)$	$(\frac{12}{28} = 42.857)$
Intellectual	$(\frac{15.5}{33} = 46.97)$	$(\frac{1}{16.5} = 6.06)$	$(\frac{2}{16.5} = 12.12)$	$(\frac{14.5}{33} = 43.94)$

corresponded to the predicted biorhythm cycle, that subject was placed in the rhythmist group. Since the actual number of rhythmists was much lower than expected based on the literature review, only descriptive statistics were used to present data for this group.

Analysis of Delivery Questionnaire

Frequencies were tabulated by hand for the variables occurring in each phase, such as positive, negative, critical days and critical periods, for each of the three cycles. The dependent variables correlated were: a) time of labor onset; b) time of delivery; c) occurrence of complications (premature labor, prolonged labor, hypertension, hemorrhage, infection, Apgar score less than 7 at 1 minute, and Cesarean section); and d) subjective impressions of the childbearing experience. Prolonged labor was determined by the parameters established by Friedman (1978), which are summarized in Table 3.

Chi-square analysis was used to determine whether the observed frequencies were significantly different from the expected frequencies for each phase of each cycle. The level of significance selected was $\alpha = 0.05$. All X^2 values were derived with a hand calculator and also a self-programmed home computer.

Table 3

Parameters of Normal Labor

Phase	Limits of Normal
Latent phase (Onset- 4 cm)	20 hrs. (Nulliparous) 14 hrs. (Multiparous)
Active phase (4 - 8 cm)	1.2 cm/hr. (Nulliparous) 1.5 cm/hr. (Multiparous)
Deceleration (8 - 10 cm)	3 hrs. (Nulliparous) 1 hr. (Multiparous)
Descent (2nd stage)	1.0 cm/hr. (Nulliparous) 2.0 cm/hr. (Multiparous)

Note. Total length of 1st stage of labor:
Nulliparous = 26.3 hrs.
Multiparous = 17.7 hrs.
(Data from Friedman, 1978)

The chi-square analysis considered positive phase, negative phase and critical day as well as positive phase, negative phase and critical period for each cycle. The expected frequencies for each phase of each cycle are listed in Table 2.

CHAPTER III

RESULTS

Of the 106 subjects initially agreeing to participate, 57 completed the 6-week data collection. Seventy-five returned the delivery questionnaire; 6 were eliminated due to induction of labor or Cesarean section prior to labor onset. Data were analyzed for the remaining 69 subjects.

The subjects ranged in age from 15 to 36 with a mean age of 24.99; the modes were 23 and 28 and the median age 24.3. In terms of pregnancies, the sample included 52 primigravidas, 13 gravida ii, and 4 gravida iii. Problems of pregnancy noted in the demographic data are summarized in Table 4. Only two of the subjects listing problems indicated complications of labor and delivery possibly related to these problems. There was no method to verify whether or not predisposing factors or complications arose after the initial contact and prior to labor onset. This was a recognized limitation of the study.

Table 4

Problems of Pregnancy for Sample

(n = 69)

Problem	Frequency	Relative Frequency
High blood pressure	4	5.8%
Anemia	6	8.7%
Edema	5	7.2%
Infection	6	8.7%
Vaginal bleeding (1st tri.)	2	2.9%
Premature labor	2	2.9%
Headaches	8	11.6%
Jaundice	0	-
Total	33	47.8%

Onset of Labor

The first research question was:

> Does labor onset occur more frequently than expected during the positive phase, negative phase, critical days or critical periods of any of the biorhythm cycles?

Table 5 summarizes the data for this research question.

For the physical cycle, 31 (45%) labors began in the positive phase, 29 (42%) in the negative phase, and 9 (13%) on a critical day ($\underline{X}^2 = 1.706$, $\underline{df} = 2$, $\underline{p} \leq 0.5$). Fifteen labors (21.7%) began in the critical period of the physical cycle ($\underline{X}^2 = 1.189$, $\underline{df} = 2$, $\underline{p} \leq 0.7$). The reported frequencies were not significantly different than expected for all phases of the physical cycle.

In the emotional cycle, 29 (42%) labors began in the positive phase, 36 (52.2%) in the negative phase, and 4 (5.8%) on a critical day ($\underline{X}^2 = 1.239$, $\underline{df} = 2$, $\underline{p} \leq 0.7$). The observed frequencies were not significantly different than expected for all phases of the emotional cycle.

For the intellectual cycle, labor onset occurred in the positive phase for 39 (56.5) subjects, in the negative phase for 29 (42%), and on a critical day for only one subject ($\underline{X}^2 = 4.135$, $\underline{df} = 2$, $\underline{p} \leq 0.2$). In the critical period, 6 (8.7) labors began ($\underline{X}^2 = 3.544$, $\underline{df} = 2$, $\underline{p} \leq 0.2$). Onset of labor did

Table 5

Relationship of Labor Onset and Biorhythm Cycles

(N = 69, α = 0.05)

Cycle:	Physical				Emotional				Intellectual			
Phase:	Pos.	Neg.	Crit. Day	Crit. Per.	Pos.	Neg.	Crit. Day	Crit. Per.	Pos.	Neg.	Crit. Day	Crit. Per.
Frequency	31 (45%)	29 (42%)	9 (13%)	15 (21.7%)	29 (42%)	36 (52.2%)	4 (5.8%)	7 (10%)	39 (56.5%)	29 (42%)	1 (1.5%)	6 (8.7%)
Expected freq.	31.5	31.5	6	12	32	32	5	9.857	32.4	32.4	4.2	8.36
X^2 (df = 2)		1.706		1.189		0.981		1.239		4.135		3.544
p value		0.5		0.7		0.7		0.7		0.2		0.2

not occur more frequently than expected in any phase of the intellectual cycle.

Time of Delivery

Time of delivery was correlated with the different phases of each biorhythm cycle for the second research question:

> Does time of delivery occur more frequently than expected during the positive phase, negative phase, critical days or critical periods of any of the biorhythm cycles?

These data are summarized in Table 6. The frequencies for this question were identical with that of labor onset (since most women delivered within 24 hours of labor onset or at least in the same biorhythmic phase) with the following exceptions noted.

For the emotional cycle, delivery occurred for 30 (43.5%) subjects in the positive phase, 36 (52.2%) in the negative phase, and 3 (4.3%) on a critical day. For these frequencies, ($\underline{X}^2 = 1.425$, $\underline{df} = 2$, $\underline{p} \leq 0.5$). In the critical period, 5 deliveries occurred (7.2%) ($\underline{X}^2 = 3.876$, $\underline{df} = 2$, $\underline{p} \leq 0.2$). The results were not significantly different than expected for the time of delivery for all phases of the emotional cycle.

In the intellectual cycle, 8 (11.6%) deliveries occurred in the critical period. This was not signifi-

Table 6

Relationship of Delivery and Biorhythm Cycles

($n = 69, \alpha = 0.05$)

Cycle:	Physical				Emotional				Intellectual			
Phase:	Pos.	Neg.	Crit. Day	Crit. Per.	Pos.	Neg.	Crit. Day	Crit. Per.	Pos.	Neg.	Crit. Day	Crit. Per.
Frequency	31 (45%)	29 (42%)	9 (13%)	15 (21.7%)	30 (43.5%)	36 (52.2%)	3 (4.3%)	5 (7.2%)	39 (56.5%)	29 (42%)	1 (1.5%)	8 (11.6%)
Expected freq.	31.5	31.5	6	12	32	32	5	9.857	32.4	32.4	4.2	8.36
x^2 (df = 2)		1.706		1.189		1.425		3.876		4.135		1.354
p value		≤ 0.5		≤ 0.7		≤ 0.5		≤ 0.2		≤ 0.2		≤ 0.7

cantly different than expected ($\underline{X}^2$ =1.354, $\underline{df}$ = 2, $\underline{p} \leq 0.7$).

Complications

Research question three stated:

> Do complications, such as premature labor, prolonged labor, hypertension, hemorrhage, infections, emergency Cesarean sections, and infant Apgar scores of less than 7, occur more frequently than expected during the negative phase, critical day or critical period of any of the cycles?

Relatively few subjects (6) reported more than two complications, and none reported more than four complications. Therefore, for purposes of chi-square analysis, the data were collapsed into only two groups: no complications and complications. These data are summarized in Table 7.

For deliveries occurring in the positive phase off the physical cycle, 7 subjects reported no complications and 24 had one or more complications. In the negative phase, 14 had no complications; 15 reported complications. Nine deliveries occurred on a critical physical day: 4 without and 5 with complications ($\underline{X}^2$ = 6.194, $\underline{df}$ = 2, $\underline{p} \leq 0.05$). The reported frequencies did vary significantly from the expected frequencies; a fewer percentage of subjects delivering in the negative phase had complications compared to those delivering in the positive phase. This was

Table 7

Relationship of Complications and Biorhythm Cycles

(n = 69, α = 0.05)

Cycle:	Physical				Emotional				Intellectual			
Phase:	Pos.	Neg.	Crit. Day	Crit. Per.	Pos.	Neg.	Crit. Day	Crit. Per.	Pos.	Neg.	Crit. Day	Crit. Per.
Freq.	7	14	4	6	10	15	0	0	14	10	1	2
No Complications	(28%)	(56%)	(16%)	(24%)	(40%)	(60%)	-	-	(56%)	(40%)	(4%)	(8%)
Exp. freq.	11.4	11.4	2.2	4.34	11.6	11.6	1.8	3.6	11.75	11.75	1.5	3
Freq.	24	15	5	9	20	21	3	5	25	19	0	6
Complications	(54.5%)	(34.1%)	(11.4%)	(20%)	(45.4%)	(47.8%)	(6.8%)	(11.4%)	(56.8%)	(43.2%)	-	(13.6%)
Exp. freq.	20.1	20.1	3.8	7.66	20.43	20.43	3.14	6.28	20.67	20.67	2.66	5.33
Total	31	29	9	15	30	36	3	5	39	29	1	8
χ^2 (df = 2)	6.194			3.61	3.049			5.917	4.561			2.024
p value	$<$ 0.05*			$\leq$ 0.2	$\leq$ 0.3			$\leq$ 0.1	$<$ 0.2			$<$ 0.5

Note. * indicates significant value.

the reverse of the expected outcomes according to biorhythm theory.

For subjects delivering in the critical physical period, 6 had no complications, whereas 9 had complications. This was not significantly different from the expected frequencies ($\underline{X}^2 = 3.61$, $\underline{df} = 2$, $\underline{p} \leq 0.2$).

In the positive phase of the emotional cycle, 10 deliveries were accompanied by no complications while 20 deliveries were complicated. In the negative phase, 15 subjects reported no complications, and 20 had complications. Of the three deliveries occurring on an emotional critical day, all three had complications. These results did not differ significantly from the expected frequencies ($\underline{X}^2 = 3.049$, $\underline{df} = 2$, $\underline{p} \leq 0.2$). In the critical period of the emotional cycle, all five deliveries had complications. Again, this was not significant when analyzed with the frequencies of the positive and negative phases ($\underline{X}^2 = 5.917$, $\underline{df} = 2$, $\underline{p} \leq 0.1$). However, it was noteworthy that all the deliveries on critical emotional days and periods had complications.

Fourteen subjects delivering in the positive phase of the intellectual cycle reported no complications and 25 experienced complications. In the negative phase, ten had no complications while 19

experienced complications. The one delivery occurring on a critical intellectual day had no complications. The $\underline{X}^2$ for these data were 4.561, $\underline{df}$ = 2, and $\underline{p} \leq 0.2$. In the critical period, two deliveries were uncomplicated while six were complicated ($\underline{X}^2$ = 2.024, $\underline{df}$ = 2, $\underline{p} \leq 0.5$). The occurrence of complications in all phases of the intellectual cycle was not significantly different from the expected frequencies.

Subjective Experiences

Research question 4 stated:

> Does a mother's subjective rating of her birth experience correlate with the positive or negative phase, critical days or critical periods of any of the biorhythm cycles?

To answer this final research question, the subjects were asked first to rate the birth experience on a 5-point scale from very easy to very distressing and then to compare the actual experience with their expectations, also on a 5-point scale. The data were collapsed in order to have the minimum of one expected frequency per chi-square cell. Comparisons of very easy/somewhat easy answers to moderately stressful/very distressing answers were analyzed for each phase of each biorhythm cycle. The results of these findings are summarized in Table 8.

For subjects delivering in the positive phase

Table 8

Relationship of Subjective Experience and Biorhythm Cycles

Easy versus Stressful

(n = 54, α = 0.05)

Cycle:	Physical				Emotional				Intellectual			
Phase:	Pos.	Neg.	Crit. Day	Crit. Per.	Pos.	Neg.	Crit. Day	Crit. Per.	Pos.	Neg.	Crit. Day	Crit. Per.
Freq.	9	11	5	6	14	9	2	2	16	9	0	1
Easy	(16.7%)	(20.4%)	(9.2%)	(11.1%)	(25.9%)	(16.7%)	(3.7%)	(3.7%)	(29.6%)	(16.7%)	-	(1.9%)
Exp. freq.	11.4	11.4	2.2	4.34	11.6	11.6	1.8	3.6	11.75	11.75	1.5	3
Freq.	13	13	3	6	9	19	1	3	16	12	1	7
Stressful	(24.1%)	(24.1%)	(5.5%)	(11.1%)	(16.7%)	(35.2%)	(1.8%)	(5.6%)	(29.6%)	(22.2%)	(1.9%)	(13%)
Exp. freq.	13.24	13.24	2.51	5.04	13.5	13.5	2	4.14	13.62	13.62	1.76	3.52
Total	22	24	8	12	23	28	3	5	32	21	1	8
χ^2 (df = 2)		4.183		1.08		5.343		8.264		4.618		7.695
p value		≤ 0.2		≤ 0.7		≤ 0.1		≤ 0.02		≤ 0.1		≤ 0.05*

Note. *indicates significant value.

of the physical cycle, 9 reported an easy experience and 13 a stressful one. For the negative phase of the physical cycle, 11 subjects reported an easy experience, and 13 reported a stressful birth. Five subjects delivering on a critical physical day considered the birth experience easy; three considered it stressful ($\underline{X}^2 = 4.183$, $\underline{df} = 2$, $\underline{p} \leq 0.2$). These results were not significant.

For subjects delivering in a physically critical period, six reported easy birth experiences while six described stressful experiences. There was no significant difference in positive and negative subjective experiences for the critical physical period ($\underline{X}^2 = 1.08$, $\underline{df} = 2$, $\underline{p} \leq 0.7$).

For the emotional cycle, there were differences in the reported subjective experience, but they were not significant at the level specified. In the positive phase, 14 reported easy experiences, whereas 9 considered the birth stressful. Conversely, in the negative phase, 9 reported easy birth experiences, compared to 19 stressful experiences. Two deliveries on a critical emotional day were considered easy and one stressful ($\underline{X}^2 = 5.343$, $\underline{df} = 2$, $\underline{p} \leq 0.1$). In the critical period of the emotional cycle, two subjects reported easy births while three described stressful

experiences. Considering the critical emotional period, the differences were significant with $\underline{X}^2 = 8.264$, $\underline{df} = 2$, and $\underline{p} \leq 0.02$.

In the positive phase of the intellectual cycle, 16 subjects considered the experience easy and 16 considered it stressful. In the negative phase, nine subjects reported an easy experience while 12 described it as stressful. The one delivery that occurred on a critical intellectual day was considered stressful. These differences were not significant ($\underline{X}^2 = 4.618$, $\underline{df} = 2$, $\underline{p} \leq 0.1$). In the critical period, one subject reported an easy birth and seven reported stressful births. Considering the critical intellectual period, easy compared with stressful deliveries were significantly different ($\underline{X}^2 = 7.695$, $\underline{df} = 2$, $\underline{p} \leq 0.05$).

For the second half of the research question, the subjects compared the actual birth experience with what they expected. It was anticipated that this question would take into account past experiences as well as the variable of fear and anxiety for each subject. Again, the data were collapsed to compare the "much/somewhat easier" responses with the "somewhat/great deal harder" responses. The results are summarized in Table 9.

Table 9

Relationship of Subjective Experience and Biorhythm Cycles

Easier versus Harder than Expected

(n = 60, α = 0.05)

Cycle:	Physical				Emotional				Intellectual			
Phase:	Pos.	Neg.	Crit. Day	Crit. Per.	Pos.	Neg.	Crit. Day	Crit. Per.	Pos.	Neg.	Crit. Day	Crit. Per.
Freq.	15	15	7	8	20	15	2	3	21	16	0	3
Easier	(25%)	(25%)	(11.7%)	(13.3%)	(33.3%)	(25%)	(3.3%)	(5%)	(35%)	(26.7%)	-	(5%)
Exp. freq.	16.9	±6.9	3.2	6.4	17.2	17.2	2.6	5.3	17.4	17.4	2.2	4.5
Freq.	10	11	2	6	5	17	1	2	13	9	1	5
Harder	(16.7%)	(18.3%)	(3.3%)	(10%)	(8.3%)	(28.3%)	(1.6%)	(3.3%)	(21.7%)	(15%)	(1.6%)	(8.3%)
Exp. freq.	10.5	10.5	2	4	10.7	10.7	1.6	3.3	10.8	10.8	1.4	2.8
Total	25	26	9	14	25	32	3	5	34	25	1	8
χ^2 (df = 2)	4.988		1.701		7.845		10.838		3.92		3.821	
p value	$\leq$ 0.1		$\leq$ 0.5		$\leq$ 0.02*		$\leq$ 0.01*		$<$0.2		$\leq$0.2	

Note. *indicates significant value.

Fifteen subjects delivering in the positive physical phase considered the birth experience easier than expected, and ten considered it harder. In the negative phase of the physical cycle, 15 deliveries were considered easier than expected, and 11 were considered harder. On critical days there were seven deliveries reported easier and two reported harder than expected ($\underline{X}^2 = 4.988$, $\underline{df} = 2$, $\underline{p} \leq 0.1$). The results were not significantly different for the physical cycle. For deliveries during the critical period of the physical cycle, eight were considered easier than expected and six harder. These differences were not significant ($\underline{X}^2 = 1.701$, $\underline{df} = 2$, $\underline{p} \leq 0.5$).

Differences in perceptions of the delivery experience occurred in the emotional cycle. For subjects delivering in the positive phase, 20 reported an easier than expected experience. Five considered it harder, and none reported "a great deal harder" experience. In the negative phase of the emotional cycle, 15 deliveries were considered easier than expected, whereas 17 were reported harder. On critical emotional days two deliveries were reported easier and 1 harder ($\underline{X}^2 = 7.845$, $\underline{df} = 2$; the difference was significant at the $\underline{p} \leq 0.02$ level). In the critical period of the emotional cycle, three subjects considered the

birth experience easier and two considered it harder than expected. The differences for the different phases considering the critical period were also significant ($\underline{X}^2 = 10.838$, $\underline{df} = 2$, $\underline{p} \leq 0.01$).

Subjects delivering in the positive phase of the intellectual cycle reported 21 births easier than expected and 13 harder. In the negative phase of the intellectual cycle, 16 subjects reported the birth experience easier than expected, and 9 considered it harder. The one delivery on a critical intellectual day was reported harder than expected. This difference was opposite the predicted effect of the negative phase, but was not significant ($\underline{X}^2 = 3.92$, $\underline{df} = 2$, $\underline{p} \leq 0.2$). Eight deliveries occurred in a critical period of the intellectual cycle, with three considered easier and five considered harder than expected ($\underline{X}^2 = 3.821$, $\underline{df} = 2$, $\underline{p} \leq 0.2$). The differences were not significant.

Rhythmists

The analysis of the checklists identified the number of subjects as rhythmists. They are presented in Table 10. Only one subject demonstrated rhythmicity in all three cycles. These percentages were considerably lower than the 70% suggested in the literature. Consequently the data for rhythmists constituted

Table 10

Subjects Identified as Rhythmists

	No. of Subjects[a]	No. of Rhythmists	%
Physical cycle	46	10	21.7
Emotional cycle	45	12	26.7
Intellectual cycle	40	11	27.5

Note. [a]Differing numbers due to incomplete checklists from some subjects.

frequencies too small to analyze for significance. Descriptive data for those who demonstrated rhythmicity are presented in Tables 11, 12 and 13.

For those showing rhythmicity in the physical cycle (n = 10), five began labor and delivered in the positive phase and five in the negative phase. None delivered on a critical physical day or period, as the literature stated (Thommen, 1973). One of the five deliveries in the positive phase had no complications compared to three uncomplicated deliveries in the negative phase. This was counter to what was predicted by the biorhythm theory; however, the number of subjects was much too small to determine a trend. Subjective experiences seemed to be evenly divided between the positive and negative phase.

Twelve subjects met the criteria for the rhythmist group in the emotional cycle. Four began labor and delivered in the positive phase, seven in the negative phase, and one on a critical emotional day. The proportion of no complications to complications was comparable for the two phases. As with data for all subjects, subjective experiences for the two phases were different. Seventy-five percent of subjects delivering in the positive phase considered the birth experience easy, whereas 71% of those delivering in

Table 11

Physical Rhythmist and Study Results:

Physical Cycle of Rhythmists

($\underline{n}$ = 10)

Variable	Pos.	Neg.	Crit. Day	Total	Crit. Period
Labor Onset	5 (50%)	5 (50%)	0	10	0
Delivery	5 (50%)	5 (50%)	0	10	0
No Complications	1 (20%)	3 (60%)	0	4	0
Complications	4 (80%)	2 (40%)	0	6	0
Easy Birth Experience	1 (20%)	1 (20%)	0	2	0
Stressful Birth Experience	3 (60%)	2 (40%)	0	5	0
Easier than Expected	1 (20%)	1 (20%)	0	2	0
Harder than Expected	2 (40%)	2 (40%)	0	4	0

Table 12

Emotional Rhythmists and Study Results:

Emotional Cycle Rhythmists

(n = 12)

Variable	Pos.	Neg.	Crit. Day	Total	Crit. Period
Labor Onset	4 (33.3%)	7 (58.3%)	1 (8.3%)	12	1
Delivery	4 (33.3%)	7 (58.3%)	1 (8.3%)	12	1
No Complications	2 (50%)	3 (43%)	0	5	0
Complications	2 (50%)	4 (57%)	1 (100%)	7	1
Easy Birth Experience	3 (75%)	0	1 (100%)	4	1
Stressful Birth Experience	1 (25%)	5 (71%)	0	6	0
Easier than Expected	2 (50%)	3 (43%)	1 (100%)	6	1
Harder than Expected	1 (25%)	3 (43%)	0	4	0

Table 13

Intellectual Rhythmists and Study Results:

Intellectual Cycle Rhythmists

(n = 11)

Variable	Pos.	Neg.	Crit. Day	Total	Crit. Period
Labor Onset	4 (36.4%)	7 (63.6%)	0	11	1
Delivery	4 (36.4%)	7 (63.6%)	0	11	1
No Complications	2 (50%)	3 (43%)	0	5	0
Complications	2 (50%)	4 (57%)	0	6	1
Easy Birth Experience	1 (25%)	4 (57%)	0	5	1
Stressful Birth Experience	2 (50%)	1 (14%)	0	3	0
Easier than Expected	2 (50%)	4 (57%)	0	6	1
Harder than Expected	2 (50%)	2 (28%)	0	4	0

the negative phase considered it hard. The differences between the two phases for comparing the actual birth experience to that expected were less remarkable.

For the intellectual cycle, 11 subjects followed the predicted rhythm. Four labored and delivered in the positive phase and seven in the negative phase; none on a critical intellectual day. Comparison of the complications to the no complications groups showed little differences between the phases. The majority of subjects delivering in the negative phase considered the birth experience easy and easier than expected (57%).

Summary

The results of this study showed that onset of labor and time of delivery did not occur more frequently than expected during any phase, critical days or critical periods of any biorhythm cycle. Complications occurred with no significant differences between the phases of the emotional and intellectual cycle; in the physical cycle fewer complications occurred for those delivering in the negative phase.

The emotional cycle showed significant differences in subjective responses to the birth experience. More subjects who delivered in the positive emotional phase considered the birth experience easier than

expected as compared with those who delivered in the negative emotional phase. Also, in the intellectual cycle there were more stressful births in the critical period.

Frequencies of subjects classified as rhythmists for a particular biorhythm cycle were too small to analyze with chi-square tests of significance. There was a trend in the emotional cycle for subjective birth experience to be correlated with the positive and negative phases. In the intellectual cycle, the trend was reversed; more subjects delivering in the negative phase considered the birth easy and easier than expected.

CHAPTER IV

DISCUSSION

Rhythmists

The first finding of this biorhythm study was that very few of the subjects who completed the checklists met the criteria for rhythmists. Several possibilities could explain this discrepancy with the 70% suggested in the literature (Kennedy, 1981).

1. The biorhythm theory was not supported, and those subjects who met the criteria for rhythmists did so by chance. Statistically, the probability of chance occurrences was set at 0.05; with greater than 20% findings of rhythmists in each cycle, this is unlikely. It is possible that too many artificial stimuli in today's Western society impinge on the natural rhythm and mask it (much as jet lag and night shift work disrupt the circadian rhythms [Tom & Lanuza, 1976]). At the turn of the century, lifestyles were considerably simpler and more in synchrony with natural rhythms. Thus the regular cycles discovered by Fleiss and Swoboda may no longer be valid

for many people today.

2. Biorhythms were disrupted during pregnancy due to hormonal changes, emotional lability and psychosocial role adjustments experienced by the pregnant woman. Research has demonstrated a significant change in the circadian rhythms of blood pressure and WBC's in pregnant women (Malek, Suk, Brestak & Maly, 1962). Considering all the physiologic processes affected by pregnancy, one could theorize that pregnancy also disrupt a woman's biorhythm cycle. Perhaps a more accurate determinant of rhythmists as opposed to nonrhythmists could be obtained by measurement after the six-week postpartum period, when most bodily functions have returned to a nonpregnant state.

3. The checklist was not a valid measure of daily biorhythm status. As stated in the methodology, this instrument had not been used previously for the purpose of determining rhythmists. While the questions referring to each biorhythm cycle had face validity in terms of the biorhythm theory, these questions may have been interpreted differently or the influence of one cycle masked the effects of the others.

4. The subjects completed the daily checklists haphazardly or not at the same time every day, as instructed. Ideally, the checklists should have been

marked each day for the previous 24 hours at about the time of the subject's birth. Subjects were not instructed specifically regarding the time to mark the checklists. Considering that almost half of the subjects indicated a time of birth between 10:00 pm and 8:00 am, it is probable that overlapping for critical days and periods occurred in some cases.

5. The subjects were not challenged sufficiently each day to be aware of their status relative to each biorhythm cycle. For example, unless a physical workout was a daily routine, the subject may have had nothing to evaluate in terms of whether she was feeling "very energetic" or "about average."

Any or all of these factors could have affected the outcome. A more precise and less subjective tool would be needed before totally rejecting the biorhythm theory. Separating the subjects into a rhythmist/nonrhythmist dichotomy based on the checklists was of questionable value.

Onset of Labor and the Biorhythm Cycles

Chi square analysis of the frequencies of labor onset with the phases of each biorhythm cycle showed no significant differences from the expected frequencies. These findings did not support the claim

by Thommen (1973) and Kennedy (1981) that labor most often began on a woman's physical or emotional critical day. In the physical cycle the actual frequency of labor onsets (n = 9) did exceed the expected (6), but this difference was not significant. Since methodology and data were not provided by Thommen and Kennedy, tentative explanations for this discrepancy would be purely hypothetical.

The inverse relationship between labor onset and critical days found by Armstrong et al., (1978) also was not supported by the current study. The data for the rhythmist group in the current study did indicate no subjects began labor on a physical critical day or an intellectual critical day, and only one subject in 12 began labor on an emotional critical day. Armstrong used a much larger sample (n = 286) and statistically significant results could be demonstrated. Extensive, repeated sampling would be necessary before concluding any significant generalization to the population regarding onset of labor.

This study did not support the effect of the mother's biorhythms on triggering the feedback mechanisms which begin labor contractions. However, it is known that the fetal membrane contains the precursors for prostaglandins, which play a key role

in the initiation of labor contractions (Pritchard & MacDonald, 1980). Therefore, the fetal, rather than the maternal, biorhythms may have an effect on when labor begins. This is impossible to research unless exact date of conception or the beginning of the fetal biorhythms can be determined.

Time of Delivery and Biorhythm Cycles

Time of delivery did not occur more frequently than expected during the positive phase, negative phase, critical days or critical periods of any of the biorhythm cycles. This corresponded closely with the data for labor onset, but both variables were considered because of possible differences with criticalcal days and/or critical periods. For exact determination of these days, the subject's time of birth needed to be considered. Unfortunately, only 42 of 69 (61%) recorded the time of birth on the demographic information sheet. Exact time of birth for all subjects as well as a larger sample would yield more accurate conclusions about biorhythm phases and time of delivery.

The subject's length and progress of labor were subject to numerous physiologic, psychological, and environmental variables, none of which could be con-

trolled for the purposes of this study. For example, prolonged labor may have been related to mistimed analgesia, epidural anesthesia, the woman's position in labor, her fetopelvic relationship, and so on. Labor progress is also considerably affected by emotional factors (such as the amount of fear, anxiety, and tension) and the physical fitness and endurance of the parturient. The potential effect of biorhythms over these other variables was beyond the scope of this study. A few hours' difference in time of delivery due to extraneous variables or interventions would have affected the biorhythmic phase in which delivery occurred in a very limited number of subjects.

Complications and Biorhythm Cycles

The results did not support the theoretical prediction that more complications would occur during the biorhythmic negative phases and critical days, except in the intellectual critical period. In the physical cycle, the opposite was observed: 24 out of 31 subjects delivering in the positive phase had complications compared to 15 out of 29 in the negative phase. This difference was significant at the 0.05 level, but could have occurred by chance. If, in fact, it represented a trend in reality, no logical explanation for this discrepancy could be devised

in terms of the biorhythm theory. The obvious conclusion was that the biorhythm theory did not apply to events of labor and delivery or that the complications were a result of extraneous variables not under the influence of biorhythms.

The original basis for this research question was that the actual number of complications might correlate with the phases of the biorhythm cycles. Even collapsing into two groups of 1-2 and 3-4 complications, the frequencies were too small for $\underline{X}^2$ analysis. Those subjects with three to four complications ($\underline{n}$ = 6) were equally distributed between the positive and negative phases of the physical and intellectual cycles. For the emotional cycle, five deliveries occurring in the negative phase had three to four complications compared to one complicated delivery in the positive phase. A larger sample would be needed to conclude that more complications occur when a woman delivers in the negative emotional phase.

Epidural anesthesia may have been the predisposing factor for many of the complications seen in this sample. Fifty-one subjects (73.9%) indicated they had an epidural for labor and/or delivery. Regional anesthesia has been associated with higher incidences of severe hypotension, which could affect

uterine blood flow and compromise the fetus; convulsions from accidental intravenous injection of the anesthetic agent; desultory labor in first stage and prolonged descent in second stage (Pritchard & MacDonald, 1980). In this research, complications which could have been a direct effect of the epidural were not differentiated. Elimination of subjects having this type of anesthesia may have produced strikingly different results.

Subjective Experiences

Correlation of subjective birth experiences with phases of the biorhythm cycles was significant primarily in the emotional cycle. Subjects delivering in the positive phase of the emotional cycle had a more positive perception of labor and delivery, whereas subjects delivering in the negative phase tended to view the experience as more stressful and harder than expected. These results reaffirm the impact of emotional aspects on labor and delivery. How a woman perceives the experience can greatly affect her anxiety and tension during labor and her interactions with the newborn after delivery. A positive experience tends to promote feelings of accomplishment and joy in the creative process for the new mother. A negative experience, especially for those expecting to cope

effectively with the labor contractions, can lead to disappointment, feelings of failure and guilt.

If indeed a positive emotional outcome is desirable, the implications of these findings for the health care provider are simple. It is not possible to predict or control in which emotional phase a client will begin to labor. But an identification of the woman's emotional rhythm may provide cues for supportive care. If a woman is in a negative phase, more emotional support, as well as the constant presence of a significant other, may be needed to assist her through contractions. An understanding of the client's rhythms may evoke more empathetic responses from those attending her during labor. In addition, knowledge of inherent rhythms and explanations to the client after the experience may alleviate some feelings of disappointment and guilt. (Prior knowledge would not be recommended for fear of contributing to a self-fulfilling prophecy.)

A serious limitation was the widespread usage of epidural anesthesia. If effectively administered, complete pain relief from the contractions of labor is achieved, and this could definitely impact a woman's perception of labor. The time of administration and effectiveness was not recorded on the questionnaire,

so it was not possible to evaluate this factor's influence on the subject's overall impression of the birth experience.

Recommendations

The findings of this research did not support biorhythm theory as influencing the events of labor and delivery, with the exceptions of the emotional cycle and the intellectual critical period with the woman's subjective experience. It is recommended that further research in the area of biorhythms and birth be conducted before rejecting any effect of biorhythms in this area.

A larger sample of women is needed to support greater statistical significance of the findings. The relatively small sample size was recognized as a limitation of this study. Some of the frequencies, especially for critical days and periods, were not sufficient for five per chi-square cell, and thus the tests may be held suspect. Increased sample size and repeated sampling in various settings would improve the generalization of the results.

Women should be interviewed as soon as possible after delivery to insure accurate perceptions and allow access to medical records for more complete data. Those having had regional anesthesia during

labor should be eliminated from the sample for the reasons stated earlier.

Questions concerning the subjective experience could relate more specifically to the physical, emotional and intellectual aspects of labor and delivery; results may then show a closer correlation to the corresponding cycles. The questions used in this study were subject to interpretation with reference to physical or emotional ease/stress.

Further research with repeated questions on the subjective experience of birth could be administered at set intervals after delivery. Possibly a regular pattern of responses would emerge related to the time interval after the birth. Answers could also be correlated with a woman's biorhythm cycles at the time of the interview to determine whether the biorhythms affect the woman's perception of labor and delivery.

If an attempt to differentiate rhythmists from nonrhythmists is desired, a more accurate means of measuring should be devised (such a tool and appropriate research would perhaps support or negate the biorhythm theory in its essence). It is recommended that the measurements begin at least six weeks after delivery, or a pre- and postmeasurement given to

determine any influence of the pregnancy itself on the woman's biorhythms.

Conclusion

Generalization of the results of this investigation is limited to pregnant women in the Salt Lake City area. Labor onset and delivery did not occur more frequently in one particular phase of any of the biorhythm cycles for this sample. Considering the small frequencies for complications and subjective experiences and the predominant use of epidurals, generalizing the findings for the last two research questions would be questionable. Further testing is necessary to support or contradict the current findings.

The question of biorhythms remains a mystery. Previous research with large samples showed a circadian rhythm and even a seasonal rhythm for time of birth. This researchers attempt to link the events of birth to the maternal biorhythms yielded, for the most part, nonsignificant results. While definite rhythms can be demonstrated in almost all areas of nature--and in the entire known universe--man's infradian cycles would seem nonmeasurable or too variable to predict. Perhaps man, in his efforts to control his bodily functions, his environment and his "fate," has ignored

the natural rhythms to such an extent that they are no longer recognizable. Is such control evidence of man's potential mastery over the forces of nature? Or by defying the natural rhythms does he create disharmony, anxiety and ill health? Perhaps man would benefit himself--and the universe--by careful consideration of these questions.

APPENDIX A

CONSENT FORMS

Informed Consent
(A-1)

You have been asked to participate in a study of biorhythms in pregnancy. The purpose of this study is to determine whether labor begins during a certain phase of a woman's biorhythm cycle, or if outcomes can be predicted by the biorhythms.

If you agree to participate, you will be asked to complete a daily checklist of 10 questions for 6 weeks. The checklist should take only 1 to 2 minutes to complete, but it is very important that it is completed at the same time each day. These checklists will be used to match your emotional, physical and mental "ups" and "downs" with your biorhythm curves. After 6 weeks of the checklist have been completed (or if you deliver before 6 weeks), please send the sheets to the researcher in the stamped, addressed envelope provided.

You will be given another questionnaire to fill out concerning your labor and delivery. The information needed is: when your labor started, how long it lasted, time of delivery, any problems with childbirth, and how you felt about the experience. It would be greatly appreciated if this is completed as soon as possible after your delivery and mailed to the researcher in the second stamped, addressed envelope.

There are no physical risks in the study to you or your unborn baby. There are also no personal benefits to you during your pregnancy. However, after your delivery I will share with you the biorhythm theory and your personal biorhythm curves, if you so desire. Also, in appreciation for your participation, I will send to you by mail a 6-month biorhythm chart after I receive your completed questionnaire. You may feel that another benefit from your participation is the knowledge that you contributed to scientific research on biorhythms.

The information you provide is considered confidential, and your participation in this study is anonymous. You will be given a code number for your checklists and questionnaire; neither your name nor the information you provide will appear anywhere in the final report.

If at any time you choose to withdraw from this study, you may do so by contacting the researcher. If you wish to receive a summary of the results when the study is completed, please note that request on your questionnaire.

Thank you for your participation and cooperation. I may be reached by telephone at 583-4204 if you have any questions about the study.

Carol Morganti, R.N.
Graduate Student, University of Utah

I hereby give my consent to participate in a research study on biorhythms in pregnancy, the general plan of which has been explained to me, including anticipated benefits and potential complications.

I fully understand, as it has been explained to me, that by giving notice to the principle researcher, I may withdraw from this research project at any time that I wish to do so.

_____
Participant's signature

_____
Date

Consent for Participation
in Investigational Study
(A-2)

The Effects of Biorhythm Cycles
on Labor Onset, Time of Delivery and Outcome
of Pregnancy

I. Information

You have been asked to participate in a study of biorhythms in pregnancy. The purpose of this study is to determine whether labor begins during a certain phase of a woman's biorhythm cycle, or if outcomes can be predicted by the biorhythms.

If you agree to participate, you will be asked to complete a daily checklist of 10 questions for 6 weeks. The checklist should take only 1 to 2 minutes to complete, but it is very important that it is completed at the same time each day. These checklists will be used to match your emotional, physical and mental "ups" and "downs" with your biorhythm cycles. After 6 weeks of the checklist have been completed (or if you deliver before 6 weeks), please send the sheets to the researcher in the stamped, addressed envelope provided.

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There are no physical risks in the study to you or your unborn baby. There are also no personal benefits to you during your pregnancy. However, after your delivery, I will share with you the biorhythm theory and your personal biorhythm curves, if you so desire. Also, in appreciation for your participation, I will send to you by mail a 6-month biorhythm chart after I receive your completed questionnaire. You may feel that another benefit from your participation is the knowledge that you contributed to scientific research on biorhythms.

The information you provide is considered confidential, and your participation in this study is anonymous. You will be given a code number for your checklists and questionnaire; neither your name nor

the information you provide will appear anywhere in the final report.

If at any time you choose to withdraw from this study, you may do so by contacting the researcher. If you wish to receive a summary of the results when the study is completed, please note that request on your questionnaire.

In the event you sustain physical injury resulting from the research project in which you are participating, the University of Utah will provide you, without charge, emergency and temporary medical treatment not otherwise covered by insurance. Furthermore, if your injuries are caused by negligent acts or omissions of University employees acting in the course and scope of their employment, the University may be liable, subject to limitations prescribed by law, for additional medical costs and other damages you sustain. If you believe that you have suffered a physical injury as a result of participation in this research program, please contact the Office of Research Administration, phone no. 581-6903.

Thank you for your participation and cooperation. I may be reached by telephone at 583-4204 if you have any questions about the study.

Carol Morganti, R.N.
Gradute Student, University of Utah

II. Consent

I have read the foregoing and my questions have been answered. I desire to participate in this study and accept the benefits and risks which may be serious and substantial. I give permission for information gathered in this study to be released to Carol Morganti.

_____
Signature

_____ _____
Date Witness

If the participant is a minor or otherwise unable to consent, complete the following:

Upon consideration of the possible benefits and risks of the study outlined, I approve the participation of _____ in this study.

_____
Signature

_____ _____
Date Relationship

_____
Witness

APPENDIX B

PARTICIPANT'S INFORMATION

Code No._____

Name:

Address:

Phone no:

Best time(s) to phone:

Age:

Birth date:

Time of birth:

Place of birth:

EDC:

Parity:

Problems with this pregnancy:

High blood pressure

Anemia

Edema

Infection

Vaginal bleeding

Premature labor

Medication

Headaches

Jaundice

Other:

APPENDIX C

INDIVIDUAL DAILY CHECKLIST*

Code No. _____

Birth Date _____

Instructions:

On the following sheets, please check the ONE best choice within each category which describes the way you feel. Please record your answers the same time each day. Please be sure to record the date at the top of each column.

	DATE						
1. IN TERMS OF YOUR GENERAL SPIRITS, DO YOU FEEL:							
in exceptionally good spirits							
in quite good spirits							
as you usually feel							
somewhat depressed							
quite depressed							
2. HOW DO YOU FEEL PEOPLE SEE YOU TODAY:							
particularly 'up'							
moderately 'up'							
about average							
somewhat 'down'							
quite 'down'							
3. IF SOMEONE DISAGREED WITH YOU TODAY, WOULD YOU REACT:							
without irritability							
with hardly any irritability							
neither irritably nor nonirratably							
somewhat irritably							
quite irritably							

	DATE						
4. WHEN YOU GOT UP THIS MORNING, DID YOU FEEL:							
exceptionally alert							
quite alert							
about average							
quite foggy							
exceptionally foggy							
5. WHILE DOING YOUR MOST CRITICAL WORK TODAY, DID YOU:							
concentrate very well							
concentrate quite well							
concentrate as usual							
have some difficulty concentrating							
have great difficulty concentrating							
6. IF FACED WITH A TECHNICAL OR CREATIVE PROBLEM TODAY, DID YOU UNDERSTAND IT:							
very quickly							
quite quickly							
as quickly as usual							
less quickly than usual							
much less quickly than usual							
7. TODAY DID YOU FEEL:							
very energetic							
quite energetic							
about average							
somewhat tired							
very tired							

	DATE						
8. IN YOUR PHYSICAL ACTIVITIES TODAY, WERE YOU:							
extremely active							
very active							
about average							
somewhat inactive							
very inactive							
9. IN YOUR ACTIVITIES TODAY WERE YOUR REACTIONS:							
very quick							
quick							
average							
slow							
very slow							
10. DID YOU HAVE ANY TRYING OR STRESSFUL INCIDENTS TODAY:							
a great deal more than usual							
more than usual							
same as usual							
less than usual							
a great deal less than usual							

If you had a difficult day, please write briefly what made the day stressful, i.e., argument with boss or friend, discomforts, bad news.
Date: Stress:

*Reprinted with permission of Armstrong, M., unpublished material.

APPENDIX D

QUESTIONNAIRE

Code No. _____

Please complete the information on this sheet as completely and as accurately as possible. Some information may be obtained from the nurses caring for you during your labor and delivery or during your hospital stay.

1. Due date _____

2. When did your labor begin (regular contractions every 5-10 minutes and continuing until delivery)?

   Date _____ Time _____ am/pm

3. At what time were you completely dilated?

   Time _____ am/pm Don't know _____

4. What time was your baby born?

   Date _____ Time _____ am/pm

5. Type of delivery:

   _____ Spontaneous vaginal

   _____ Forceps

   _____ Cesarean section (Reason _____)

6. Anesthesia for delivery:

   _____ None

   _____ Local/pudendal

   _____ Epidural

   _____ Spinal or saddle

   _____ Other _____

7. Newborn babies are given an Apgar score shortly after birth to indicate the baby's general condition. What was your baby's Apgar score?

   1 minute _____ 5 minutes _____

8. Did you have any problems during labor or delivery?

_____ High blood pressure

_____ Seizures

_____ Vaginal bleeding (heavy)

_____ Infection or fever

_____ Premature baby (3 wks. or more before due date)

_____ Prolonged labor

_____ Need for Pitocin to stimulate labor

_____ Excessive bleeding after delivery

_____ Other _____

9. How would you consider your overall labor and delivery experience?

_____ Very easy

_____ Somewhat easy

_____ Neither easy nor stressful

_____ Moderately stressful

_____ Very distressing

10. How did your birth experience compare with what you expected?

_____ Much easier

_____ Somewhat easier

_____ About the same

_____ Somewhat harder

_____ A great deal harder

Comments on your birth experience and/or your participation in this study:

Do you desire a copy of the results of this study?
_____ Yes _____ No

Thank you very much for participating in this study. Your biorhythm chart will be sent to you soon after you send this questionnaire to:

Carol Morganti
3014 Kennedy Dr.
Salt Lake City, UT 84108

Please call me if you have any question: 583-4204

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